Aspirations and Investments in Livestock: Evidence of Aspiration Failure in Kenya

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Abstract

Aspirations have been shown to positively influence future-oriented behavior and ensuing outcomes. But they may also fail to do so when the aspired-to-status is too far away from the current one. Theoretical predictions suggest an inverted U-shaped relationship between this aspiration gap and the effort to achieve what is aspired to. Aspirations that are ahead but not too far ahead of the current status serve as the best incentives for investments. We examine the income aspiration gap of smallholder households and relate it to livestock in a pastoral setting in Northern Kenya. Our focus on livestock is guided by the burgeoning recognition of livestock as an investment and saving conduit for many households in pastoral communities in developing nations. Employing different empirical strategies including parametric and semi-parametric techniques, we find livestock to be increasing with aspirations up to a threshold, from which it then declines leading to an aspiration failure. Different U-shaped tests confirm this relationship, bolstering the evidence of an aspiration failure. To unpack which livestock matters more relative to the others, we perform some heterogeneity analysis and found cattle to respond most to the aspiration gap. The findings are robust to the inclusion of relevant controls, truncations at zero and different variable transformations. We also show that the findings are unlikely to be driven by unobserved heterogeneity. A dive into mechanisms reveals that the internal locus of control, i.e. the degree to which individuals believe they control outcomes in their lives, decreases with the aspiration gap. Our findings have two implications: first, it reinforces previous claims of the role of psychological constraints on poverty reduction and rural development. More importantly, it has implications for the current debates and plans for boosting the development of the livestock sector in Africa as a pathway to overall economic development.

Keywords: Aspirations; Investment; Livestock savings; Psychological constraints, Economic development

JEL codes: D91; E71; I32; O13

1. Introduction

The poor usually make very little investments even in the face of high returns (Banerjee and Duflo, 2007). This behavior has been attributed to external constraints like information

asymmetry, poor infrastructure and access to education, missing markets and market imperfection in product and credit markets as well as to inappropriate credit and saving measures (Banerjee and Newman, 1993; Dasgupta and Ray, 1986; Galor and Zeira, 1993; Janzen et al., 2017). While we recognize the relevance of the above factors in explaining an individual's failure to benefit from investments, external constraints may not sufficiently explain the lack of future-oriented behavior (Janzen et al., 2017). Internal constraints like agency and aspirations, which have largely been unexploited in the literature, may also have a role to play in explaining the partial lack of 'future making' of individuals (Banerjee and Mullainathan, 2010).

Aspirations have been associated with various future-oriented socio-economic outcomes. Particularly, they are associated with human capital through education (Beaman et al., 2012; Bernard et al., 2019; Favara, 2017; García et al., 2019; Macours and Vakis, 2014; Pasquier-Doumer and Brandon, 2015; Ross, 2019; Serneels and Dercon, 2021), savings (Janzen et al., 2017; Seshan and Yang, 2014), and women's empowerment (Kosec et al., 2021). They also matter in inducing civic engagement and political participation (Healy et al., 2017; Kosec and Mo, 2017) and in increasing happiness (Stutzer, 2004). Beyond the above relationships, aspirations also increase food security (Mekonnen and Gerber, 2017).

Since a positive relationship is suggested between aspirations and future-oriented efforts, and thus outcomes, one direct policy implication could be to boost aspirations. This is not straightforward however, as the theoretical literature highlights an inverted U-shaped relationship between aspiration and future-oriented economic efforts (Dalton et al., 2016; Genicot and Ray, 2017; Lybbert and Wydick, 2018). This goes to say that aspirations should be large enough to incentivize but not so large as to cause frustration, resulting from what are perceived as highly unattainable efforts. In this regard, it is the aspiration gap rather than the aspiration that determines behavior (Ray, 2006). The aspiration gap is defined as the difference between the individual's current and the aspired-to status. The way individuals respond to this gap may lead to an aspiration failure in boosting the individual's future-oriented efforts. It thus becomes relevant to better understand the link between the aspiration gap and individual behavior in a bid to uplift the poor from chronic poverty.

In this paper, we provide additional insights on the link between aspirations and future-oriented behavior by empirically testing if the relationship between the aspiration gap and livestock follows an inverted U-shape, i.e. if livestock first increase then decrease with the aspiration

gap. Using household-level data from Kenya, we find evidence of this inverted U-shaped relationship and the implied aspiration failure. Specifically, we find suggestive evidence of 'aspiration fatalism' and 'aspiration frustration' arising from low and high aspirations respectively. Thus, we conclude that aspirations that are ahead but not too far ahead of the current income levels offer the best incentives for increasing the livestock of households. Our findings are robust to the inclusion of several controls and various transformations of livestock. We also show that one mechanism that could be driving the reduction in livestock with aspiration gaps is the reduction of the internal locus of control. This could be explained by frustration induced by high aspirations perceived as too farfetched to attain. In the interest of uncovering potential heterogeneities, we further reclassify livestock into three categories - large ruminants, small ruminants and poultry - and find that large ruminants, particularly cattle, respond more to aspirations.

We contribute to the literature on aspirations and future-oriented behavior in four main ways. First, we add empirical evidence by directly testing the relationship between the aspiration gap and investment. The literature here is growing, however, it is mixed in terms of results (Bloem, 2021). While earlier analysis (Pasquier-Doumer and Brandon, 2015) reported no statistically significant relationship between aspirations and investments, recent studies show different results (Bloem, 2021; Janzen et al.,2017; McKenzie et al., 2021; Ross, 2019). McKenzie et al. (2021) use experimental methods to exogenously induce financial aspirations as a means of credibly identifying the relationship between aspirations and financial decisions among poor entrepreneurs in the Philippines.

The second contribution relates to our outcome measure, livestock. To our knowledge, this is the first study to examine the relationship between aspirations and livestock. Although the theoretical literature on aspirations largely discusses the relationship between aspirations and investments, very few empirical studies actually study investments. Janzen et al. (2017) get at investments by approximating with savings and by looking specifically about education expenditures. Bloem (2021) proxy for investment using expenditures about purchases on land and household construction materials. Both of these studies, however, really do not cleanly measure investments. We on the other hand do and therefore provide a direct test of the inverse U-shaped hypothesis looking at livestock. In many arid and semi-arid regions in sub-Saharan Africa (SSA), livestock can be regarded as an encompassing measure of rural welfare as they serve to provide multiple services and products including nutritious food, insurance, wool (in

the case of sheep) and traction power (Aryal and Holden, 2012). In Kenya for example, the Government with support from the Food and Agriculture Organization (FAO), the United States Agency for International Development (USAID) and other stakeholders are working towards a sustainable livestock sector by 2050 in what is referred to as the African Sustainable Livestock 2050 Initiative (FAO, 2019). Cattle and poultry populations are projected to increase by about 94% and 375% respectively by 2050 (ibid). Beyond such national importance, livestock also signifies and represent cultural values and attributes since they are offered for dowry and presented as gifts during weddings (Tabe-Ojong et al., 2021). Their droppings can also be used as organic fertilizers with cattle and oxen are used as farm inputs for less mechanized farming systems (Veljanoska, 2021). Moreover, livestock are regarded as the bank of the poor as they allow for capital accumulation in the absence of access to banking and other viable means to save.

Third, we follow McKenzie et al. (2021) in eliciting a plausible mechanism through which aspirations that are difficult to achieve may have long term effects on livestock. This is through reducing the internal locus of control, which may make individuals believe that they do not have control over their lives. Such belief systems may have adverse effects on their future-oriented behavior. This mechanism is our addition and not included in the theoretical model of Genicot and Ray (2017). However, earlier work by Ross (2019) shows evidence of a positive association between high aspirations and low optimism / low agency. McKenzie et al. (2021) further show that failed or unmet aspirations may have enduring effects on financial investments through a reduction in the locus of control. Indeed, if individuals with high aspirations believe that they have less control over outcomes in their lives, this may reduce their future oriented efforts.

Our final contribution has a regional scope as we provide novel evidence of aspiration failure from SSA. To the best of our knowledge, there has been no direct test of the aforementioned inverted U-shaped relationship and aspirations failure in SSA, although earlier work from Bernard et al. (2019) report results that are consistent with it. Most of the previous studies have been limited to Asian and South American countries like Nepal, Myanmar, India, Peru, Nicaragua, Colombia, Pakistan, and the Philippines.

To credibly identify the association between aspirations and livestock, the use of experimental techniques may seem the best option (Bernard et al., 2019; McKenzie et al., 2021). However, ethical issues associated with the use of such techniques may render it less feasible. This is

even more the case for this theorized relationship given that exogenously increasing aspirations in an experimental setting may render individuals worse off if this relationship is indeed true (La Ferrara, 2019). For instance, exogenously inducing higher financial aspirations amongst poor entrepreneurs in the Philippines led to potentially harmful outcomes like less borrowing, reduced business investments and an eroding internal locus of control (McKenzie et al., 2021). In this case, credibly identifying this relationship with the use of econometric methods suited for observational data (despite the limitations) may be the best way forward (Bloem, 2021). We include a plethora of controls in the regression models to account for potential confounding factors. However, it may be the case that unobservable factors drive the inverted U-shape, though it seems difficult to explain how unobservable factors may do so (Janzen et al., 2017). We employ the framework of Altonji et al. (2005) and Oster (2019) to verify how large the effect of unobservable factors would need to be, in comparison to the observable factors, to annul the inverted U-shaped relationship between the aspiration gap and livestock. Here, we find evidence that the inverted U-shaped relationship is robust to the influence of unobserved factors.

The rest of the paper is structured as follows: the theoretical framework presented in section two offers a brief overview of the relationship between aspirations and future-oriented behavior. This is followed by a description of the research area and data used in the analysis. Section four provides information on the empirical model and strategies used. Results are presented and discussed in section five along with the various robustness checks while the article concludes in section six with an outlook.

2. Theoretical framework

To structure thinking about aspiration failure and motivate testing the inverted U-shaped relationship between aspirations gap and livestock, we present a simple theoretical model. The framework we utilize is derived and discussed in Genicot and Ray (2017). It was later summarized by Janzen et al. (2017) with some minor modifications in Bloem (2021). For this analysis, we extend the model to the context of livestock in rural Kenya. We begin with what aspirations are, and move on to the concept of aspiration failure.

Aspirations are well-filtered goals relevant from an individual's viewpoint and backed by motivational outcomes (Locke and Latham, 2002). They are targets that households set to achieve in the future. Being goals for the future, they serve as motivators spurring households

to put in the necessary effort to achieve these aspirations. Investing efforts in achieving aspirations will only occur if the individual believes that these goals are achievable and that one has control over achieving these goals (Lybbert and Wydick, 2018). These efforts could take multiple forms including making productive investments and building up savings, which may yield future returns and improved livelihoods. However, households might not invest the necessary efforts because of too high or too low aspirations, which constitutes an aspiration failure.

Aspiration failure understood in the light of Appadurai (2004) results from a lower 'capacity to aspire'. According to him, the poor get trapped in poverty because of a lower navigational capacity to utilize social networks for experimentation and information gathering. Aspirational achievements of their peers, serving as aspirational targets for them, are not sufficiently dispersed in their local networks, which leads to small aspiration gaps. When the gap is small (aspiration is slightly above current achievement), the associated effort (investment) necessary to reach the aspiration is also low causing no (or at best low) productive investment. Ray (2006) described this low investment to be an aspiration failure or fatalism. As aspirations increase, the effort needed to achieve them goes up, and if individuals put in this additional effort, then aspirations fulfill their motivating role. However, there exists a point where higher aspirations lead to frustration since the required investment becomes too high. Thus, aspiration failure is a combination of both aspiration fatalism and frustration.

Understanding aspiration failure from a theoretical viewpoint is based on three assertions (Dalton et al., 2016): (1) aspirations can be represented in utility functions as reference points that affect individual utility from any given outcome; (2) based on the feedback mechanism between efforts and aspirations through the realized outcome, aspirations and efforts are determined together in equilibrium. In short, low aspirations induce low efforts whose outcome reinforces low aspirations; (3) despite being determined jointly, individuals hardly incorporate the effort feedback on aspirations. This creates a bias in decision-making, which may induce aspiration failure. Such a decision-making process is termed behavioral as an individual chooses his effort level while taking his aspiration as given.

According to the aspiration-based utility framework (Janzen et al., 2017), an individual with an initial wealth level (w_0) maximizes utility over the present and the future following a two-period utility function:

$$u(k,s) = v_0(k) + \beta[v_1(ps) + b \times I(ps \geq a)] \quad (1)$$

The individual can either use his income for consumption (*k*), or saving (*s*) purposes with an ensuing payoff (*p*). Rural Kenya being a pastoral community, livestock savings and investments are one of the forward-looking decisions of households. At the beginning of the first period, $w_0 = k + s$, while at the start of the second period $w_1 = ps$. In both periods, the individual derives utility from consumption and initial wealth. The individual also has aspirations *a,* which are assumed to be exogenous. Depending on whether the individual is meeting his aspirations, s/he also derives a 'bonus' utility, *b*, which can either be treated as an increasing function of how aspirations are exceeded (Genicot and Ray, 2017) or just as a constant amount gained (Janzen et al.,2017).[1] v_0 and v_1 are assumed to be smooth, increasing and strictly concave while β is the discount factor.

Just like any other decision taken by households, benefits and costs of keeping livestock are being compared. The cost of these investments and savings can be represented as:

$$C(s) = v_0(w_0) - v_0(w_0 - s) \quad (2)$$

For the benefit function, the individual considers two alternatives. Either aspirations are met and can be described as 'satisfied' or they are not met, which would imply 'aspiration frustration'. The benefit function is represented as:

$$B(s) = \begin{cases} \beta[v_1(ps) + b] & \text{if } ps \geq a \text{ (satisfied)} \\ \beta[v_1(ps)] & \text{if } ps < a \text{ (frustrated)} \end{cases} \quad (3)$$

Following from this and in line with Genicot and Ray (2017), investments increase with aspirations up to a particular threshold, $\hat{a}$ and decline thereafter because of the relative high aspiration-investments required. In selecting an investment level, the individual compares the benefits, $B(s)$ and cost of the investment, $C(s)$ and will thus settle for an optimal investment level s^* that maximizes his/her net benefit of investment,

$$NB(s) = B(s) - C(s) \quad (4)$$

[1] This is done to maintain consistency with models that treat aspirations as reference points. Moreover, treating the 'bonus' utility as a constant amount if aspirations are met enables the marginal returns to consumption to have a similar difference above and below the aspiration threshold.

Based on the households' holding of livestock, s/he receives a return of ps on his/her investments. Aspirations are satisfied when $ps \geq a$ and frustrated when $ps < a$ as illustrated in figure 1.

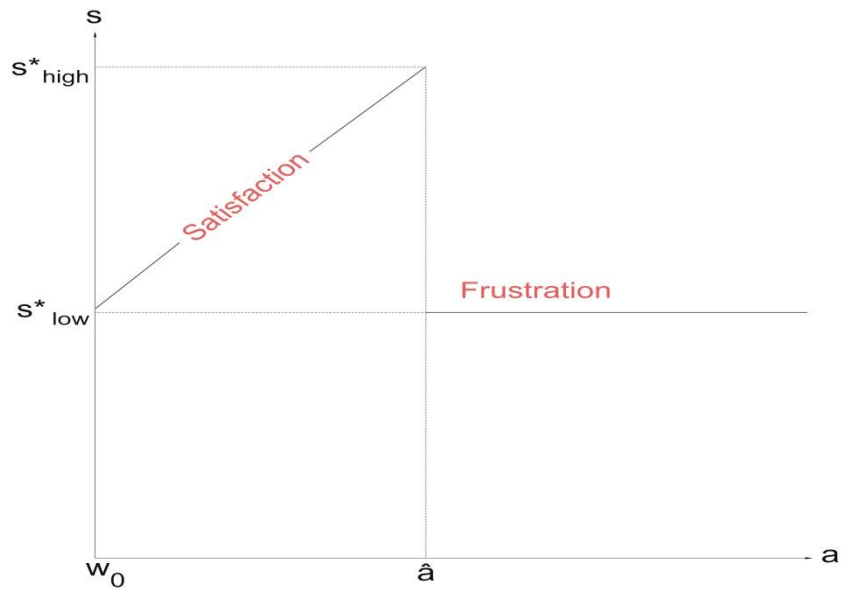


Figure 1 Savings and investments response to aspirations

From Figure 1, so far as the aspiration falls in the satisfaction zone, livestock increase with aspirations. However, after the aspiration threshold $\hat{a}$, there is a sharp change from satisfaction to frustration accompanied by a fall in livestock. In this zone, investments remain constant no matter the associated increase in aspiration since the cost of meeting aspirations $C(s)$ outweighs the benefits $B(s)$. Important to note that the chosen investment range from s^*_{low} to s^*_{high}: s^*_{low} is optimal for an individual whose aspiration is above the threshold while levels slightly above s^*_{low} and s^*_{high} is optimal when aspirations are below the threshold. At the threshold $\hat{a}$, the individual is indifferent between satisfying his/her aspirations or not. This turning point depends on the wealth level of the individual as well as on other characteristics associated with their utility function (Bloem, 2021). For instance, individuals with greater wealth levels will have a higher turning point (Janzen et al., 2017). This implies that they will be less likely to experience aspiration frustration and is another, more formal way, to frame Appadurai's higher capacity to aspire when it comes to the rich (Appadurai 2004?).

3. Data and measurement of variables

3.1 Data

This analysis is based on household-level data of smallholder households in the Northern parts of Kenya. The survey was conducted between July and August 2019 and relied on a two-stage

sampling framework. With support from the Kenyan National Bureau of Statistics (KNBS), 35 villages were randomly selected using probability proportional to size sampling. In a second step, we randomly selected 15-16 households from each selected village based on household lists created with the help of the village leaders.

Interviews were then conducted with the household heads or their spouse. This process was carried out by a group of well-trained enumerators who interviewed households in their local languages. Interviews were enabled with the use of questionnaires designed on survey-based tablets. The questionnaires were concise allowing households to report their aspirations based on 5 dimensions (Bernard and Taffesse, 2014). Information was also collected on the socio-economic characteristics of the households such as age, education and family size. Current wealth levels including livestock ownership and access to institutional services such as credit and extension as well as membership in producer organizations were also recorded. Table 1 presents the summary statistics of some of these variables.

Table 1 Summary statistics of model variables

	Mean	Std. Dev.
Outcome variables		
Livestock ownership (yes=1)	0.84	0.36
Herd size (number)	20.57	35.76
Herd size (TLU)	3.18	5.07
Covariates		
Income aspirations	45484.15	60869.41
Income aspirations gap	0.69	0.19
Income aspirations gap^2	0.52	0.24
Age of household head	45.15	15.62
Education level of the household head (years)	7.89	4.86
Household head is male (yes=1)	0.74	0.44
Household size	5.94	2.83
Access to credit (yes=1)	0.43	0.49
Extension contact (yes=1)	0.26	0.44
Cooperative membership (yes=1)	0.25	0.44
Off-farm income (yes=1)	0.27	0.44
Income (Ksh)	10887.65	13330.24
Asset ownership (Ksh)	171532.5	1055138
Tugen and Pokot ethnicity (yes=1)	0.66	0.47

Notes: Just about 13 households in the sample have a Pokot origin. Given that households with a Tugen ethnicity reported more livestock than households from the Ilchamus ethnic group, we combined these 13 Pokot households with the Tugen households to create a dummy for ethnicity which reflects some pastoral underpinnings and keen attention to livestock keeping.

3.2 Measurement of aspiration gap

Different scales have been used to proxy and measure aspirations in many settings, making comparisons between studies non-trivial. We relied on direct aspiration measures using the framework of Bernard and Taffesse (2014). Based on specific dimensions, these measures have been at the core of recent aspiration studies (Bloem, 2021; Janzen et al.,2017; Kosec and Mo, 2017). With regards to income aspirations, we essentially asked households four questions[2]. The first two were anchoring questions and the latter two were (1) 'what is your present level of income?' and (2) 'what level of income would you like to achieve in the future?' While (1) represents the current income level of households, (2) is the aspired-to income level.

From the two measures above, we then computed the aspiration gap as the relative difference between current and aspired-to levels[3]:

$$Aspiration\ gap = \frac{aspiration - current\ status}{aspiration} \quad (5)$$

The measure ranges between 0 and 1, enabling comparison across households with different current status levels. For dimensions with a current status of zero and an aspired-to status greater than zero, the aspiration gap will be one. Figure 2 shows the distribution of income aspirations and normalized income aspirations gaps. Income aspirations are quite variable. Aspirations are positively and aspiration gaps negatively skewed. Households have an average monthly income of 10887Ksh[4] ($105) and an average monthly income aspiration of 45484.15Ksh ($437), signaling that aspirations are about 4.5 times the current levels.

[2] The first two of the four questions are only used to get the respondents to settle for a realistic range for his/her aspirations. This relates to the enquiry about the maximum and minimum income levels of households in the local area of the household.

[3] This gap has also been used by Janzen et al., 2017; Ross, 2019 and Bloem, 2021

[4] 1Ksh= $0.0096 (06.07.2019)

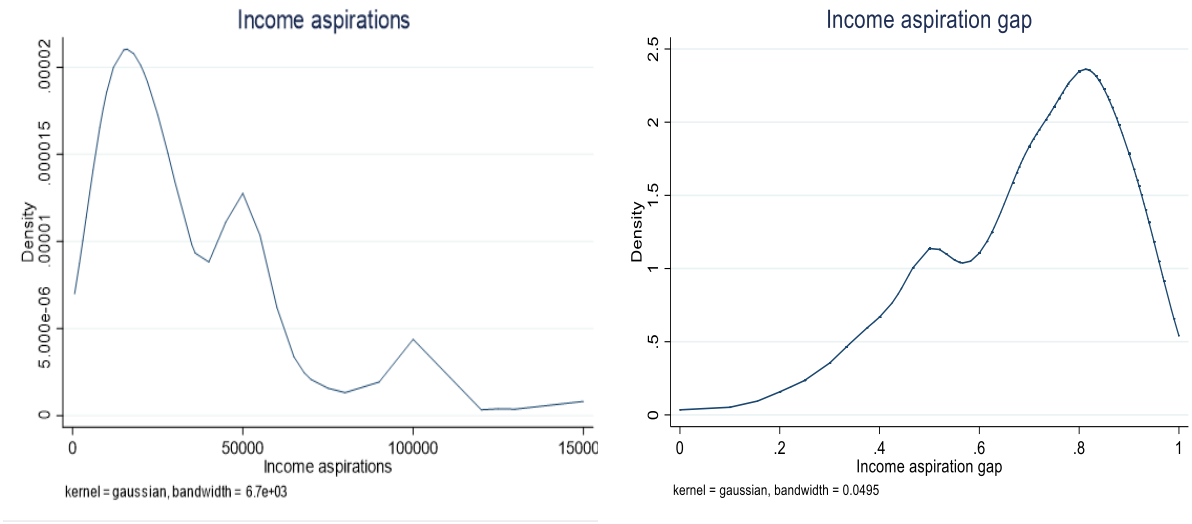


Figure 2 Distribution of Income aspiration and aspiration gaps

3.3 Measurement of livestock

In rural Kenya, like in many semi-arid and arid regions of sub-Saharan Africa, livestock are a common means of investment and saving. In these regions, households usually keep livestock as a buffer for unforeseen events and to store value. That is, apart from serving the purposes of food and farm production, livestock are also used for insurance and saving motives (Abay and Jensen, 2020). We use three measures of livestock: (1) a binary measure of livestock holding. i.e. whether the household has any livestock or not. Livestock here refers to cattle, goats, sheep, rabbits, poultry and donkey. The second measure (2) considers herd size as a head-count of all the livestock per household. While this contains more information than the binary measure, treating the different livestock as equal will still allow only a rather poor comparison of livestock value across households. We therefore also use (3) Tropical Livestock Units (TLU) as a third measure. TLU was developed by the Food and Agriculture Organization and essentially apportions units to different livestock based on their live weight. For instance, a cow equals 0.70 units, a sheep or a goat represent 0.1 units and a chicken equals 0.01 units.

4. Empirical strategy

We perform both parametric and semi-parametric methods to empirically test the inverse U-shaped relationship between aspirations and livestock investments. From a parametric point of view, our empirical strategy involves estimating the relationship between income aspiration gaps and livestock by imposing a quadratic functional form and including a set of controls as explanatory variables shown in Eqn. (6):

$$LS_{iv} = \beta_0 + \beta_1 G_{iv} + \beta_2 G_{iv}^2 + \beta_3 W_{\boldsymbol{iv}} + \beta_4 \boldsymbol{X_{iv}} + v_{iv} + \epsilon_{iv} \quad (6)$$

Where LS_{iv} represents livestock, G_{iv} the income aspiration gap and G_{iv}^2 allows the fitted relationship to exhibit the theorized non-monotonic functional form between the income aspiration gap and livestock. $\boldsymbol{X_{iv}}$ is a vector of controls including socio-economic characteristics of households like age, education, sex, family size, institutional variables like access to credits, extension services and membership in cooperative groups. Here, we also control for the current wealth status of households as well as for their ethnicity. Controlling for the current wealth status (W) is important for two main reasons: (1) the wealth level of households is presumably correlated with livestock through other channels. Wealthier households may have more livestock than their counterparts. (2) The turning point of the aspiration gap effect on livestock could be increasing in one's current wealth level (Janzen et al., 2017). To cater for this possibility, we include an interaction between current wealth and the aspiration gap. We also control for village fixed effects (v_{iv}). ϵ_{iv} is the residual term and $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ are the coefficients to be estimated. Our main parameters of interest are β_1 and β_2 since they tell us how and how strongly the aspiration gap incentivizes livestock savings.

For an inverse U-shaped relationship to be confirmed, we expect the slope of the curve to be positive ($\beta_1 > 0$) when G = 0 and negative ($\beta_1 + 2\beta_2 < 0$) when G = 1 with one turning point between. Just looking at the signs of β_1 and β_2 may be enough to already comment on the presence of the inverted U-shaped relationship. However, as Lind and Mehlum (2010) have argued, this might be sound but potentially misleading[5]. We thus follow the framework they adopted in testing and confirming the presence of a U-shaped relationship following tests developed by Sasabuchi (1980). The test provides results for the estimated slopes at G=0 and G=1, the turning point, the Sasabuchi p-value and the Fieller confidence interval for the turning point.

For a robustness check, we also employ semi-parametric techniques where we do not impose any prior functional form for how the aspiration gap enters the equation:

$$LS_{iv} = \beta_0 + f(G) + \beta_3 W_{iv} + \beta_4 \boldsymbol{X_{iv}} + v_{iv} + \epsilon_{iv} \quad (7)$$

The only difference between equations (6) and (7) is how the gap enters the estimation.

[5] As they highlight, it becomes problematic when the true relationship is convex but monotone over different data values. In this case, a quadratic specification may erroneously yield an extreme point. In such cases, it may be worthwhile to test whether the relationship is increasing and decreasing at high and low values respectively within the interval.

The following additional analyses are performed: (1) In the interest of unpacking heterogeneity as to which type of livestock matters more, we also disaggregate livestock into large ruminants, small ruminants and poultry. (2) We also explore the mechanism that the locus of control could be partially driving the relationship between aspirations and livestock. (3) Given that our results could still be driven by unobserved heterogeneity despite the inclusion of various controls, we estimated bounds based on Altonji et al. (2005) and Oster (2019), indicating how large the omitted variable bias has to be to annul the estimated relationship between aspirations and livestock. (4) We finally perform some robustness checks applying variable transformations, including truncations at zero and the inverse hyperbolic sine transformation (Bellemare and Wichman, 2019).

5. Results and discussion

5.1 Evidence of aspiration failure

We use OLS to estimate our models both for the dichotomous and continuous livestock outcomes. For the dichotomous outcome, we used the linear probability model and a probit model as robustness check. Beginning with the dichotomous measure of livestock ownership, we observe consistency with the theorized inverse U-shaped relationship between aspirations and livestock, though the relationship is not statistically significant (Table 2). The sign of the income aspiration gap is positive while the sign of the squared income aspiration gap is negative. Given that we aggregate all livestock irrespective of the live weight, it is probable that we missed out on some relevant heterogeneity. To unpack the underlying reasons, we perform some disaggregation analysis in the next section.

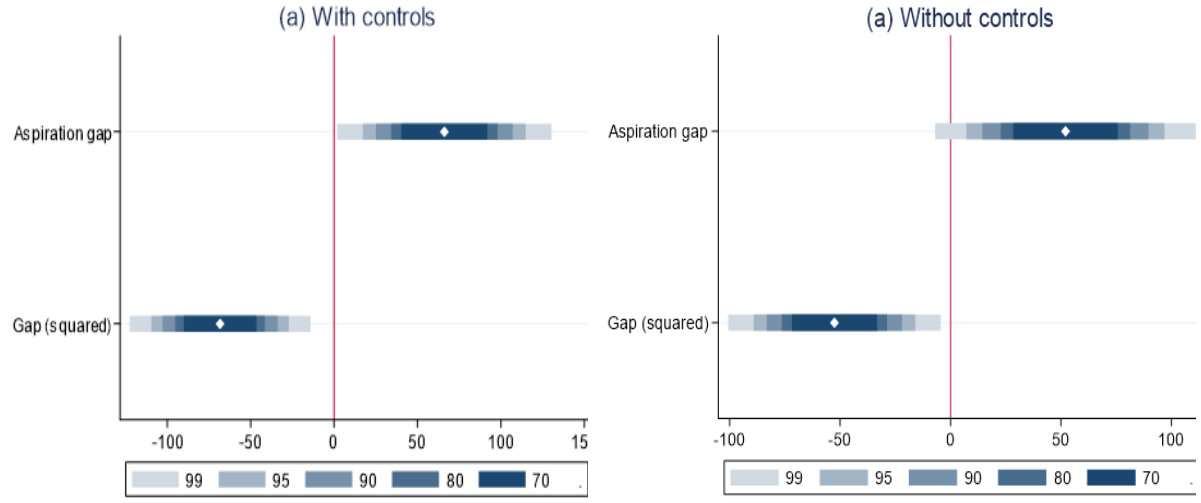
Table 2 Estimates of the association between aspirations gap and livestock ownership (binary measures)

	LPM		Probit	
	(1)	(2)	(3)	(4)
Income aspirations gap	0.330	0.148	0.201	0.005
	(0.442)	(0.435)	(0.459)	(0.410)
Income aspirations gap^2	-0.405	-0.209	-0.334	-0.117
	(0.361)	(0.354)	(0.356)	(0.320)
R squared	0.169	0.245	0.016	0.122
Village FE	Yes	Yes	No	No
Additional controls	No	Yes	No	Yes
F statistic	3.37***	3.10***		
Observations	530	530	530	530
U-test results				
Turning point	0.408	0.355	0.300	0.321
Sasabuchi p-value	0.366	0.366	0.331	0.495

Slope at minimum	0.330	0.148	0.840	0.026
Slope at maximum	-0.479	-0.270	-1.954	-1.186
Fieller 95% confidence interval	[-Inf; +Inf]	[-Inf; +Inf]	[-Inf; +Inf]	[-Inf; +Inf]

Notes: In columns (2) and (4), we include additional control variables. Additional controls include the age of the household head, educational level of the household head, gender of the household head, household size, access to credit, extension contact, cooperative membership, off-farm income, wealth levels, and ethnicity. Robust standard errors clustered at the village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Moving to the continuous measures of livestock, we consider both the herd size (Figure 3[6]) and the standard TLU. For both measures, we estimated two models where we controlled for different confoundings (Table 3). In models (2) and (4), we include a set of controls to establish the robustness of our model to observed heterogeneity. The estimated coefficients of the gap are very similar for the same livestock measure. Because of this similarity, we restrict discussion to models (2) and (4) in Table 3. Looking at both the herd size and the TLU, we observe a positive relationship between the income aspirations gap and livestock. As expected, an inverse relationship is reported for the square of income aspiration gap and livestock. The coefficient estimates here are statistically different from zero. Looking specifically into this relationship, a one-percent increase in the gap before the turning point leads to an increase in livestock by about 53 herds. In terms of livestock units, about 7.3 TLUs is invested. Given that our two measures of livestock offer similar signs and direction, our results are robust to varying continuous measures of livestock. Overall, the findings are in line with the theoretical predictions that aspirations that are ahead but not too far ahead of the status quo serve as the best incentives for household savings and investments.



[6] Figure 3 confirms the inverse U-shaped relationship between aspiration and herd size, with and without controls respectively.

Figure 3 Relationship between aspiration gap and livestock (with and without controls)

The U test results (Table 3) further support the evidence of this inverted U-shaped relationship. The Sasabuchi p-values are below 0.05, allowing us to reject the hypothesis that the first derivative of the quadratic fit is the same sign at both the maximum and minimum points of the interval. We estimate a turning point around 0.49, similar to turning points reported in Janzen et al. (2017) and Bloem (2021). The Fieller 95% confidence interval (CI), which simply gives the CI around the turning point of the U-shaped function (Fieller, 1954), lies within the interval of the argument. All these results act as additional support for the inverted U-shaped relationship.

Table 3 Estimates of the association between aspirations gap and livestock ownership (Herd size and TLU)

	Herd size		TLU	
	(1)	(2)	(3)	(4)
Income aspirations gap	66.088***	52.028**	9.117*	7.334*
	(24.858)	(22.817)	(5.129)	(4.326)
Income aspirations gap^2	-66.345***	-52.552***	-9.637**	-7.642**
	(20.962)	(18.597)	(3.960)	(3.367)
R squared	0.124	0.294	0.113	0.311
Village FE	Yes	Yes	Yes	Yes
Additional controls	No	Yes	No	Yes
F statistic	2.94***	3.39***	2.77***	3.96***
Observations	530	530	530	530
U-test results				
Turning point	0.483	0.495	0.473	0.479
Sasabuchi p-value	0.004	0.011	0.038	0.045
Slope at minimum	66.088	52.028	9.117	7.334
Slope at maximum	-70.595	-53.071	-3.180	-7.949
Fieller 95% confidence interval	[0.276;0.602]	[0.197;0.618]	[0.237;0.601]	[0.516;0.612]

Notes: In columns (2) and (4), we include additional control variables. Additional controls include the age of the household head, educational level of the household head, gender of the household head, household size, access to credit, extension contact, cooperative membership, off-farm income, wealth levels, and ethnicity. Robust standard errors clustered at the village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

We now check if the inverted U-shape relationship holds if we apply semi-parametric techniques. As shown in Figure 4 (a and b), the results are again indicative of the theorized relationship between aspirations and investments. Conclusively, the theorized inverse relationship between aspiration and livestock is maintained both when imposing and when not imposing a functional form on the relationship.

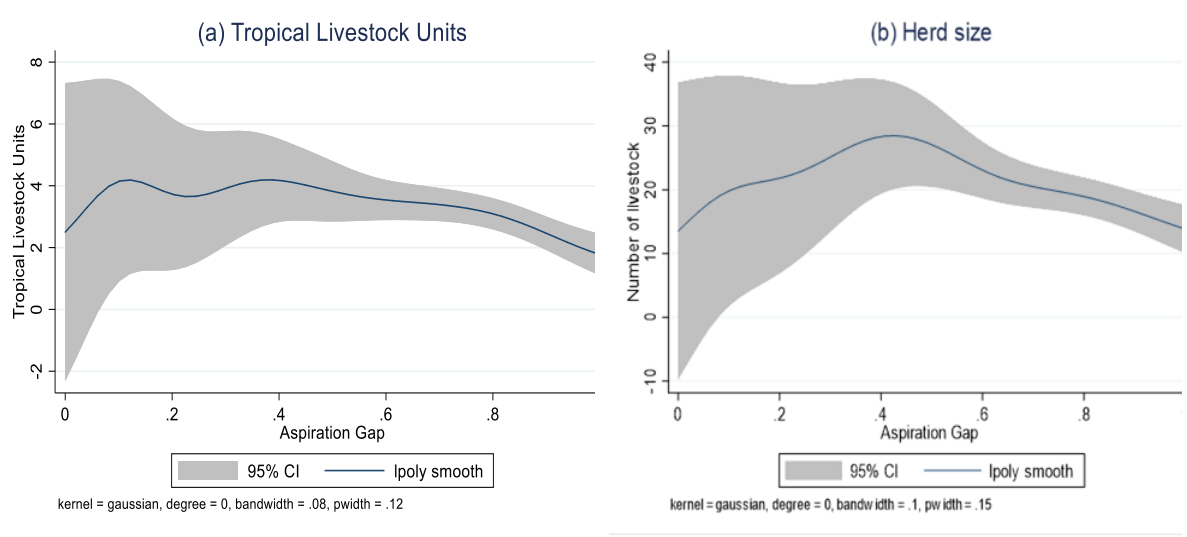


Figure 4 Non-parametric relationship of aspiration and livestock investments

Our results suggest the presence of both aspiration fatalism and aspiration frustration for pastoralists in Kenya. Small aspiration gaps are associated with little in the way of livestock. In such cases, aspirations are unmet, since they are small and probably internalize little effort. However, for individuals whose aspirations are far ahead of their current status, livestock increase with aspirations up to a turning point beyond which the required livestock may be very high, resulting in resignation and frustration. Our results lend credence to previous studies that have tested and confirmed this theorized relationship (Bloem, 2021; Janzen et al.,2017; McKenzie et al., 2021; Ross, 2019)

5.2 Heterogeneity by livestock type

As outlined in section one, livestock serves multiple purposes in rural areas including precautionary savings and insurance, market-related purposes, use in farm production and in signaling social status. Because of this, households may decide to own particular livestock based on their expected perceived benefits. While some households who are exposed to the vagaries of weather may prefer investing in small ruminants such as sheep and goats, which can be liquidated easily (Abay and Jensen, 2020), others may prefer a larger stock such as cattle as they are more valuable, produce more milk and manure (Shackleton et al., 2005) and signal a greater status. We thus reclassify and disaggregate livestock ownership into three separate groups of large ruminants (cattle), small ruminants and poultry to untangle the livestock and relate this to the aspiration gaps of households. Given that all the outcomes are binary, we again used the linear probability model for estimation. As shown in Table 4, the expected signs and direction of the estimated coefficients speak to the theoretical predictions. However, only cattle ownership is statistically significant. This offers an interesting insight into livestock

heterogeneity. Cattle seem to matter more in regard to aspirations than other livestock. High but not too high aspiration levels induce households to invest in large ruminants as opposed to small ruminants and poultry. This finding can be explained by social status as well as other inherent benefits like more meat, greater manure production and higher savings, which could be used to cushion or smooth consumption in times of income shocks. In terms of income aspiration, cattle are the relevant asset available for investing in future income streams and livelihood insurance.

Table 4 Income aspirations and livestock portfolio classification

	Cattle	Goat and sheep	Poultry
Income aspirations gap	0.905*	0.590	0.194
	(0.535)	(0.749)	(0.539)
Income aspirations gap^2	-0.864**	-0.623	-0.379
	(0.426)	(0.597)	(0.430)
R squared	0.275	0.265	0.232
Village FE	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes
F statistic	4.08***	3.89***	3.25***
Observations	530	530	530
U-test results			
Turning point	0.523	0.473	0.25
Sasabuchi p-value	0.045	0.215	0.360
Slope at minimum	0.905	0.590	0.194
Slope at maximum	-0.824	-0.655	-0.565
Fieller 95% confidence interval	[-2.492;0.649]	[-Inf; +Inf]	[-Inf; +Inf]

Notes: Additional controls include the age of the household head, educational level of the household head, gender of the household head, household size, access to credit, extension contact, cooperative membership, off-farm income, wealth levels, and ethnicity. Robust standard errors clustered at the village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5.3 Unobserved selection

Credibly identifying the relationship between income aspirations and livestock may require the use of experimental or panel data methods to control for both observed and unobserved heterogeneity. To reduce the bias arising from our use of cross-sectional data, we test the robustness of our estimates first with the inclusion of a battery of control variables to reduce the potential bias of observable characteristics. Given that unobservable characteristics may jointly determine both income aspirations and livestock savings, we estimate by how much unobserved characteristics, in comparison with observed characteristics can explain away the

estimated inverted U-shaped relationship. For this, we followed the methodology proposed by Altonji et al. (2005) and Oster (2019).[7]

We used two approaches to do this: in the first approach, we assume a value for R^2 max and compute the value of delta for which beta is zero. This tells us how much greater the influence of unobservable factors would need to be, relative to observable factors, to let the inverted U-shaped relationship vanish (Oster, 2019). The second approach is to use bounds on R^2 max and delta to calculate bounds for beta. This indicates how our main estimates would change if selection on unobservables was as strong as the selection on observables. The estimated beta here can be described as bias-adjusted. For the first approach, we estimate that unobserved selection would have to be about six times[8] stronger than observed selection to explain away the inverted-U shaped relationship (Table 6). All of the values are outside the recommended 0-1 range (Oster, 2019). If the selection was equal, we observe bias-adjusted betas to be slightly above the estimated betas. The beta values fall within a 95% CI of the true estimated beta values. Thus, we could conclude that the bias-adjusted betas are just an upper bound of the estimated betas since they don't change the original findings. Overall, we can conclude that the estimated inverse U-shaped relationship between aspirations and livestock is unlikely driven by unobserved heterogeneity.

Table 5 Check for omitted variable bias

	Income aspiration gap		Income aspiration gap^2	
	(1)	(2)	(3)	(4)
Beta	0	55.31	0	-54.63
Delta	6.07	1	-6.86	1
R^2 max	0.29	0.29	0.29	0.29
Observations	530	530	530	530

Notes: The estimated coefficients are set to zero and the degree of omitted variable bias is calculated in specifications (1) and (3). For (2) and (4), we follow Oster (2019) to set the omitted variable bias to be equal to selection on included controls. We then estimate the resulting bias-adjusted beta coefficient.

5.4 Aspiration gap and locus of control

According to Bernard et al. (2014), other aspiration studies have taken an indirect approach by measuring proxies for aspirations like locus of control. However, in the context of the aspiration gap, the concept of locus of control can be interpreted as a *mechanism* explaining

[7] The caveat in using these methods is that they rely on a set of assumptions which are untestable (Ross 2019). However, they do provide evidence as to what extent the model is influenced by omitted variable bias.

[8] A negative delta means that if the observables are positively correlated with the outcome, the unobservables have to be negatively correlated with the outcome to get the specified beta.

reduced investments in the presence of high aspirations. Locus of control, understood as the belief that one has control over one's life (Rotter, 1966), reduces with increasing aspirations beyond a certain point as the individual does not believe him/herself to be able to achieve such lofty goals. Such reduction in beliefs may make people less willing to invest (McKenzie et al., 2021). While this is not theoretically motivated in Genicot and Ray (2017, 2020), we follow Ross (2019) and McKenzie et al. (2021) in using one measure of belief/control over one's life to establish if this is driving livestock reduction. To capture locus of control, we used 8 statements from the Rotter (1966) scale and created a locus of control index. Higher scores represent an internal locus of control while lower scores signify an external locus of control. While individuals with an internal locus of control believe that they have control over life's outcomes, individuals with an external locus of control rather believe factors beyond their control and stochastic errors shape their lives.

Figure 4 shows some positive correlation between the aspiration gap and the locus of control. However, as the gap increases, a negative correlation is observed, with aspirations that are too high leading to a large aspiration gap (quadratic term). The semi-parametric technique further confirms this relationship. This result suggests large aspiration gaps correspond to a low extent to which households believe they have control over their lives. In this case, this may result in livestock reductions as they feel themselves to be at the mercy of external forces potentially interfering with efforts. While aspirations are goals that individuals seek to achieve, a reduction in the extent to which they believe they control outcomes about their lives may lead to frustration if aspirations stay unmet. Similar findings were observed by McKenzie et al. (2021) in the framework of exogenously inducing aspirations to entrepreneurs in the Philippines.

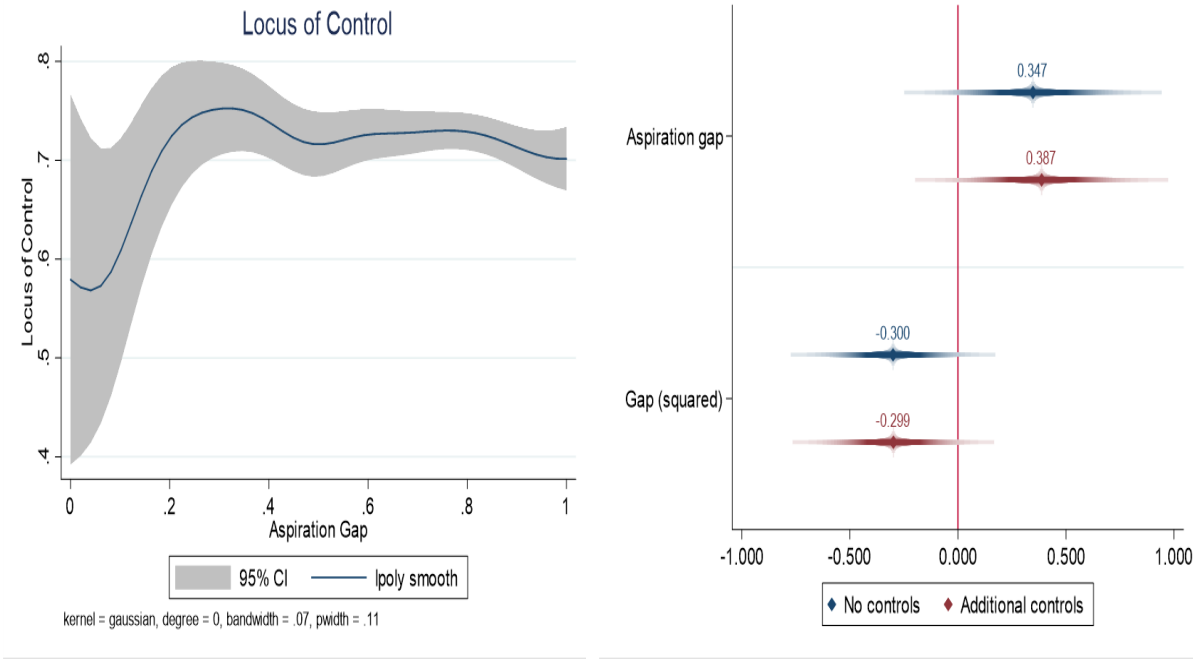


Figure 5 Relationship between aspiration gap and locus of control

So far, we only estimated a direct relationship between locus of control and the aspiration gap. To establish whether locus of control is a mechanism explaining the relationship between aspiration gaps and livestock, we do two things. First, we interact locus of control and the aspiration gap and see how they both influence livestock. The estimates presented in Table 6 are indicative of a positive and statistically significant interaction effect of the aspiration gap and locus of control on livestock. Second, we use the sequential g-estimation framework of Acharya et al. (2016). This framework establishes whether a mediator (locus of control in our case) explains the relationship between aspiration gap and livestock. As a first step, we run a livestock model with aspiration gap, locus of control and other covariates. From this, the estimate of locus of control is subtracted to generate a new outcome variable. This variable is now regressed on aspiration gap and the other controls. The parameter estimate of the aspiration gap then provides evidence on whether locus of control is a mechanism through which the aspiration gap is associated with livestock. As seen in table 6, the aspiration gap variable is not statistically significant while the aspiration gap^2 variable is only significant at the 10% level of probability suggesting that locus of control is indeed mediating the relationship between high aspirations and livestock investments.

Table 6 Interaction and Sequential g-estimation model results

	Interaction model	Sequential g-estimates
Income aspirations gap x locus of control	7.606**	

	(3.165)	
Income aspirations gap^2 x locus of control	-5.288**	
	(2.688)	
Income aspiration gap		7.433
		(5.438)
Income aspiration gap^2		-7.242*
		(4.337)
R squared	0.423	0.247
Village FE	Yes	Yes
Additional controls	Yes	Yes
F statistic	4.25***	4.86***

Notes: Additional controls include the age of the household head, educational level of the household head, gender of the household head, household size, access to credit, extension contact, cooperative membership, off-farm income, wealth levels, and ethnicity. Robust standard errors clustered at the village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

5.5 Additional Robustness checks

We perform two additional robustness checks. In the first, we conduct two transformations on the continuous livestock variable to efficiently manage zeros. Given that livestock may follow a right-skewed distribution, our objective here is to express this in a manageable way. We truncate and exclude all households with no livestock to verify if our results are robust to the exclusion of zeros. As a second robustness check, we transform our outcome variable in such a way that the zeros, representing no livestock are retained. We used the inverse hyperbolic sine (IHS) transformation (Bellemare and Wichman, 2019) as another means of effectively managing zeros. Akin to natural log transformation, this has the additional advantage of being able to handle and retain zeros. Estimating the models using OLS (Table 7), the coefficients are similar to the main model in signs, direction and magnitudes. The U-test results are also maintained and further support the original findings. This finding confirms that our model is not sensitive to the exclusion of zeros or to the IHS transformation. This further strengthens the empirical evidence supporting the hypothesis that aspirations that are ahead but not too far ahead of the status quo incentivize households to undertake productive investments and savings that can improve their welfare and livelihood options.

Table 7 Estimates when truncating and retaining zeros in livestock ownership

	Flock size		TLU	
	Truncated	IHS	Truncated	IHS
Income aspirations gap	69.067***	2.668**	10.340**	2.675***
	(27.185)	(1.481)	(5.087)	(1.008)
Income aspirations gap^2	-68.105***	-2.504**	-10.127**	-2.511***
	(22.248)	(1.238)	(4.026)	(0.805)

R squared	0.288	0.313	0.303	0.351
Village FE	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes
F statistic	2.73***	6.75***	3.28***	8.56***
Observations	433	530	433	530
U-test results				
Turning point	0.507	0.532	0.510	0.532
Sasabuchi p-value	0.005	0.036	0.021	0.004
Slope at minimum	69.067	2.668	10.340	2.675
Slope at maximum	-67.136	-2.341	-9.913	-2.347
Fieller 95% confidence interval	[0.285;0.614]	[0.375;0.691]	[0.068;0.627]	[0.347;0.612]

Notes: Additional controls include the age of the household head, educational level of the household head, gender of the household head, household size, access to credit, extension contact, cooperative membership, off-farm income, wealth levels, and ethnicity. Robust standard errors clustered at the village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

6. Conclusion

In this paper, we examine the specific relationship between aspirations and future-oriented outcomes. Particularly, we provide an empirical test of the theorized non-monotonic relationship between the aspiration gap and efforts. We define the aspiration gap to be the difference between the current income status and the aspired-to income status of households relative to the aspiration level. For our measures of efforts, we focus on livestock which is arguably an important indicator of rural welfare, especially in many pastoral communities in developing nations. Here, we consider the various livestock, proxied as the herd size as well as the Tropical Livestock units (TLUs). We relate these outcomes to the aspiration gap and establish whether aspirations that are ahead, but not very far ahead of people's current status serve as incentives for livestock investments. Using household-level data from 530 smallholder households in Northern Kenya, we find aspirations to increase livestock. However, we also note that very high aspirations relative to the current status lead to lower livestock investments. This could be explained by frustration arising from the fact that a high level of investment is necessary to match up with such high aspirations. Contributing to frustration, marking an aspiration failure, is the reduction in the internal locus of control, which reflects the reduced belief of being in control of one's life, thought to be a prerequisite for engaging in the effort to achieve desired goals.

Using various tests, we find evidence of an inverted U-shaped relationship between aspiration gap and livestock in Kenya. The findings are also robust to the inclusion of additional controls, truncations of livestock savings at zero and the inverse hyperbolic sine transformation which efficiently retains zeros. We also show that it is very unlikely that our findings are driven by

omitted-variable bias. Performing some heterogeneity analysis, we find that the aspiration gap responds more to large ruminants such as cattle as opposed to small ruminants like sheep and goats. In addition to previous findings, our study brings forward two new insights. To begin with, we strengthen the theoretical (Genicot and Ray, 2017) and empirical debates (Bloem, 2021; Janzen et al., 2017; McKenzie et al., 2021; Ross, 2019) that psychological and behavioral factors like aspirations matter for improving future-oriented outcomes, especially in terms of investments. Solely focusing on improving development outcomes by relieving and relaxing external constraints may not be effective if the aspirations of households are not considered. But again, only fostering aspirations may yield similar unsatisfactory outcomes given that the aspiration gap is a function of the current wealth levels. In this regard, the two should be regarded as complements rather than as exclusive in reducing rural poverty and achieving shared prosperity.

Finally, we reinforce the role of other psychological and internal factors like locus of control in fully explaining this non-linear relationship between aspirations and future-oriented behavior. Taken together, the analysis has implications for pastoral communities in many rural areas. At a time when many governments in Africa are galvanizing efforts with support from organizations like USAID and FAO to boost livestock production in the framework of the Africa Sustainable Livestock 2050 initiative, our findings show aspirations to be one of the conduits for this great transformation. That said, improving aspirations to higher levels could just lead to frustration and reduced investments (McKenzie et al., 2021). In this regard, simply exposing households to the relevant networks and successful households in their communities may create the unintended effect of actually decreasing efforts to achieve aspirations (Beaman et al., 2012; Bernard et al., 2019).

We end by highlighting some limitations of the study which point to the need for future research. Given that we use cross-sectional data, we cannot claim to have controlled fully for confounding factors, which may be in the way of establishing causality in the inverted U-shaped relationship. That said, we encourage future work along these lines to strengthen the external validity of these findings as they have implications for many pastoral settings in Africa where livestock represents to a large extent rural wealth. Building upon the relationship between the locus of control as a mechanism explaining the inverted U-shaped hypothesis and doing so theoretically may be of significant interest in the growing aspirations literature.

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Appendix

Table A1 Estimates of the association between aspirations gap and livestock ownership (binary measures) - full results

	LPM		Probit	
	(1)	(2)	(3)	(4)
Income aspirations gap	0.330 (0.442)	0.148 (0.435)	0.201 (0.459)	0.005 (0.410)
Income aspirations gap^2	-0.405 (0.361)	-0.209 (0.354)	-0.334 (0.356)	-0.117 (0.320)
Age of household head		0.002** (0.001)		0.002* (0.001)
Education level of the household head (years)		-0.001 (0.004)		-0.003 (0.004)
Household head is male (yes=1)		0.014 (0.040)		0.018 (0.035)
Household size		0.028*** (0.005)		0.035*** (0.006)
Access to credit (yes=1)		0.036 (0.032)		0.022 (0.035)
Extension contact (yes=1)		-0.014 (0.035)		-0.027 (0.036)
Cooperative membership (yes=1)		0.107*** (0.035)		0.147*** (0.043)
Off-farm income (Ksh)		-0.032 (0.040)		-0.058 (0.037)
Income(Ksh)		0.859** (3.251)		0.098 (0.052)
Asset ownership (Ksh)		0.013* (0.007		0.002 (0.001)
Tugen and Pokot ethnicity (yes=1)		0.099 (0.100)		0.126 (0.079)
Constant	0.780*** (0.167)	0.421** (0.184)		
R squared	0.169	0.245	0.016	0.122
Village FE	Yes	Yes	No	No
Additional controls	No	Yes	No	Yes
F statistic	3.37***	3.10***		

Observations	530	530	530	530
U-test results				
Turning point	0.408	0.355	0.300	0.321
Sasabuchi p-value	0.366	0.366	0.331	0.495
Slope at minimum	0.330	0.148	0.840	0.026
Slope at maximum	-0.479	-0.270	-1.954	-1.186
Fieller 95% confidence interval	[-Inf; +Inf]	[-Inf; +Inf]	[-Inf; +Inf]	[-Inf; +Inf]

Table A2 Estimates of the association between aspirations gap and livestock ownership (Herd size and TLU) – full results

	Flock size		TLU	
	(1)	(2)	(3)	(4)
Income aspirations gap	66.088***	52.028**	9.117*	7.334*
	(24.858)	(22.817)	(5.129)	(4.326)
Income aspirations gap^2	-66.345***	-52.552***	-9.637**	-7.642**
	(20.962)	(18.597)	(3.960)	(3.367)
Age of household head		0.488***		0.075***
		(0.135)		(0.018)
Education level of the household head (years)		1.210***		0.178***
		(0.387)		(0.063)
Household head is male (yes=1)		5.619***		3.264**
		(2.072)		(1.235)
Household size		0.068		0.227***
		(0.517)		(0.079)
Access to credit (yes=1)		-0.127		-0.175
		(2.322)		(0.411)
Extension contact (yes=1)		1.793		0.415
		(2.569)		(0.423)
Cooperative membership (yes=1)		10.993***		2.110***
		(5.089)		(0.699)
Off-farm income (Ksh)		1.120		-0.650*
		(3.063)		(0.374)
Income(Ksh)		0.265**		0.025
		(2.135)		(0.036)
Asset ownership (Ksh)		1.151***		0.016**
		(0.363)		(0.049)
Tugen and Pokot ethnicity (yes=1)		-1.727		-0.352
		(6.277)		(1.164)
Constant	2.160	-37.837***	0.730	-6.482
	(8.778)	(11.986)	(1.761)	(1.822)
R squared	0.124	0.294	0.113	0.311
Village FE	Yes	Yes	Yes	Yes
Additional controls	No	Yes	No	Yes
F statistic	2.94***	3.39***	2.77***	3.96***
Observations	530	530	530	530
U-test results				

Turning point	0.483	0.495	0.473	0.479
Sasabuchi p-value	0.004	0.011	0.038	0.045
Slope at minimum	66.088	52.028	9.117	7.334
Slope at maximum	-70.595	-53.071	-3.180	-7.949
Fieller 95% confidence interval	[0.276;0.602]	[0.197;0.618]	[0.237;0.601]	[0.516;0.612]

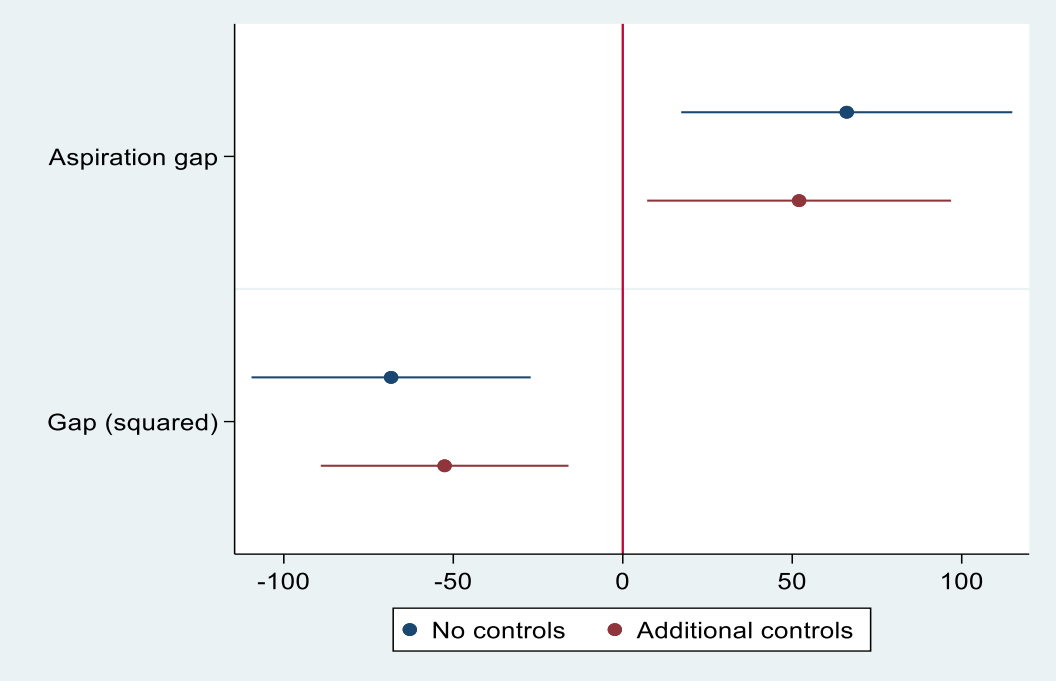

Figure A1 Relationship between aspirations and livestock