



***Selected Presentation at the 2020 Agricultural &
Applied Economics Association Annual Meeting,
Kansas City, Missouri, July 26-28***

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Collective action and smallholder rural households:

Implications for income and asset aspirations

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Abstract

While it is increasingly recognized that aspirations drive economic behaviour and outcomes, it is not clear how aspirations are formed. Theoretical literature assumes that aspirations are formed in the 'thick of life' and by observing neighbours and peers in a cognitive neighbourhood. In this regard, collective action and group interaction may be a pathway in forming the aspirations of rural households, enabling them to escape poverty. This study establishes the role of cooperative membership in the formation of income and asset aspirations. Employing household-level data from smallholder farmers in Kenya, and controlling for selection into cooperatives, the study finds cooperative membership to be crucial in the formation of income and asset aspirations. The analysis also finds evidence supporting the concept of 'capacity to aspire' which holds that poor households usually aspire for less owing to their current condition which curtails their aspirations. The study therefore lends support to the development of financial and institutional mechanisms that can increase households' access to cooperative membership. Also, policies and interventions tackling external constraints may be instrumental in relaxing aspirational constraints faced by rural households. Addressing these external constraints may go a long way to offset and alter the internal constraints (aspirations) that households face in improving their future-oriented outcomes.

Keywords: income aspirations, asset aspirations, cooperative membership, capacity to aspire, Kenya

1. Introduction

Aspirations and their role in future-oriented economic outcomes like investments and poverty are currently recognized in economic literature. With insights from Appadurai (2004), households with low aspirations usually aspire for less as their current poverty status curtails their aspirations. Poor households do not save and usually, let go of investments with high returns. Past research attributes the inability of households to make profitable investments to external constraints like asymmetric information, imperfect and thin markets as well as the lack of well-functioning credit and insurance markets. Internal constraints like aspirations and behavioural biases have been suggested as important in explaining the lack of investment behaviour of poor households (Duflo 2013; Appadurai 2004; Ray 2003; Macours and Vakis 2014), but have received little attention in the empirical literature. Further, one might suspect that these external constraints also affect internal constraints, reinforcing their effect (Lybbert and Wydick 2018; Garcia et al. 2020). To this end, addressing constraints like imperfect information and the lack of credit markets may be instrumental in shaping the aspirations of rural households.

Aspirations are defined as goals to which individuals invest time, money and effort for their attainment (Bernard and Taffesse 2014). They are future-oriented and exclude present level gratification. Aspirations are a subjective endogenous concept formed by human interactions or associations in a social setting (Appadurai 2004). Despite their endogenous formation, they are not evenly distributed in any community (Appadurai 2004). For example, the more resources, responsibility or power an individual possess in a society, the better placed and conscious he is in effectively forming his aspirations. The poor with lesser resources on the other hand internalize their resource constraints and aspire for less which is reflected in their low investment levels. Moreover, non-poor individuals have the potential to navigate easily and routinely share information amongst themselves than with others in their community. Perhaps their build of experience and easy access to information from their set of extended relations make it easier for them to directly link different aspirational options (La Ferrara 2019). Their high aspirations, coupled with the available resources and putting in the required efforts for aspiration attainment, they invest in the future leading to improved welfare. This scenario can be likened to the assertion, 'the rich get richer and the poor get poorer'.

While a burgeoning theoretical and empirical literature has established the link between aspirations and future-oriented outcomes, current research is geared at understanding how aspirations are formed (or eroded). Critical to the formation of aspirations is the concept of aspiration window (Ray 2006). An aspiration window is a group of individuals having similar capabilities and most likely sharing similar features like religion, gender, occupation, and caste. An individual's aspiration window is formed from a cognitive window of perceived individuals with similar traits. Depending on social mobility and informational flow in a network, an individual's aspiration window can be small or large, and thus limiting or not. Under this window, aspirations are built and developed through social interaction with relevant and influential peers.

Theoretical literature generally assumes that aspirations are formed in the 'thick of life' and by observing neighbours and peers in a cognitive neighbourhood (Appadurai 2004; Genicot and Ray 2017). According to the aspiration window concept of Ray (2006), individuals build their aspirations based on their experiences and the experiences of others in their cognitive window or better still, their social environment. In this regard, collective action and group interaction may be a pathway in improving the aspirations of rural households, enabling them to escape poverty. In their investigation on the social interaction effect on aspiration formation in Nicaragua, Macours and Vakis (2014) randomly assigned households to three treatment groups to which they received different packages of a conditional transfer payment. Each group had at least a leading member in the community with regular meetings organized to instill interaction amongst members. They found members in groups with successful and motivated leaders having higher aspirations and exhibiting positive future-oriented behaviors. Such members are also observed with a greater likelihood of having higher incomes as well as investing more in the education and nutrition of their children, suggestive of a social interaction effect on aspirations.

Collective action and membership in cooperative and savings groups are institutional arrangements that can shape the aspirations and behaviour of smallholder households by improving their access to information (Ray 2006). For instance, membership can reduce information asymmetry and relax the liquidity constraint of households by improving their access to credit services. These groups can integrate information from a variety of sources and channel this knowledge to its members (Mojo et al. 2017). Due to

the credibility of cooperatives and their numerical strength, they can also link their members to external stakeholders such as the state. Perhaps, it even offers a more integral role by acting as a coordinating device whose effectiveness can be explained in the context of multiple equilibrium. This, of course, has an incentivizing role potentially relevant for aspiration formation. As rural households are somewhat disadvantaged in terms of information access and utilization, cooperative members have the ability to learn from their peers and build on their aspirations and future-oriented behavior. Thus, cooperative membership may play a vital role in shaping individual aspirations, preferences, beliefs, and even decisions as they are a medium through which interaction and social learning occurs. This interaction enables individuals to (re)update their aspirations and hopes since they not only learn from own experiences but from the experiences of others in their network.

To the best of our knowledge, only Mojo et al. (2017) have examined the role of cooperative membership and farmer collective action in shaping the aspirations of smallholder farmers. Using propensity score matching (PSM) to control for observable characteristics, they find that cooperative membership is crucial in improving the aspiration levels of smallholder farmers in Ethiopia. However, the PSM technique is quite limited as it does not account for unobservable characteristics like skills, motivation, preferences and risk perception that might be correlated with aspirations. This paper controls for both observable and unobservable characteristics and provides further understanding on how aspirations are shaped by collective action and household membership in cooperative groups. We begin by identifying the factors that influence farmers to participate in cooperative groups and collective action activities. We then estimate the impact of collective action on income and asset aspirations.

We model the decision of households to be members of cooperative groups as a selection process, whereby farmers are driven by their expected utility in participating in a cooperative group. To account for selection bias, we make use of the endogenous switching regression technique and assess both the drivers of cooperative membership and their effect on the income and assets aspirations of households. The advantage of the endogenous switching regression technique over PSM is its ability to account for both observable and unobservable characteristics that may affect both the selection equation and the outcome variables. Moreover, it specifies two outcome equations for

households involved in collective action and households not involved in collective action enabling us to estimate slope shifts other than intercept shifts common in instrumental variable (IV) models. As aspirations are directly linked to poverty, understanding the formation of aspirations under an institutional setting like cooperative membership is a pathway to escaping rural poverty and improving the welfare of rural communities.

The remainder of the article is organized as follows: Section two offers a primer into an aspiration formation model. Section three presents the data, variable measurement and some summary statistics while the empirical strategy is presented in section four. The empirical results are discussed in section five. The article ends with a conclusion and policy implications.

2. Towards an aspiration formation model

Aspirations are always geared at achieving an economic or welfare outcome corresponding to a given utility (Lybbert and Wydick 2018). Because of this influence on utility, aspirations enter the utility function as reference points which cause utility increases in these outcomes. For instance, consider an individual with an initial wealth level v and final wealth w . The individual aspires (a) to reach his final wealth level through a costly effort e . For choosing a particular effort level, he derives a utility dependent on the benefit gained in reaching his final wealth w , his aspirations and the cost level of the effort as shown below.

$$u(e, a, w) = b(w) + r \left[\frac{w-a}{w} \right] - c(e) \quad (1)$$

Where $b(w)$ is the benefit obtained after reaching wealth level w . Here, we assume that $b(w)$ is an increasing and concave function over w with an Arrow-Pratt measure of relative risk aversion strictly less than 1, that is $(w) = -wb''(w)/b'(w) < 1$.

$r \left[\frac{v-a}{v} \right]$ is a value function that carries the idea that the aspiration level of an individual is a reference point that impacts the utility associated with w . It is assumed here that it is the difference between the wealth level and the reference point (aspiration) which is relevant to an individual. For the value function, we also assume $r'(0) > 0$ to ensure the complementary relationship between aspirations and efforts. Lastly, $c(e)$ is the effort

cost where we assume continuous differentiability and an increasing convex function where $c(0) = 0$. Efforts can be rendered less effective by external constraints such as poverty, for example, lack of credit opportunities for poor individuals can negatively impact their efforts in investing and saving. Similarly, individuals who are less socially connected may require more efforts in achieving an outcome than individuals who are socially connected. This leads us to the assumption that final wealth is proportional to initial wealth (Dalton et al. 2016), that is:

$$w = f(e, v) = (1 + e)v. \quad (2)$$

Given that individuals take aspirations as given when choosing their effort levels, we require a consistent relationship between aspiration and the final wealth level with a given effort (Dalton et al. 2016). With this, the aspiration, a is equivalent to the final wealth when a consistent error-aspiration pair is defined:

$$a = f(e, v) = (1 + e)v \quad (3)$$

Theoretical findings and empirical studies show that aspirations are socially determined (external factors based on the status of people in their cognitive window), but also internally determined by the individual's beliefs, hopes, and past experiences. In this light, Genicot and Ray (2017) offer the modeling framework of aspiration formation as:

$$a = (1 - \theta)v + \theta\Psi(v, F) \quad (4)$$

Where θ is a weighting measure signifying the weight an individual places on his aspiration relative to others in his reference group, F is the wealth distribution in the reference group and Ψ is a continuous function which is non decreasing in wealth, v . It gives an indication of how the reference group affects an individual's aspiration. A reference group is usually determined on a social or geographical basis. In this analysis, we test reference groups by exploring membership in cooperative clubs and associations.

Following from equation (4), F and v get into the aspiration function Ψ , through three different ways (Genicot and Ray 2017); firstly, the social component of any aspiration for a given outcome could be the reference group maximum outcome level; secondly, it could simply be the average level of the reference group outcome (see Janzen et al.

(2017) and Knight and Gunatilaka (2012)). Finally, it can be truncated to enter the aspiration formation function as the mean outcome of individuals with a higher wealth value in the reference group.

3. Data collection and descriptive statistics

This study employs data from a farm household survey conducted between July and August 2019 in the northern part of Kenya. Households were selected using a multistage sampling technique. In the first stage, Marigat division was purposively chosen from the Baringo county of Kenya. In the second stage, 35 villages were randomly selected in all three wards (Marigat, Ilchamus and Mochongoi) in Marigat using the probability proportional to size technique (PPS). This activity was jointly undertaken with the Kenyan National Bureau of Statistics (KNBS). Finally, 15-16 households were randomly selected in the villages with the help of a household listing exercise. In total, 530 households were randomly selected and interviewed by a group of well-trained enumerators. Interviews were carried out with the household head or spouse of the household. The survey was designed on Survey Solutions, enabling us to check the quality of the data on a real-time basis. The survey contains detailed information on the aspiration levels of households based on 5 dimensions (assets, livestock, income, education, and social status), socio-demographic characteristics (education, age, household size), asset and livestock holdings, membership in cooperative and saving associations, as well as information on credit access and extension services.

3.1. Measurement of key variables

Because of its multidimensional nature, different measurements and scales have been used to proxy for aspirations. While some authors used internal measures thought to influence the future like depression scales (Macours and Vakis 2014), locus of control and self-efficacy (Bernard et al. 2011), Knight and Gunatilaka (2012) used a minimum adequate income reported by individuals to proxy for income aspirations. Beaman et al. (2012) employed a more direct measure of asking parents about the educational level they wish their children attain, their chosen occupation at 25 and the village leadership position for their female children. Building on this direct approach, Bernard and Taffesse (2014) put forward a more central and reliable measuring instrument for

capturing aspirations. They relied on the self-reporting of aspiration levels based on a number of dimensions (in their case, asset aspiration, social status aspiration, educational aspiration, and income aspiration). This framework has been tested by Kosec and Mo (2017) on all the four dimensions and Janzen et al. (2017) who only considered income aspiration and the educational aspiration of children. This study uses this recent aspiration measuring framework to enable comparison with the meagre extant literature and draw new insights on what forms rural aspirations. However, we make use of the income and asset aspirations of households as outcome variables as they have a somewhat direct link to household welfare and poverty. While income aspirations relate more to the short term aspirations of households, asset aspirations are more forward-looking, allowing us the possibility of addressing issues related to the long-term poverty prospects of households. We use the monetary values of the asset aspirations of households to enable comparison with income aspirations.

Table 1 offers basic descriptive characteristics and definitions of the variables considered in the analysis. Cooperative membership is an indicator variable that takes the value of one for households that are members in cooperative societies and zero otherwise. From the table, households are observed with a mean age of 45 years and a mean educational level of 8 years which is just above primary education. Approximately 25% of the household heads are females with an average household size of about 6 members. Households are not only engaged with the production of crops and rearing of livestock but also engage in off-farm activities and wage labour. The average area of cultivation is 1.29 acres with the use of both family and hired labour. The relatively small farm sizes show that most of the households are smallholder farmers who mainly cultivate food crops like maize, beans and leafy vegetables.

Table 1. Descriptive statistics of variables used in the estimation models

Variable	Description	Mean	SD
Age of household head	Age of the household head (years)	45.15	15.61
Household head is male	Dummy, 1= male, 0 otherwise	0.74	0.44
Education level of household head	Number of years of education of the head of household	7.89	4.86

Marital status	Indicator, 1= married, 2 = divorced, 3 = never married	1.76	1.23
Household size	Number of members in a household	5.93	2.82
Off-farm participation	Dummy, 1= participation, 0 otherwise	0.27	0.44
Crop experience	Experience in crop farming	13.4	13.02
Livestock experience	Experience in livestock farming	17.06	16.14
Extension access	Dummy, 1= access, 0 otherwise	0.26	0.44
Credit access	Dummy, 1= access, 0 otherwise	0.43	0.49
Farm size	Size of cultivated area (acres)	1.29	1.79
Fertiliser quantity	Quantity of fertilizers used (Kg)	47.55	124.83
Labour days	Total labour (person-days)	51.31	61.62
Radio ownership	Dummy, 1= ownership, 0 otherwise	0.62	0.48
Mobile phone ownership	Dummy, 1= ownership, 0 otherwise	0.81	0.39
Cooperative membership	Dummy, 1= membership, 0 otherwise	0.25	0.43
Neighbour membership	Dummy, 1= membership, 0 otherwise	0.31	0.46
Income	Household income (Ksh)	10887.65	13330.24
Asset	Total value of household assets (Ksh)	171532.50	1055138
Livestock ownership	Total livestock ownership (TLU)	3.17	6.51
Income aspiration	Income aspirations of household (Ksh)	45484.15	60869.41
Asset aspiration	Asset aspirations of household (Ksh)	894611.3	6220386

Source: Authors' computation from survey data, 2019

Households reported an annual income of approximately 10887Ksh¹ with an accompanying asset value of 171532Ksh. Most households own assets ranging from productive assets to information assets as well as non-productive assets. Being a livestock community, households also own livestock like cows, goats and sheep. Livestock ownership was converted into tropical livestock units (TLU) using the Food

¹ 1Ksh= \$0.0096 (06.07.2019)

and Agriculture (FAO) conversion scale for the different livestock. Households have a mean income aspiration of approximately 45484.15Ksh and an asset aspiration of 894611.3Ksh. In terms of the key dependent variable, only about 25% of households belong to agricultural cooperative societies.

To offer primer insights into the observed differences between cooperative members and non-cooperative members, a mean difference test is undertaken and the results are presented in Table 2 below. Cooperative members are younger than non-cooperative members and have lesser experience in crop production and livestock rearing. They are also more educated than non-cooperative members with larger families as well. In terms of access to institutional services like extension and credits, cooperative members have better access than non-cooperative members. They also have larger farm sizes and use more farm inputs like fertilizers and labour than non-members. Also, cooperative members depict a greater probability of owning information assets like radios and mobile phones than their non-cooperative counterparts. Furthermore, cooperative members have most of their neighbours in cooperative societies than non-cooperative members.

Table 2. Differences in means between cooperative and non-cooperative members

Variable	Cooperative membership	Non-cooperative membership	Mean differences
Age of household head	40.80 (1.11)	46.60 (0.81)	-5.80***
Household head is male	0.84 (0.03)	0.70 (0.02)	0.14***
Education level of household head	9.28 (0.39)	7.43 (0.24)	1.85***
Marital status	1.41(0.08)	1.88 (0.06)	-0.47***
Household size	6.45 (0.21)	4.76 (0.15)	0.69**
Off-farm participation	0.29 (0.03)	0.26 (0.02)	0.02
Crop experience	12.30 (0.94)	13.73 (0.68)	-1.45
Livestock experience	15.51 (1.21)	17.58 (0.84)	-2.07

Extension access	0.44 (0.04)	0.20 (0.02)	0.24***
Credit access	0.66 (0.04)	0.35 (0.02)	0.31***
Farm size	2.03 (0.22)	1.04 (0.06)	0.98***
Fertiliser quantity	110.85 (18.83)	26.34 (2.87)	84.51***
Labour days	77.64 (5.82)	42.49 (2.86)	35.15***
Ownership of radio	0.74 (0.03)	0.58 (0.02)	0.16***
Ownership of mobile phone	0.87 (0.02)	0.79 (0.02)	0.08**
Neighbour membership	0.86 (0.03)	0.12 (0.01)	0.74***
Income	15039.1 (1677.76)	9496.86 (513.93)	5542.23***
Asset	392394 (180190.2)	97541.11(8080.96)	294852.9***
Livestock ownership	5.29 (0.95)	2.46 (0.19)	2.83***
Income aspiration	58060.15 (6495.10)	41271.03 (2752.74)	16789.12***
Asset aspiration	1337135 (750813.7)	746360.2 (258893.2)	590775.1

Notes: Standard deviations are in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Coming to the variables of interest, cooperative members have higher income aspirations than non-cooperative members with the mean difference being statistically significant at the 0.01 level of probability. There exist no statistically significant difference in asset aspirations between cooperative members and non-cooperative members. There also exist mean significant differences between cooperative members and non-members in terms of their income and asset value levels. Overall, the mean difference between cooperative members and non-members is already suggestive of the role of cooperative membership in building the income and asset aspirations of rural households in Kenya. However, it is inconclusive to already draw inferences from these descriptive comparisons as they do not control for confounding factors. These confounding factors are both observable household characteristics and unobserved characteristics such as ability, skills, motivation, and perceptions. All these are controlled in the next section below.

4. Empirical specification

The conceptual framework is based on a rational and risk-neutral household who decides to be a member in cooperative society or not. From this viewpoint, cooperative membership is actually a choice as households will only belong to cooperative societies if their perceived gains and benefits and advantages are guaranteed. We model this decision based on a random utility framework where a representative and utility-maximizing household decides to belong to a cooperative if the utility gains from cooperative membership is greater than the utility of not belonging as shown below:

$$M_i^* = \partial \mathbf{Z}_i + \mu_i \text{ with } M_i = \begin{cases} 1 & \text{if } M_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (5)$$

where M_i^* is the utility difference between belonging to a cooperative society and not belonging; M_i is a binary variable that takes 1 if a household belongs a cooperative society and 0 otherwise; ∂ is a vector of parameter estimates; \mathbf{Z}_i is a vector of independent variables like household income, age of household head, educational level of household head and cropland area; μ_i is the stochastic error term. The resulting probability of being a member of a cooperative is:

$$\Pr(M_i = 1) = \Pr(M_i^* > 0) = \Pr(\mu_i > -\partial \mathbf{Z}_i) = 1 - F(-\partial \mathbf{Z}_i) \quad (6)$$

Here is the cumulative distribution function for the error term, μ_i .

Given that the vector of outcome variables (income and asset aspirations) is a linear function of independent variables \mathbf{X}_i as well as a dummy for cooperative membership, the outcome equation can be specified as:

$$Y_i = \beta \mathbf{X}_i + \gamma M_i + \varepsilon_i \quad (7)$$

Where Y_i represents the income and asset aspirations of households; \mathbf{X}_i is a vector of explanatory variables; M_i is an indicator variable for cooperative membership; β and γ are the parameter estimates and ε_i is the error term. Estimates of the parameter γ give the effect of cooperative membership on income and asset aspirations. Assuming the choice of cooperative membership is exogenously determined, equation (7) can conveniently be estimated using ordinary least square (OLS). However, since households self-select themselves into cooperative societies, OLS will lead to biased and inconsistent estimates. Furthermore, biased estimates may also arise from the fact that

unobserved characteristics may jointly influence μ_i in the selection equation and ε_i in the outcome equation such that the two error terms become correlated, that is $\text{corr}(\mu_i, \varepsilon_i) \neq 0$. Not accounting for this selection bias will either lead to understated or overstated effects of cooperative membership.

Getting consistent and unbiased impacts entails controlling both for observable and unobservable characteristics that drive households into cooperative membership. One way of ensuring this is through the random assignment of households into treatments so that the obtained effect may be due solely to treatment. However, the random assignment of households into treatment is not always possible. This makes the observable and unobservable characteristics of households to not only affect selection into treatment but also the outcome indicators. To control for this selection bias, quasi-experimental methods like the propensity score matching (PSM) have been used (Mojo et al. 2017). PSM uses a propensity score to match households from an observational dataset and replicate randomization by ensuring that the treatment and the control groups are comparable on observable characteristics. It hinges directly on the premise that selection into treatment is based entirely on observables. In the case where selection is triggered by unobservable characteristics, using PSM may lead to biased estimation. Since households select themselves into cooperative societies based on both observable and unobservable characteristics like skills, ability, motivations, preferences and risk aversion, the use of a modeling framework that controls for these characteristics is required for consistent and unbiased estimates. We thus employ the endogenous switching regression (ESR) model to control for both observed and unobserved heterogeneities (Lokshin and Sajaia 2004). It uses the full information maximum likelihood (FIML) approach to jointly estimate one selection equation and two outcome equations for both cooperative members and non-cooperative members.

4.1 The ESR model

The ESR model is a simultaneously estimated two-tiered model, where in the first tier, a selection model is estimated to determine the factors explaining cooperative membership. The second tier involves the specification of the impact of cooperative membership on the outcome variables based on two regimes of cooperative members and non-cooperative members as shown below:

$$M_i^* = \partial \mathbf{Z}_i + \mu_i \quad (8)$$

$$\text{Regime 1 (membership): } Y_{im} = \beta_1 \mathbf{X}_i + \varepsilon_{im} \quad \text{if } M_i = 1 \quad (9)$$

$$\text{Regime 2 (non-membership): } Y_{in} = \beta_0 \mathbf{X}_i + \varepsilon_{in} \quad \text{if } M_i = 0 \quad (10)$$

Where Y_{im} and Y_{in} represent the income and asset aspirations for cooperative members and non-cooperative members respectively; \mathbf{X}_i is a vector of explanatory variables that may explain the income and asset aspirations of households; ε_i is a stochastic error term associated with the dependent variables. Equations (9) and (10) offer a distinct feature and strength of the ESR model which is its ability to separately estimate how control variables affect outcome equations based on cooperative membership status. Of course, we expect significant differences in how control variables affect aspirations based on the participation of households in cooperative activities.

The ESR model assumes a non-zero correlation between the error term of the selection (cooperative membership) equation and the error terms of the two outcome equations. This implies the error terms in both the selection equation and the two outcome regime equations are correlated, that is $\text{corr}(\mu_i, \varepsilon_{im}, \varepsilon_{in}) \neq 0$. The three errors follow a trivariate normal distribution with a mean of zero and a variance-covariance matrix is expressed as:

$$\Sigma = \begin{bmatrix} \sigma_u^2 & \sigma_{21} & \sigma_{31} \\ \sigma_{21} & \sigma_1^2 & 0 \\ \sigma_{31} & 0 & \sigma_0^2 \end{bmatrix} \quad (11)$$

where σ_u^2 is a variance of the error term in the selection equation; σ_1^2 and σ_0^2 represent the variance of the error terms ε_{im} and ε_{in} ; σ_{21} is a covariance of the error term in the selection equation and the outcome equation of cooperative members while σ_{31} is a covariance of the error term in the selection equation and the outcome equation of non-cooperative members. Since we never observe the outcomes of both cooperative members and non-cooperative members simultaneously, the covariance between ε_{im} and ε_{in} is not defined.

The ESR addresses the correlation in the error terms of the selection and outcome equations by treating selectivity bias as a missing variable problem and adjusts it as shown below.

$$E[\varepsilon_{im}|M = 1] = \sigma_{Z1} \frac{\phi(\partial Z_i)}{\Phi(\partial Z_i)} \quad (12)$$

$$E[\varepsilon_{in}|M = 0] = \sigma_{Z0} \frac{\phi(\partial Z_i)}{1-\Phi(\partial Z_i)} \quad (13)$$

The terms $\frac{\phi(\partial Z_i)}{\Phi(\partial Z_i)}$ and $\frac{\phi(\partial Z_i)}{1-\Phi(\partial Z_i)}$ known as the inverse mills ratios are plugged into the outcome equations to account for selection bias resulting from unobserved heterogeneities. The covariance terms are also calculated and plugged into the outcome equations and suggest selection bias if its estimated coefficients are significant.

Following Lokshin and Sajaia (2004), the average treatment effect on the treated (ATT) and the average treatment effect on the untreated (ATU) is obtained from the ESR framework as indicated below.

$$ATT = E(Y_{im}|M = 1) - E(Y_{in}|M = 1) = \mathbf{X}(\beta_1 - \beta_0) + (\sigma_{\mu 1} - \sigma_{\mu 0}) \frac{\phi(\partial Z_i)}{\Phi(\partial Z_i)} \quad (14)$$

$$ATU = E(Y_{in}|M = 0) - E(Y_{im}|M = 0) = \mathbf{X}(\beta_0 - \beta_1) + (\sigma_{\mu 1} - \sigma_{\mu 0}) \frac{\phi(\partial Z_i)}{1-\Phi(\partial Z_i)} \quad (15)$$

4.2. Identification of the ESR model

While it is allowed to use the same explanatory variables in both the selection and outcome equation, it is very necessary to identify the equations of the ESR model despite the implicit identification by non-linearities. Identification requires the use of at least one instrument which determines cooperative membership but has no direct impact on income and asset aspirations. We use the same explanatory variables in the two equations but include two additional variables (instruments) in the cooperative membership equation. We use the perception of the usefulness of cooperatives to identify the model. Households will only belong to cooperative societies to the extent they perceive its usefulness. We have no cause to believe that this perception of the usefulness of cooperatives affects aspirations except through the cooperative membership pathway. Additionally, following Ma and Abdulai (2016), we use membership of a household's neighbour in a cooperative since it has been identified to drive smallholder households to participate in cooperative societies (Ito et al. 2012). However, the membership of a neighbour is expected to have no direct relationship with the income and asset aspiration of households.

To check the validity and admissibility of our instruments, we carry out a falsification test as proposed in Di Falco et al. (2011). Essentially, we first run a probit model to see if the instruments are strongly correlated with the cooperative membership decision. Based on the high significance of our instruments, we estimate an OLS model on the outcome variables, using only non-cooperative members. Again our instruments depict an insignificant effect on the income and asset aspirations of non-cooperative members, suggesting the instruments have considerable strength and may be valid. Table A1 in the appendix shows the results of the falsification test. A further correlation analysis shows that the instruments are uncorrelated with the income and asset aspirations of households.

4.3. Addressing endogeneity

In estimating the selection equation, some of the covariates can be argued to be endogenous. Institutional variables like access to credit and extension contact are examples of such variables. While extension agents disseminate new farming techniques and technologies to farmers, they may in the process lure them to belong to cooperatives. This makes extension contact potentially endogenous. Furthermore, while households with little or no credits look up to cooperative societies for agricultural financing, cooperative societies may also open up other lending options to its members by linking them with microfinance and other financial institutions. This also makes access to finance potentially endogenous.

As the selection equation is binary, the study employs the control function approach to control for these endogeneity issues. The control function involves specifying reduced form equations for the endogenous variables with the same explanatory variables but additionally some instruments. Of course, the instruments should be highly correlated with access to credit and extension contact but have no relationship with cooperative membership. Two separate probit regressions are specified for both access to credit and extension contact. For access to credit, distance to the household's credit source is used as an instrument while for extension contact, the perception of the usefulness of extension services is used to identify the model. After running the two regressions, the predicted residuals are then used in the cooperative membership model.

Adding the residuals in the structural model makes the endogenous variables exogenous as they act as control functions. In the structural model, a significant residual confirms the suspected endogenous variable is indeed endogenous and well-controlled for by the residual. An insignificant residual means the suspected endogenous variable is not endogenous. In this case, the residual should be dropped from the structural model. Thus the control function does not only control for endogeneity but can be regarded as a robust test for endogeneity.

5. Estimation results and discussion

The full information maximum likelihood (FIML) estimation procedure jointly estimates cooperative membership and the two regimes of the outcome equation based on selection. Tables 3 and 4 present the drivers of cooperative membership and its effects on income and asset aspirations. The results of the control function are presented in Table A2 in the appendix. After obtaining the residuals from the reduced form equation of the endogenous variables, we add them as covariates in the selection model. The estimate of the residual for access to credit is statistically insignificant suggesting the exogeneity of the access to credit variable. However, the residual estimate of extension contact is highly significant implying extension contact is truly endogenous. The inclusion of the residual thus controls for this endogeneity, ensuring the consistency of the estimated coefficients.

The determinants of cooperative membership are presented in columns (1) in both tables 3 and 4. All the variables reported the same signs in both models with very similar statistical significance. The age of the household head is significantly positive, suggesting that older household heads are more likely to belong to cooperatives than their younger counterparts. This positive relationship can be attributed to their awareness of the relevance of cooperatives based on their social networks and experience in farming. Since extension serves to provide vital information on matters related to the livelihoods of smallholder farmers, it is no surprise that the extension variable reports a positive relationship with cooperative membership. Of course, households that have access to extension services will receive vital agronomic and marketing informational from these agents. They may also be directly requested to obtain membership in these groups by the agents. Also, households with more livestock

have a higher probability of belonging in a cooperative society than households with lesser livestock. This finding can be attributed to the role of cooperatives in providing important and vital information ranging from good management and farm practice advice to marketing as well as institutional support. Surprisingly, households with smaller farms have a higher probability of belonging to cooperatives indicating the inclusiveness of cooperative societies. Perhaps households with large farms may already feel quite empowered with little or no incentive to belong to cooperatives.

5.1. Income aspiration impacts

The impact of cooperative membership on income aspirations is presented in Table 3. The variable for age is negative and statistically different from zero ($p < 0.01$) for cooperative members, suggesting that younger farmers have higher income aspirations. This finding can be attributed to their less fatalistic and risk-loving nature. Since aspirations involves goals to which households are ready to invest time and effort in its achievement, younger households are less fatalistic and see a lot of hope in the future. Similar results were obtained by Janzen et al. (2017) in their study on aspiration failure and formation in rural Nepal. Education has a positive and significant impact on the income aspirations of non-cooperative members. This implies education is a vital determinant in forming the income aspirations of households. Education not only changes the behavior and attitudes of individuals but increases the processing time for information that is relevant in shaping aspirations. Again, the positive coefficient of education goes to confirm the notion that aspirations are formed based on a learning process which either involves learning from individual experiences or from the experiences of others. Marital status is also an important determinant of income aspirations. Married households tend to have higher income aspirations. Could this be explained by a better resource allocation strategy of the household? Most probably as married households easily decide on various resource allocations like land and household investments which go a long way to build their income aspirations for the future.

Household income is positive and significantly increases the income aspirations for both cooperative members and non-cooperative members. Mathematically, a 10 percentage point increase in household income leads to an associated 4 percentage point change in

income aspirations for cooperative members and 3 percentage points for non-cooperative members. This suggests that understanding aspiration formation will be inconclusive without understanding the income levels of households. This is in line with the concept of ‘capacity to aspire’ by Appadurai (2004), where he posits that poor households get trapped in poverty because of their initial poverty (income) conditions. This theoretical relationship is consistent with empirical findings from Stutzer (2004), Knight and Gunatilaka (2012), Janzen et al. (2017) and Posel and Rogan (2018) who also found income aspirations to be determined by current income levels. This is not to say the poor lack the capacity to aspire but as La Ferrara (2019) rightly puts it, their aspirations are directly affected by the income inequality of the society (Genicot and Ray 2017; Posel and Rogan 2018).

Extension contact positively influences the income aspirations. For every additional contact with an extension agent, the income aspiration of households increases by approximately 28 percent. Of course, this directly reflects the role of extension services in building the income aspirations of households. As Leavy and Smith (2010) highlighted, aspirations are not just personal but are formed and shaped under new experiences with increased access to information. Building aspirations may thus require exposure and access to information that may (re)update or shape the aspirations of individuals (La Ferrara 2019). The area of cropland cultivated also exhibits a statistically positive relationship with income aspirations, which is somewhat expected. For every additional acre of land put into agricultural production, the income aspirations of households increases by 4.8 percent. The regional (ward) variables are also significantly different from zero reflecting agro-ecological variance and pointing to cluster impacts. It also points to the fact that aspirations are formed under different environmental and institutional settings.

Table 3. ESR model results for cooperative membership and their impacts on income aspirations

Variables	Income aspirations		
	(1) Selection	(2) Members	(3) Non-members

Age of the household head	0.015**	-0.014***	-0.001
	(0.007)	(0.005)	(0.003)
Education of the household head	-0.041*	0.018	0.049***
	(0.024)	(0.016)	(0.011)
Marital status of household	-0.361***	0.180**	0.054
	(0.083)	(0.072)	(0.034)
In Household income	-0.033	0.403***	0.318***
	(0.088)	(0.106)	(0.080)
In Asset	-0.063	0.043	0.064*
	(0.063)	(0.039)	(0.036)
Dependency ratio	-0.056	0.006	-0.005
	(0.070)	(0.060)	(0.037)
Access to credit	0.211	-0.139	0.003
	(0.185)	(0.142)	(0.071)
Labours days	-0.003**	0.001	0.001
	(0.001)	(0.001)	(0.009)
Access to extension services	3.158***	-0.042	0.278***
	(0.511)	(0.118)	(0.089)
Area of cropland	-0.148**	0.048**	-0.006
	(0.061)	(0.020)	(0.029)
Livestock ownership	0.050**	0.008	0.009
	(0.020)	(0.006)	(0.010)
Ownership of a radio	-1.202***	-0.054	0.016
	(0.290)	(0.149)	(0.077)
Ownership of a mobile phone	-0.246	-0.100	-0.041
	(0.253)	(0.187)	(0.110)
Perception of the usefulness of cooperatives	-0.206**		
	(0.112)		
Neighbour belongs to cooperative	2.017***		
	(0.180)		
Ilchamus ward (reference)			
Marigat	-0.046	0.297**	-0.331***
	(0.234)	(0.155)	(0.102)
Mochongoi	-0.504**	-0.017	-0.399***
	(0.243)	(0.199)	(0.123)
Constant	2.877**	6.436***	6.532***
	(1.259)	(0.934)	(0.777)
Residual (extension contact)	-2.809***		
	(0.509)		
Lnsigma		-0.590***	-0.422***
		(0.056)	(0.018)

Rho		0.024 (0.169)	0.007** (0.167)
Log-likelihood	-683.83		
Number of observations	530	133	397

Notes: Standard deviations are in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

5.2. Asset aspiration impacts

Table 4 presents the estimates of the effect of cooperative membership on asset aspirations. Education has a positive effect on the asset aspirations of households. Again, this implies that for any additional year spent in school, asset aspirations increases by 4.5 percent. Household income and the asset value of households both have a positive and highly significant effect on the asset aspirations of rural households in Kenya. It is important to note that all these effects are non-differential despite us having two outcome equations for cooperative members and non-cooperative members. In the same vein, access to credit significantly increases asset aspirations. Households who have access to credits have higher asset aspirations than their counterparts. Economically, households who have access to credits have an asset aspiration of approximately 37 percent greater than households with no access. Similar findings were obtained by Garcia et al. (2020) where they found a microcredit lending scheme in Sierra Leone to have significant impacts on aspirational hope and economic outcomes. In this regard, aspirations are thus formed over an interplay of individual and personal characteristics as well as socio-economic and biographic profiles of households (Leavy and Smith 2010).

As with income aspirations, extension contact has a positive impact on asset aspirations. Perhaps households with an extension contact break the information barrier and obtain vital and relevant information and advice from extension agents which go to build their assets aspirations (Leavy and Smith 2010). Livestock ownership is also a crucial determinant of asset aspirations. In most rural settings, livestock represents rural wealth especially in the study region which is a pastoral area. In such areas, household wealth is compared based on livestock ownership. Still in the notion of the 'capacity to aspire' concept, livestock ownership is expected to increase the asset aspirations of households as households look to the future with a lot of hope based on their current wealth levels.

Table 4. ESR model results for cooperative membership and their impacts on asset aspirations

Variables	Asset aspirations		
	(1) Selection	(2) Members	(3) Non-members
Age of the household head	0.013* (0.007)	-0.008 (0.007)	-0.001 (0.004)
Education of the household head	-0.040 (0.024)	-0.005 (0.021)	0.045*** (0.016)
Marital status of household	-0.354*** (0.080)	0.086 (0.076)	-0.010 (0.053)
In Household income	-0.049 (0.080)	0.213*** (0.061)	0.184** (0.081)
In Asset	-0.040 (0.069)	0.251*** (0.096)	0.241*** (0.065)
Dependency ratio	-0.047 (0.069)	0.055 (0.062)	-0.009 (0.045)
Access to credit	0.203 (0.182)	0.109 (0.186)	0.369*** (0.124)
Labours days	-0.003** (0.001)	0.001 (0.001)	0.001 (0.001)
Access to extension services	3.050*** (0.544)	0.227 (0.177)	0.250* (0.145)
Area of cropland	-0.129** (0.065)	0.041 (0.042)	0.029 (0.023)
Livestock ownership	0.047*** (0.020)	0.048*** (0.013)	0.031*** (0.012)
Ownership of a radio	-1.171*** (0.299)	-0.245 (0.207)	0.070 (0.121)
Ownership of a mobile phone	-0.240 (0.250)	-0.433 (0.263)	0.018 (0.147)
Perception of the usefulness of cooperatives	-0.226** (0.182)		
Neighbour belongs to cooperative	2.507*** (0.230)		
Ilchamus ward (reference)			
Marigat	-0.102 (0.231)	0.276 (0.245)	-0.447*** (0.133)

Mochongoi	-0.604*** (0.250)	0.341 (0.218)	-0.385** (0.190)
Constant	2.754** (1.263)	7.697*** (1.227)	7.745*** (0.745)
Residual (extension contact)	-2.670*** (0.552)		
Lnsigma		-0.089 (0.059)	0.059 (0.047)
Rho		0.515 (0.270)	0.109 (0.191)
Log-likelihood	-885.77		
Number of observations	530	133	397

Notes: Standard deviations are in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

5.3 Treatment Effects

Table 5 presents the average treatment effect on the treated (ATT) and the average treatment effect on the untreated (ATU) respectively. They show the effect of cooperative membership on income and asset aspirations. These estimates account for possible selection bias into cooperative membership. While cooperative membership has no statistically significant effect on income aspirations, a highly significant positive effect is observed on asset aspirations. Cooperative membership increases the asset aspirations of households by 2.43%. This is consistent with findings from Mojo et al. (2017) who found cooperative membership to have significant impacts on the formation of aspirations in Ethiopia. Turning to the average treatment effect on the untreated, we find positive and statistical significance for both income and asset aspirations, though with lesser effects. ATU show impacts on income and asset aspirations should the non-cooperative members had belonged to cooperative societies. While income aspirations would increase by 1.57% in such a scenario, asset aspirations would increase by 1.75%. These results suggest that membership in cooperative societies have a significant role in the formation of income and asset aspirations. These findings can be attributed to the benefits that accrue with group membership, especially information flow, as well as increased access and coordination (Ray 2006). Since group members regularly interact amongst themselves and channel relevant information from development experts to members in their group, it is highly probable that these form the basis of rural aspirations. This insight is confirmed by Macours and Vakis (2014) in their randomized experiment in Nicaragua where they show that social interaction on a

group basis changes households' behavior towards the future. Of course, these happen by alternating the aspiration window concept.

Table 5. Impact of cooperative membership on income and asset aspirations

Variable	Mean outcome		ATT	t-value	Change (%)
	Members	Non-members			
Income aspirations	10.55 (0.052)	10.59 (0.049)	-0.038	1.208	0.35
Asset aspirations	13.04 (0.070)	12.73 (0.072)	0.307***	6.310	2.43
			ATU		
Income aspirations	10.32 (0.033)	10.16 (0.031)	0.162***	9.218	1.57
Asset aspirations	12.18 (0.042)	11.97 (0.033)	0.214***	7.819	1.75

Notes: Standard deviations are in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Robustness check

To verify the robustness of our estimates, we perform a propensity score matching (PSM). Despite controlling only observed heterogeneity, PSM has greatly been used in estimating program effects when randomization is not possible. As it is widely discussed in the literature, we do not devote a great attention to its formal derivation. We dive straight to employing it and refer interested readers to Rosenbaum and Rubin (1985). However, we briefly motivate our choice of the matching algorithm used. To ensure good matches, we impose a tolerance level on the maximum propensity score, also known as a caliper (Caliendo and Kopeinig, 2008). It avoids bad matches by implicitly allowing for replacement similar to nearest neighbor matching. We specifically use a variant of caliper matching known as radius matching. Essentially, radius matching uses all comparison members within a caliper rather than just the nearest neighbor within the caliper. It does oversampling by using more units in the absence of good matches. Table 6 shows the ATT of cooperative membership on aspirations. The ATT of cooperative membership is positive and significantly matters in

the formation of income and asset aspirations. PSM further supports the results from the ESR estimation.

Table 6. Impact of cooperative membership on aspirations

	ATT	Std. Error
Income aspirations	0.297***	0.120
Asset aspirations	0.331***	0.166

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The ATT estimate of the radius matching is gotten by using the 'psmatch2' command in STATA. The standard errors are bootstrapped standard errors with 500 replications. Common support condition is maintained with 130 and 334 cooperative and non-cooperative members matched.

7. Conclusion and policy implications

The study of aspirations and their role in future-oriented behavior is becoming increasingly relevant from an economic point of view. While theoretical literature has already established its links to poverty and inequality with a burgeoning support from recent empirical analysis, less attention has been placed on how aspirations are formed. That notwithstanding, it has been established that aspirations are a social construct that are socially determined and formed in the thick of life. Individuals build their aspirations through social interaction on a group basis or better still individuals shape and update their aspirations based on their aspiration window. Hypothesizing that aspirations are formed on the basis of a group, this paper estimates the role of cooperative membership on the income and asset aspirations of households in rural Kenya. The study utilized a cross-sectional data of 530 farm households collected in the Baringo county of Kenya.

Mindful of possible selection into cooperative membership, the study employed an endogenous switching regression model to control for both observed and unobserved heterogeneities. Starting with descriptive statistics and mean differences, cooperative members were found to be significantly different from non-cooperative members based on observed socio-economic and household characteristics. Controlling for confounding factors, the study established a positive relationship between cooperative membership and rural aspirations of households. Particularly, while cooperative membership has a positive but no statistical effect on income aspirations for households that belonged to

cooperatives, it increases asset aspirations by 2.43 percent. The average treatment effect on the untreated (ATU) suggests an increase in income and asset aspirations by 1.57 percent and 1.75 percent respectively. These findings are indicative of the role of cooperative membership in forming/shaping the income and asset aspirations of rural households.

Young farmers are found to have higher income and asset aspirations than their older counterparts. The level of education also showed a positive relationship with rural aspirations. Other factors observed to explain aspiration formation are socio-economic and household-level characteristics such as the income and asset level of households, area of cropland, access to credit facilities and the household's contact with extension. Education and extension services are quite relevant in the formation of aspirations as they increase the information base of households. The current income and asset characteristics of households also matter when understanding determinants of aspirations. This is in line with the concept of the 'capacity to aspire' which holds that poor households aspire for less owing to their present wealth condition which curtails their aspirations.

The findings open a novel empirical insight to the understanding of aspirations in the context of a rural setting. Based on the findings, the study lends support to the development of financial and institutional mechanisms that can increase households' access to cooperative membership. Also, policies and interventions tackling external constraints may be instrumental in relaxing the constraints most rural households face in accessing information from extension services, education and credit access. Addressing these external constraints may go a long way to offset and alter the internal constraints (aspirations) that households face in improving their future-oriented outcomes. Perhaps relaxing the resource constraints of households may be combined with both formal and informal trainings meant to induce change in the behaviour and aspirations of households.

While we are confident of our estimated coefficients, it is important to mention some limitations of the analysis. Firstly we employ cross-sectional observable data making it hard to draw causal conclusions. Of course, we used different techniques to reduce selection bias and control for possible confoundings. However, as aspirations are

attitudinal and quite dynamic in nature, it may be worthwhile to understand its formation in a more controlled setting and under different time periods. Nevertheless, as this is one of the first attempts to understand cooperative effects on aspirations, we feel quite satisfied with the empirical insights. We however encourage the use of panel data combined with experimental insights to better capture the dynamic nature of aspirations and establish causal pathways.

Furthermore, it is also important to guide the understanding of this study from a rural perspective. The findings should not be generalized but understood from an African smallholder farming perspective. As rural households may aspire to a range of aspirational dimensions, the study utilizes just the income and asset aspirations which may not totally engender the aspirations of smallholder households. It may thus be important to understand cooperative impacts on other dimensions. This could be interesting areas for future research.

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Appendix

Table A1. Falsification test

Variable	Cooperative membership	Income aspirations	Asset aspirations
Perception of the usefulness of cooperatives	-0.206** (0.112)	0.037 (0.038)	0.106 (0.093)
Neighbour belongs to cooperative	2.017*** (0.180)	-0.011 (0.112)	0.331 (0.263)
Constant	-1.861* (0.954)	5.990*** (0.437)	5.874*** 0.996
Ward dummies	Yes	Yes	Yes
Sample size	530	397	397

Notes: Standard deviations are in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table A2. Control function estimation of extension contact and access to credit

Variable	Access to credit	Extension contact
Perception of the usefulness of cooperatives	-0.152** (0.068)	-0.030 (0.073)
Neighbour belongs to cooperative	0.452*** (0.133)	0.046 (0.185)
Age of the household head	-0.003 (0.005)	-0.005 (0.005)
Education of the household	0.037**	0.014

head	(0.017)	(0.016)
Marital status of household	-0.087*	0.057
	(0.051)	(0.054)
In Household income	0.095	-0.025
	(0.064)	(0.061)
In Asset	0.038	0.026
	(0.050)	(0.051)
Dependency ratio	-0.026	0.032
	(0.051)	(0.054)
Labours days	-0.006	0.002**
	(0.009)	(0.001)
Area of cropland	0.061	0.084**
	(0.045)	(0.044)
Livestock ownership	-0.008	0.003
	(0.013)	(0.013)
Ownership of a radio	0.113	0.422***
	(0.135)	(0.149)
Ownership of a mobile phone	0.267	-0.012
	(0.168)	(0.174)
Access to credit		0.056
		(0.134)
Access to extension services	0.090	
	(0.137)	
Perception of the usefulness of extension services		0.395**
		(0.182)
Distance to source of credit	0.016**	
	(0.008)	
Constant	-1.661**	-1.349*
	(0.721)	(0.749)

Notes: Standard deviations are in parentheses; *** p<0.01, ** p<0.05, * p<0.1.