Agency in Child Labor Decisions:
Evidence from Kenya

Sarah Walker[*]   Anne Bartlett[†]

September 2018

Abstract

We conduct a lab-in-the-field experiment among child laborers in Kenya to understand how a child's risk preferences correlate with household decisions over child labor supply. We find that risk averse children are more likely to make an independent decision to work, as opposed to being sent by or negotiating with parents over the decision. In addition, we find no evidence of a correlation between a child's risk preferences and whether they were sent to work by parents. The results suggest strategic behavior by risk averse children who face a risky outside option in semi-nomadic pastoralism – the main occupation in our study area. Our findings are robust to the inclusion of proxies for household wealth, as well peer influence, and do not exhibit bias from unobservables.

JEL codes:
Keywords: child labor, child decision-making, Kenya, agency, risk preferences, human capital development

1 Introduction

An estimated 246 million children are engaged in child labor worldwide. The prevalence is highest in Sub-Saharan Africa, where UNICEF estimates that 29 percent of children below the age of 15 are economically active (UNICEF, 2016).[1] While the dire consequences of child labor are well known, the act of sending a child to work is often a best response to unbearable circumstances. Nonetheless, such decisions can generate long-run negative externalities in which children sacrifice future welfare for immediate household benefit. In this sense, child labor is both a symptom and cause of poverty.

Most economic research on child labor assumes that decisions over child labor supply are generally made by parents.[2] Questions of agency – that is, the capacity of an individual to act independently and make their own choices – are thus central to child labor in the sense that the ones who bear the full costs are not necessarily the ones making the decision. Nonetheless, it is possible that under certain circumstances children do display some agency over the decision to work.

A growing literature documents the ability of children to make strategic decisions in experimental settings (Harbaugh et al., 2001; Camerer, 2003; Brosig-Koch et al., 2015; Czermak et al., 2016), while historical and contemporary work on the economics of the household suggests that some children have bargaining power over household decisions (Moehling, 2005; Lundberg et al., 2009; Dauphin et al., 2011). In this paper, we examine the extent to which children make strategic decisions about their own labor supply. To answer our questions, we conduct a lab-in-the-field experiment and short survey with 550 child laborers across 6 market centers in northwestern Kenya.

This region of Kenya, where child labor is pervasive, presents an useful laboratory

---

[1] Child labor is defined by UNICEF as "all children below 12 years of age working in any economic activities, those aged between 12 and 14 engaged in more than light work, and all children engaged in the worst forms of child labour". For the purposes of our analysis, a child laborer is defined as a child between the ages of 5 and 15 who works outside of the home for pay.

[2] See Basu (1999) and Edmonds (2007) for comprehensive reviews.

in which to explore issues of agency in child labor decisions. Data from the 2005 Kenya Integrated Household Budget Survey (KIHBS) suggest that more than 10% of children in northwestern Kenya are engaged in some form of child labor (KIHBS, 2005). In recent years, the existence of a refugee camp has generated significant demand for paid child labor, where refugees hire children from the local community to do itinerant work, such as carrying water and firewood (World Bank, 2015). These children come from a group of semi-nomadic pastoralists, known as the Turkana. Throughout Turkana, poverty rates are high, school enrollment is low, and the primary occupation is pastoralism (KIHBS, 2005).

The life of a pastoralist is inherently risky, as increased periods of severe drought devastate herd stocks and push households into poverty traps (Chantarat et al., 2013). In this environment, we argue that risk preferences should have an important bearing on child labor decisions. To the extent that wages earned from working as a child laborer suffer from less volatility than livestock assets, risk averse children should *a priori* have a preference for working over participating in pastoralist life. In this sense, we hypothesize that risk preferences should affect agency in child labor decisions in one of two ways. If parents are sophisticated about their child's risk attitudes and have other-regarding preferences, they may choose to send risk averse children to work. On the other hand, risk averse children might make an independent decision to work if they see their outside option in pastoralism as an inherently risk venture.

To test these hypotheses, we measure risk preferences for 550 child laborers using the Eckel and Grossman (2002) risk elicitation task and collect basic demographic information about each child, including their labor supply, earnings, and importantly, who made the decision for the child to work: (i) the child, herself; (ii) the parents/-guardians; or (iii) a joint decision between the child and parents/guardians. We first show that a child's risk preferences are orthogonal to a host of observable characteristics, including age, education, gender, household composition, and proxies of

household wealth. We then examine how a child's risk preferences correlate with who made the decision for the child to work.

Our empirical analysis shows that a child's risk preferences are indeed correlated with agency in child labor decisions. Specifically, we find that children with risk-averse preferences are significantly more likely to have made an independent decision: a child who selected the safest option in the risk elicitation task is 10% more likely to have made an independent decision to work than a child who chose the riskiest option. Moreover, we find that a child's risk preferences are uncorrelated with a parent sending the child to work, suggesting that Turkana parents do not consider a child's risk profile when making child labor decisions.

Our empirical analysis shows that a child's risk preferences are indeed correlated with agency in child labor decisions. Specifically, we find that children with risk-averse preferences are significantly more likely to have made an independent decision: a child who selected the safest option in the risk elicitation task is 10% more likely to have made an independent decision to work than a child who chose the riskiest option. Moreover, we find that a child's risk preferences are uncorrelated with a parent sending the child to work, suggesting that Turkana parents do not consider a child's risk profile when making child labor decisions.

The findings are robust to a number specifications. First, we conduct empirical tests to evaluate potential bias from unobservables (Oster, 2016) and find that our preferred specifications do not appear to suffer from this bias. Next, we consider household income, which should have an important bearing on child labor decisions. Children who come from extremely poor households may want to work independently, but may also feel forced to out of necessity. In this context, it is unclear whether the child was sent or made an independent decision. Controlling for various proxies of household wealth, we find consistent evidence that risk aversion is correlated with an independent decision to work. We also consider cases in which some children may

have no alternative to work, such as orphans who do not live with any guardian, and find that our results are robust to dropping this subgroup. Lastly, we consider the importance of peer influence. It is possible that a child's decision to work is not an indepenent decision at all, but rather an outcome of peer effects. We control for whether the child reported that they were encouraged by friends to work or if they have a sibling who also works, and find consistent evidence that a child's risk aversion is associated with an independent decision to work.

This research is related to the current literature in three important ways. First, our findings make a meaningful contribution to the understanding of child labor decisions. The existing theoretical work on child labor typically assumes that parents have altruistic preferences over child labor and either make decisions as a unitary household (Baland and Robinson, 2000), or that mothers and fathers bargain over child labor supply (Basu and Ray, 2002; Basu, 2006; Emerson and Souza, 2007). The child's role in the decision, however, has been largely unexplored.[3] Important work by Moehling (2005) shows using data from the early 20th century U.S. that the share of total household expenditures on child goods is increasing in the child's contribution to household income. While this provides important evidence that children do have bargaining power in household decisions, the findings do not provide insight on the bargaining power of children over child labor decisions. Our results provide some of the first empirical evidence that children have agency in the decision to work, and suggest that the theoretical framing of household child labor decisions may warrant revision to include children as agents in the household bargaining process around this decision.

---

[3]One piece of suggestive evidence comes from Iversen (2002), who shows that in a sample of child migrants in rural South India, boys who start working at age 13 and above report little contact with their parents, which he speculates is evidence that autonomy is an important motivation in the migration decision of this sub-group. In addition, if the theoretical implications of Basu (2006) with regard to female labor supply are applied to child labor supply, as a child works more, they should gain more bargaining power and may therefore decide to work more. This prediction, however, has never been empirically tested to the best of our knowledge.

Next, our work contributes to a growing literature examining child decision-making. A series of experimental work shows that children are capable of playing strategically in normal-form games (Czermak et al., 2016; Brosig-Koch et al., 2015; Camerer, 2003), and seldom violate the generalized axiom of revealed preferences (Harbaugh et al., 2001). Moreover, literature on the economics of the household document that children in developed economies have agency in decisions over consumption and time allocation (Lundberg et al., 2009; Dauphin et al., 2011). Our findings contribute to this literature by providing evidence that children may also be strategic in their decisions over child labor supply.

Lastly, this paper contributes to a growing literature documenting a correlation between experimental measures of child preferences and field behavior (Sutter et al., 2013; Castillo et al., 2011, 2018). We combine behavioral measures with survey data and show robust evidence that child preferences are correlated child labor decisions. In this sense, our findings suggest that children have agency in the decision to work.

The paper proceeds as follows. In the next section we present some important background information about our study region in northwestern Kenya and describe the general trends in child labor throughout the area. In section 3, we provide a conceptual discussion, which lends intuition for our empirical analysis. Section 4 describes the data used in our analysis, and section 5 presents our primary results and robustness checks. Section 6 concludes.

2 Background: Turkana County, Kenya

Turkana County, located in northwestern Kenya, is home to the Turkana people, whose traditional livelihoods are pastoral.[4] The region is sparsely inhabited, with population densities well under 1 person per kilometer for most parts of the region, and has long been one of the poorest districts in Kenya. Representative household

---

[4]See Figure A1 for a map of Turkana County.

data for Turkana is scarce. The most recent information comes from the 2005 Kenya Integrated Household Budget Survey (KIHBS), which assessed poverty in the Turkana region at 94.3%, the worst out of Kenya's 69 districts. School attendance is quite low, with 44% enrollment rates for primary school and less than 2% for secondary school (KIHBS, 2005). Due to the arid conditions, participation in farming tends to be very low, such that livelihoods are mainly dependent on livestock herding.

Over the last 25 years, a defining feature of the Turkana region has been the presence of Kakuma Refugee Camp, home to over 180,000 refugees who have fled from neighboring South Sudan, Ethiopia, Somalia, and other conflict-afflicted areas around East Africa. Qualitative discussions with the chief of Kakuma town, which we conducted during data collection for a separate study on the economic impacts of hosting refugees (World Bank, 2015; Alix-Garcia et al., 2015; Alix-Garica et al., 2018), identified the proliferation of Turkana children (i.e., local, not refugee children) working in and around the refugee camp as one of the major issues affecting the Turkana community. The chief further expressed that even after responding to requests from parents to collect child laborers from the market centers and return them to school or home, many children were found working in the market centers the next day. This observation led us to question whether children have some control over the decision to work.

To understand general trends in the incidence of child labor throughout the region, we first examine household level data from a registration census conducted in 2012 by the Hunger Safety Net Programme (HSNP) – an unconditional cash transfer program designed to target the poorest families in Turkana (HSNP, 2015). The HSNP data reveal a few interesting trends (Table A1 of the Appendix). First, older children are more likely to engage in child labor, where a child laborer is defined as any child under the age of 15 who either "Worked for pay" or "Worked on own/family business" as their primary occupation. In addition, girls are 50% more likely to be child laborers

by this definition. However, when we only consider children who work for pay (i.e., those akin to the children in our sample), we find that girls are no more likely to work for pay than boys (column (2) of Table A1).

At the household level (column (3) of Table A1), poor households are significantly more likely to have a child laborer who works for pay in the household, which is consistent with the prevailing finding in the literature that child labor is largely a symptom of poverty (Basu and Van, 1998; Basu, 1999; Baland and Robinson, 2000; Udry, 2006; Edmonds, 2007). Further, child labor appears to be particularly acute for households living close to Kakuma Camp. A 1% increase in the distance a household lives from the camp is correlated with a 33% lower probability that there is a child laborer in the household, suggesting that the presence of the refugee camp generates significant demand for child laborers.

3 Conceptual Discussion

3.1 Risk Environment

The life of a pastoralist is inherently risky.[5] In northern Kenya, livestock mortality is the most serious economic risk faced by pastoralist households, which is amplified by the presence of poverty traps (Chantarat et al., 2013). Livestock losses that push a household below a critical level – typically 8-16 tropical livestock units (TLUs) – tend to result in irreversible consequences for households (McPeak and Barrett, 2001; Lybbert et al., 2004). Changing climate patterns have increased uncertainty around the returns to livestock herding in Turkana, as the region faces rising temperatures, lower rainfall, and a higher frequency and duration of severe drought (Higgins, 2016). Since 1965, Kenya has experienced 15 major droughts, 5 of which occurred in the

---

[5]See Chantarat et al. (2013) for a review of the literature that pertains specifically to northern Kenya

last 10 years (EM-DAT, 2018). During periods of drought, livestock mortality is particularly high: in Turkana, estimates of herd losses over the last major drought events from 1952 to 2003 suggest livestock mortality rates between 53% and 63% (Notenbaert et al., 2007).

There is currently no formal market for livestock insurance in Turkana.[6] In the absence of formal risk-smoothing mechanisms, uninsured livestock risk is considered to be the primary driver of poverty traps among East African pastoralists (Santos and Barrett, 2016). In addition to growing risk of livestock loss, the Turkana routinely engage in conflict with neighboring ethnic groups over cattle raiding. In recent years, cattle raids have grown violent, fueled by the proliferation of small arms smuggled into the region. Media reports suggest that nearly 25,000 livestock were stolen in 56 raids in 2015, and that many of these raids were deadly (Langat, 2016).

Compared to herding cattle for a living, we argue that the income and consumption risks of working in the refugee camp are significantly lower. Most child laborers in our sample receive a wage for their work (82%), which many of them negotiate with their employer (42%), suggesting that they have some degree of control over their income streams. Since the demand for child labor is driven by the refugee economy, which is not dependent on livestock herding and relatively protected from climate shocks, we argue that these wages are subject to far less uncertainty than livestock assets maintained by pastoralists.[7] Verifying this would require data on wages over time, which do not exist. However, we can show using the HSNP data that throughout the Turkana region, households that have a wage earner have significantly higher consumption than households that do not. Moreover, households that rely on herding have significantly lower consumption than households that do not. Some herding households also have a wage earner in their household. When we compare households

---

[6]Researchers have been experimenting with index-based insurance in neighboring Marsabit County in recent years (Chantarat et al., 2013).

[7]In earlier work, we establish the relative prosperity of the refugee community compared to the Turkana (Alix-Garica et al., 2018).

that have a wage earner to households who solely depend on herding, consumption is statistically significantly higher in households with a wage earner (Table A2 in the Appendix).

3.2 Conceptual Intuition

Given the risk environment, it is our prediction that risk averse children will prefer to work as laborers, rather than endure the life of a pastoralist. It is unclear, however, how the decision to work should correlate with risk preferences. Generating predictions depends on how one models the relationship between parents and children over child labor decisions, and providing a specific theoretical model of this relationship is beyond the scope of this study. Nonetheless, we may draw intuition by comparing larger classes of models.

Let us first consider a unitary household model in which parents are the sole decision-maker over child labor supply. If parents are sufficiently sophisticated about their child's risk preferences and have other-regarding preferences,[8] when making decisions about child labor supply, parents should choose to send risk averse children to work. In this environment, we might expect to observe in our data that risk averse children are more likely to report that their guardians made the decision for them to work as a child laborer in the camp. The absence of this correlation would suggest, at the very least, that Turkana parents do not consider the risk preferences of children when making decisions about child labor supply.

An alternative way of thinking about child labor decisions is through a non-cooperative game in which parents and children have separate utility functions and bargain over some choice. Lundberg et al. (2009) present such a model in which parents exert control over child behavior and children resist. In this model, parents

---

[8]We define other-regarding preferences as those in which people are self-interested, but are also concerned about the payoffs of others. See Charnes and Rabin (2002) for a discussion of various models of other-regarding preferences.

derive utility from their own consumption and the child's level of good behavior. Children derive utility from their current consumption and experience a disutility from deviating from some "natural" level of good behavior, which children can reduce by engaging in resistance. The interaction between parent and child is a non-cooperative Nash bargaining game in which the parent chooses how much control to exert as a function of the child's resistance, and the child chooses how much resistance to offer as a function of parental control and demand for autonomy in decision-making. In equilibrium, the optimal level of control a parent chooses is increasing in parental resources, and decreasing in the autonomy-seeking preferences of the child for parents with fewer resources.[9]

We can apply the predictions of this model to our research setting. To the extent that risk-averse children would prefer to work, we take risk aversion as a proxy for a child's demand for autonomy in labor supply decisions. In this environment, we would expect that risk averse children have a greater demand for autonomy over child labor decisions and therefore are more likely to make an independent decision to work.

4   Data and Summary Statistics

While it would be ideal to observe household-level data on parents, children and their risk preferences, and the decision to work, it is difficult to collect such data in Turkana, where households are semi-nomadic. Many households do maintain semi-permanent settlements, which are typically maintained by women, while men and boys graze cattle at distances far away from the settlements.[10] To this extent, it would have been possible to at least interview mothers and any children remaining at the homestead. However, the costs and logistics involved in first identifying child

---

[9]To the extent that Turkana is the poorest region in Kenya, we assume that in our data, increases in autonomy-seeking preferences will unequivocally decrease parental control.

[10]The anthropology literature documents that over a 2-year period, the Turkana can travel more than 600 kilometers grazing cattle over 14 major movements (Dyson-Hudson and McCabe, 1983).

laborers and then tracing them back to their settlements were outside of the scope of our budget. Moreover, to the extent that boys are frequently absent from the homestead during grazing, we still would not have been able to obtain experimental measures for this subset of non-child laborers.

To the extent that the households of the children in our sample have all selected into child labor, we should expect their characteristics to be quite similar. The main variation in our data comes from who made the decision to work and the risk preferences of the child. If these factors are systematically related to household or child characteristics, however, our primary results could be biased. We did ask children a few questions about their household circumstances, including how many siblings they have, if both parents are alive, only the mother is alive, only the father is alive, or both parents are deceased (orphan), and how many animals their parents or guardians own. We conduct balance tests in Table A3 of the Appendix by regressing these observables on risk preferences, controlling for enumerator and survey date fixed effects and find that, overall, the risk measures are orthogonal to observables.[11].

In regard to sampling, preliminary conversations with the chief of Kakuma town revealed that Turkana children were most likely to work in the 5 main market centers within the refugee camp, as well as the main market in Kakuma town (Figure A2).[12] We therefore targeted these 6 locations in order to recruit children between age 5 and 15 to participate in the study. Children were first approached by the clerk to the chief of Kakuma, who is a known youth leader in the community. The clerk informed the children that we were conducting a study to better understand the conditions faced by children who work in the camp, and that if they participated they would receive 2 lollipops and could earn anywhere between 20 and 220 Kenyan shillings for

---

[11]There is some weak evidence that children whose only surviving parent is their mother are less risk averse. We control for this in our main specifications

[12]Each market center was surveyed over 1 day, with the exception of "Ethiopia", the largest market center, which was surveyed over 2 days. Therefore, the final sample includes surveys in 6 locations over 7 days.

their time.[13] The clerk was instructed to approach as many children as he could find working in the camp that day. If the child agreed to participate in the study, they were then paired with an enumerator.

Participation required that a child complete a 15-minute survey with an enumerator that included questions about household composition, the decision to work, labor supply, earnings, and education. In addition, the child completed an incentivized task based on the Eckel and Grossman (2002) method for eliciting risk preferences. The Eckel and Grossman method is a simple way of eliciting risk preferences and has been used widely in the literature, especially in populations where participants have lower math abilities Charness et al. (2013). Participants are presented with 6 gambles, each which involves a 50-50 chance of winning a low or high payoff. The payoff in the first gamble is a certain payoff. Gambles 2-5 increase in both expected payoff and standard deviation, while gamble 6 has the same expected payoff as gamble 5, but with a higher standard deviation. Table 1 displays the choices that the child faced in the risk elicitation task.

Table 1: Risk Elicitation Method

	Low Amount	High Amount	E(X)	Std. Dev
Option 1	100	100	100	0
Option 2	90	120	105	15
Option 3	80	140	110	30
Option 4	70	160	115	45
Option 5	60	180	120	60
Option 6	20	220	120	100

Amounts are in Kenyan Shillings, where 100 KSh = 1 USD

An enumerator explained the method to the child, emphasizing that the gamble selected would be played for real money and that the outcome would be determined by a coin flip, where "heads" resulted in the low amount and "tails" resulted in

---

[13]At the time of our survey, 100 Kenyan shillings was roughly equivalent to 1 USD. On average, children in our sample earn 137 shillings per day working in the camp.

the high amount. Pretesting revealed that children understood the game and were comfortable with the notion of a coin flip. Moreover, child laborers around Kakuma are accustomed to dealing with money, as many of them are paid in cash – 82% of the children in our sample conduct at least one activity per week for which they are paid in cash.

In total, 552 children were surveyed and 550 completed the risk elicitation task. Table 2 presents summary statistics for the children in our sample. On average, respondents are 12 years old, and almost a quarter of them are girls. Approximately one-third of the sample is currently enrolled in school, while slightly more than half have at least some primary education. Slightly less than half of the sample are orphans in the sense that both of their parents are deceased, 84% of whom live with a relative or adult non-relative. Only 7% of the sample are orphans who have no guardian. The children in our sample eat slightly less than 2 meals per day, on average, suggesting that their economic situation is quite dire.

In terms of labor supply, the children in our sample report working almost 37 hours per week over slightly more than 4 days per week, and earn approximately 137 Kenyan Shillings (Ksh) per day. They do various types of activities, including cleaning (39%), carrying water (35%), begging for food or money (27%), or carrying firewood (20%). Most children do more than one activity. On average, children report doing 1.59 different types of tasks per week. Children are paid either in cash or in-kind for the work that they do, but the vast majority are paid in cash: 82% of respondents report that they are paid in cash for at least one of the activities that they do, while 18% are paid in-kind (e.g., a meal, sugar, flour, rice, etc.) for at least one activity.[14]

Our primary outcome of interest is a child's agency in the decision to work, where we define agency as a child having control over the decision to work. To proxy for this, we asked children the following question: "Who made the decision for you start

---

[14]Only 5% of children are paid exclusively in-kind for all activities.

Table 2: Summary Statistics

	N	Mean	SD	Min	Max
Characteristics of child					
Age	552	12.12	2.74	4	19
Female	552	0.22	0.42	0	1
Number of siblings	550	2.43	2.17	0	12
Currently enrolled in school	552	0.36	0.48	0	1
Has some primary school	552	0.52	0.50	0	1
Can read	552	0.36	0.48	0	1
Orphan (deceased parents)	552	0.46	0.50	0	1
Orphan (no guardian)	552	0.07	0.26	0	1
Only mother living	552	0.18	0.38	0	1
Only father living	552	0.09	0.28	0	1
Child lives on street	552	0.30	0.46	0	1
Labor supply and earnings					
Hours per week of work	552	36.96	40.39	0	168
Days of work per week	552	4.27	2.34	0	7
Paid in KSH	552	0.82	0.38	0	1
Paid in kind	552	0.18	0.39	0	1
Hourly wage (KSH)	552	21.81	35.71	0	500
Daily earnings (KSH)	552	136.90	189.10	0	2600
Types of work					
Number of jobs	552	1.59	1.17	0	6
Cleaning	552	0.39	0.49	0	1
Carry water	552	0.35	0.48	0	1
Beg for food or money	552	0.27	0.44	0	1
Carry firewood	552	0.20	0.40	0	1
Sell things	552	0.19	0.39	0	1
Who made decision to work?					
Independent	552	0.74	0.44	0	1
Joint with guardians	552	0.09	0.28	0	1
Sent by guardians	552	0.17	0.37	0	1
Preferences					
Choice 1: 100 KSH vs. 100 KSH	550	0.19	0.39	0	1
Choice 2: 90 KSH vs. 120 KSH	550	0.12	0.32	0	1
Choice 3: 80 KSH vs. 140 KSH	550	0.15	0.36	0	1
Choice 4: 70 KSH vs. 160 KSH	550	0.13	0.33	0	1
Choice 5: 60 KSH vs. 180 KSH	550	0.16	0.36	0	1
Choice 6: 20 KSH vs. 220 KSH	550	0.25	0.44	0	1
σ risk choice	550	46.95	36.47	0	100

coming to this market to work? a) You, independently? b) Your parents/guardians? c) You and your parents/guardians, together?" The summary statistics indicate that almost three-quarters of the sample reports that they made the independent decision

to work on their own, while 17% report that their parents/guardians sent them to work. Since we cannot directly observe who made the decision to work within the household, one may choose to interpret these statistics as a child's perception of who made the decision to work.

We are interested in understanding how who made the decision to work – child, guardians, or joint – correlates with a child's risk preferences. The summary statistics in Table 2 show that 19% of children in our sample chose the safest option in the risk elicitation task, while 25% chose the riskiest. On average, the standard deviation of the risk choice is 47, which is slightly higher than the standard deviation of Option 4. The median risk choice was Option 4, which corresponds to a CRRA range of $0.72 < r < 1$.

To the best of our knowledge, there are no studies of risk aversion in children from a sample that is similar to ours, so it is difficult to benchmark our measures against other related studies. Nonetheless, we do find some consistency with other studies that have measured risk preferences in children. In a sample of German children ages 10-18, Sutter et al. (2013) find a median measure of risk aversion $r = 0.53$, suggesting that the children in our sample are slightly more risk averse. In addition, the authors find that age is not a significant predictor of risk aversion, but that girls are more risk averse than boys. In our sample, we also find that age is uncorrelated with risk, but find no correlation between gender and risk (Table A3). In a related study, Castillo et al. (2018) find in a sample of 8th graders (presumably from the US) that the safe option in their risk experiment is chosen three-fifths of the time. They find no correlation between gender and the number of safe options chosen, but do find that older children choose fewer safe options (however, this is only due to natural age variation within the 8th grade cohort). These results are consistent with ours in that we find no correlation between gender and risk preferences.

5 Estimation and Results

5.1 Decision to Work

To understand how risk preferences correlate with the decision to work, we estimate the following equation:

$$Decision_i = \alpha + \gamma Risk_i + \delta \mathbf{X_i} + \tau_e + \mu_d + \varepsilon_{id} \tag{1}$$

where $Risk_i$ represents the child's risk preferences as measured by the risk elicitation task. In our baseline specifications we consider both the standard deviation of the chosen risk option (0 for the safest choice and 100 for the riskiest choice), as well as the number of the risk option chosen (1 to 6). In all specifications, we include enumerator fixed effects, τ_e, to control for unobservable enumerator traits that may systematically influence a child's responses to survey questions.[15] In addition, we include survey date fixed effects, μ_d, to control for unobserved factors specific to a particular market on a given day, which could be systematically related the type of children found working in that market on that day.[16] We cluster standard errors at the survey date level, ε_{id}, to account for correlation in survey responses among children who were surveyed at the same location on the same day.

In some specifications, we include the vector $\mathbf{X_i}$ of controls. While risk preferences are orthogonal to most observable characteristics (Table A3), we include additional controls that are likely to have an important influence on the decision to work. These include age, whether the child can read, gender of the child, whether the child is an orphan (i.e., both parents are deceased), and whether the child's mother is the only surviving parent.

Household income is an important factor to consider. For instance, children living

---

[15]There were 9 enumerators in total, such that each regression includes 8 enumerator dummies.

[16]There were 7 days of surveying, such that each regression includes 6 date dummies.

in very poor households may decide independently to work, but feel forced to do so simply because no alternative is available. In these cases, there is a fine line between being forced to work and making an independent decision. Unfortunately, we do not have direct measures of household income. Instead, we include proxies that capture the extent to which children come from relatively poor households. First, we consider children whose only surviving parent is their mother. The HSNP data reveal that female-headed households are significantly more likely to be living in poverty (Table A4), especially if there are school-age children in the household. In addition, we consider whether the child is an orphan. In our own survey, we asked children to report the number of animals their parents/guardians owned. Our data reveal that orphans report that their guardians own significantly fewer animals than children who have one or both of their biological parents (Table A5).[17] In section 5.2, we run a few robustness checks to directly examine the issue of household wealth.

The dependent variable, $Decision_i$, represents who made the decision to work. First, we estimate a multinomial logit model where the dependent variable is one of three mutually exclusive values: (i) child made the independent decision, (ii) the guardian(s) made the decision, or (iii) it was a joint decision. In our main tables, we report the marginal effects coefficients for (i) and (ii). As a robustness check, we also run a linear specification in which we construct two dependent variables. The first is a binary variable equal to 1 if the child reports having made the independent decision to work, and the second is a binary variable equal to 1 if the child reports that their parents or guardians made the decision to work.

Given the limitations of our data, it is not our intention to produce causal estimates of the effect of child risk preferences on the decision to work. Instead, we are primarily interested in understanding whether there is any robust evidence of

---

[17]While many children could not provide an estimate of the number of animals their guardians owned, orphans were as equally unable to report animal estimates as non-orphans. In both groups, approximately 60% of children were unable to report the total number of animals owned by their guardians (p-value of difference in means equal to 0.9940).

a correlation between risk preferences and the decision to work. In the absence of household-level data, especially for non-laborers, it is possible that our estimates omit important factors that affect the decision to work. In order to address the possibility of endogeneity due to key omitted variables, we follow the recommendations of Oster (2016), who proposes a test statistic to evaluate the potential bias from unobservables. At the core of the test is a conjecture about the covariance between the omitted variable and the treatment variable – in this case, risk preferences. One commonly made assumption is that the covariance between the omitted and treatment variable is equivalent to that between the observables and the treatment variable. This is known as the proportional selection assumption and implies a coefficient of proportionality (δ) equal to 1. We calculate the coefficient of proportionality that would overturn our results and present it in the bottom row of our main tables.[18] For intuition, note that, for example, $—\delta| = 2$ would suggest that the unobservables would need to be twice as important as the observables to produce an effect of zero (Oster, 2016). It is worth mentioning that because this test only applies to linear models, we only report δ coefficients in our OLS specifications.

The results of estimating equation (1) are presented in Table 3. We examine the independent decision to work in Panel A and whether the child was sent by guardians in Panel B. Columns (1) and (2) include only the survey date and enumerator fixed effects, while columns (3)-(6) include the full set of controls. Panel A shows consistent evidence that risk preferences are negatively correlated with the independent decision to work. In our estimates without controls, increasing the standard deviation of the risk choice by 100, which is equivalent to moving from the safest to the riskiest choice in the risk elicitation task, is associated with a 9 percentage point reduction in the likelihood that a child reports having made the independent decision to work. Once

---

[18]Based on (Oster, 2016) recommendation, we assume an Rmax that is the lesser of 1.3 times the R-squared achieved by the full regression specification and 1. The Rmax is an estimate of the R-squared that would be achieved in the case where we were able to include all the key unobservables.

we account for the full set of controls, the magnitude and precision of the coefficients diminish marginally, but the evidence still suggests that risk preferences are negatively correlated with an independent decision to work. Specifically, a child's risk aversion appears to be correlated with making an independent decision to work. The results are robust to using using the raw risk choice instead of the standard deviation of the gamble in columns (2) and (4), as well as OLS estimation in columns (5) and (6).

In Panel B, we find no evidence that risk preferences are correlated with children being sent to work by their parents/guardians. Moreover, we find that while statistically insignificant, the coefficients on risk preferences are positive. To the extent that we expect risk averse children to have a preference for working in the camp rather than engaging in pastoralism, we interpret this finding to suggest that perhaps Turkana guardians do not take this information into consideration when sending children to work. That is, if Turkana families make decisions about child labor supply as a unitary household where the guardians are the sole decision-makers, there is no evidence to suggest that they consider the risk preferences of children when making these decisions.

It is interesting to note that the δ coefficients on our risk measures in Panel A are fairly large. In column (5), a δ coefficient of 4.09 suggests that the unobservables would need to be 4 times as important as the observables included in the regression for the estimated coefficient on the standard deviation of the risk measure to be statistically equal to zero. We therefore conclude that our preferred estimates do not suffer from omitted variable bias.

We now turn our attention to some important heterogeneity. The coefficients for gender in Table 3 indicate that girls are less likely to make an independent decision to work and more likely to be sent by parents. In many ways, this is consistent with the different risk environments faced by males and females in Turkana society. To the extent that boys are responsible for grazing cattle, they are arguably more exposed

Table 3: Decision to work

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Independent Decision						
σ risk choice	-0.0009*** (0.0002)		-0.0007** (0.0003)		-0.0008* (0.0003) [0.14]	
Risk choice		-0.0175*** (0.0055)		-0.0116* (0.0063)		-0.0140* (0.0066) [0.23]
Female			-0.1678*** (0.0371)	-0.1665*** (0.0368)	-0.2160** (0.0606) [0.09]	-0.2149** (0.0605) [0.09]
Orphan			0.2548*** (0.0542)	0.2544*** (0.0537)	0.2412** (0.0698) [0.03]	0.2411** (0.0702) [0.03]
Age			-0.0073 (0.0070)	-0.0076 (0.0070)	-0.0061 (0.0074)	-0.0063 (0.0075)
R^2	0.207	0.206	0.300	0.300	0.235	0.234
δ for risk					4.09	1.64
Panel B: Sent by Guardians						
σ risk choice	0.0005 (0.0003)		0.0003 (0.0002)		0.0004 (0.0003) [0.24]	
Risk choice		0.0109 (0.0077)		0.0067 (0.0062)		0.0085 (0.0066) [0.23]
Female			0.1403*** (0.0200)	0.1399*** (0.0203)	0.1708*** (0.0359) [0.03]	0.1704*** (0.0359) [0.03]
Orphan			-0.1993*** (0.0669)	-0.1983*** (0.0669)	-0.1787** (0.0682) [0.07]	-0.1786** (0.0682) [0.07]
Age			0.0024 (0.0043)	0.0024 (0.0044)	0.0022 (0.0054)	0.0022 (0.0054)
R^2	0.207	0.206	0.300	0.300	0.189	0.190
δ for risk					-0.91	-0.73
Observations	550	550	550	550	550	550
Model	MLogit	MLogit	MLogit	MLogit	OLS	OLS

+ $p< 0.15$ * $p< 0.10$, ** $p<0.05$, *** $p < 0.01$. All estimates include enumerator and survey date fixed effects. Columns (3)-(6) include the following additional controls: whether the child can read and if the child's mother is the only surviving parent. Coefficients in columns (1)-(4) are the marginal effects of a multinomial logit estimation with categories: 1) independent (base category), 2) sent by guardians, 3) joint decision, and R^2 is the pseudo-R^2. Standard errors clustered at the survey date level in parentheses. Wild cluster bootstrap p-values in brackets.

to the risks of the pastoralist life.[19] The finding that girls are less likely to make

---

[19]With the rising incidence of drought, female pastoralists are also heavily exposed to risk, as they are responsible for collecting water and often travel great distances to find water sources. However, anthropological research shows that in times of drought, some women enjoy increased household authority, as they are responsible for providing famine relief food (Wawire, 2003).

an independent decision and more likely to be sent by parents is also congruent with anthropological findings that women and girls are relatively unempowered in Turkana society (Wawire, 2003).

Contrary to what we observe for girls, the findings in Table 3 suggest that orphans are significantly more likely to make an independent decision to work and less likely to be sent by their guardians. This result is perhaps unsurprising, given that orphans come from non-traditional households where intra-household bargaining decisions are likely different from those between biological parents and children. Moreover, some orphans – those who do not live with any guardian – may truly have no alternative than to work. We explore the extent to which our results are sensitive to excluding this group in the next section.

5.2 Robustness checks

5.2.1 Household wealth and children without alternatives

Household income will likely influence the decision to work. Children who come from extremely poor households may want to work independently, but may also feel forced to out of necessity. In this context, it is unclear whether the child was sent or made an independent decision. Moreover, children who have no guardian may face no choice but to work in order to survive. In this section, we explore the extent to which our results are sensitive to alternative proxies for household wealth and to excluding groups of children who may not face any alternative but to work.

We re-estimate equation (1) and replace our proxies for household welfare – orphan and whether the child's mother is the only surviving parent – with two alternate measures of household wealth. First, we use the child's self-reported estimate of how many animals their parents or guardians own. Note that 60% of children could not provide an estimate, such that our sample sizes in these estimates are quite low. Nonetheless, this is our best direct measure of household wealth. In addition, we

asked children to report the main reasons they were working in the market that day. Common reasons included: lack of food (94%), lack of money (78%), to pay school fees (44%), and encouraged by friends (30%). As a proxy for a lack of household wealth, we include a binary variable equal to 1 if the child reported that they were working because of lack of money. Lastly, we rerun our original estimates (i.e., those which control for orphan and whether the child's mother is the only surviving parent as proxies for household welfare), and exclude all orphans who do not live with a guardian. The estimates are presented in Table 4.

The results are consistent with those presented in Table 3 and suggest that risk preferences are negatively correlated with an independent decision to work and un-correlated with being sent by guardians. In columns (1) and (2), the magnitude of the coefficients are consistent with our baseline estimates, but precision is slightly lower, most likely due to the large number of missing observations for animals. It is interesting to note that the coefficient on animals is statistically significant and negative for an independent decision, while it is statistically significant and positive for begin sent by guardians. This is consistent with the theoretical predictions of Lundberg et al. (2009), who hypothesize that parents with more resources will exert more control over child decision-making.

In columns (5) and (6), we rerun our baseline estimates and exclude orphans who do not have a guardian. The coefficients on risk preferences are consistent with the estimates presented in columns (3) and (5) of Table 3, although the precision of the estimates are diminished slightly. Nonetheless, the δ coefficient remains large, suggesting that when we use orphan and whether the child's mother is the only surviving parent as proxies for household welfare, the estimates of the effect of risk preferences on the independent decision to work do not suffer from selection on unobservables.

Table 4: Controlling for wealth and excluding orphans

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Independent Decision						
σ risk choice	-0.0006+	-0.0008*	-0.0010***	-0.0009**	-0.0007*	-0.0009*
	(0.0004)	(0.0004)	(0.0002)	(0.0003)	(0.0004)	(0.0004)
		[0.11]		[0.02]		[0.24]
Animals	-0.0051***	-0.0025*				
	(0.0009)	(0.0010)				
		[0.16]				
Lack of money			0.0157	0.0427		
			(0.0461)	(0.0437)		
R^2	0.412	0.300	0.243	0.172	0.289	0.230
δ for risk		0.27		-1.06		4.80
Panel B: Sent by Guardians						
σ risk choice	0.0006	0.0008	0.0005+	0.0005	0.0003	0.0004
	(0.0004)	(0.0006)	(0.0003)	(0.0003)	(0.0003)	(0.0004)
		[0.25]		[0.21]		[0.34]
Animals	0.0029***	0.0020*				
	(0.0009)	(0.0009)				
		[0.35]				
Lack of money			-0.0470	-0.0584		
			(0.0439)	(0.0480)		
R^2	0.412	0.201	0.243	0.148	0.243	0.187
δ for risk		1.20		-0.38		-0.95
Observations	221	221	550	550	510	510
Model	MLogit	OLS	MLogit	OLS	MLogit	OLS

+ p< 0.15 * p< 0.10, ** p<0.05, *** p < 0.01. All estimates include enumerator and survey date fixed effects. Columns (1)-(4) control for female, age, and whether the child can read. Columns (5)-(6) exclude orphans who have no guardian and control for female, whether the child is an orphan who lives with a guardian, age, whether the child can read, and whether the child's mother is the only surviving parent. In columns (1), (3), and (5), coefficients are the marginal effects of a multinomial logit estimation with categories: 1) independent (base category), 2) sent by guardians, 3) joint decision, and R^2 is the pseudo-R^2. Standard errors clustered at the survey date level in parentheses. Wild cluster bootstrap p-values in brackets.

5.2.2 Peer influence

An alternative way of thinking about child labor decisions is that the decision to work is not an independent decision at all, but an outcome of peer effects. In this section we explore the extent to which children were influenced to work by peers or

siblings.

When we asked children their main reasons for working in the market that day, approximately 30% reported that one of the reasons was because friends encouraged them. In addition, we asked children whether they had siblings who also worked in the market (67%). To explore the extent to which peers influence the decision to work, we include a dummy variable equal to 1 if the child reported that one of the reasons they are working is because friends encouraged them. We also explore a separate specification controlling for whether the child has a sibling who is also working in the refugee camp. The results are presented in Table 5.

The estimated coefficients on risk preferences are consistent with our baseline specifications and lend further support to the finding that risk averse children are more likely to make an independent decision to work. It is interesting to note in Panel A that the coefficients on encouraged by friends and having a sibling who works are positive, suggesting that perhaps children who believe they have made an independent decision to work are in some way influenced by peers. However, these correlations are statistically insignificant. Nonetheless, the magnitude of the coefficients on risk preferences are consistent with what we find in our baseline specifications: moving from the safest choice to the riskiest choice in the risk elicitation task is associated with a 7 percentage point reduction in the likelihood that child made an independent decision to work. Relative to a basline of 0.74, this suggests that risk averse children are 10% more likely to make an independent decision to work than the least risk averse children.

6   Conclusion

This paper provides important empirical evidence that child laborers in northwestern Kenya have significant agency in decision-making around labor supply. Specifi-

Table 5: Friends and siblings

	(1)	(2)	(3)	(4)
Panel A: Independent Decision				
σ risk choice	-0.0007**	-0.0008*	-0.0005*	-0.0007*
	(0.0003)	(0.0004)	(0.0003)	(0.0003)
		[0.19]		[0.002]
Encouraged by friends (0/1)	0.0357	0.0346		
	(0.0502)	(0.0521)		
Siblings work (0/1)			0.0785	0.0514
			(0.0638)	(0.0674)
R^2	0.300	0.236	0.311	0.248
δ for risk		62.34		-1.57
Panel B: Sent by Guardians				
σ risk choice	0.0003	0.0004	0.0001	0.0003
	(0.0002)	(0.0003)	(0.0004)	(0.0004)
Encouraged by friends (0/1)	-0.0122	-0.0157		
	(0.0291)	(0.0308)		
Siblings work (0/1)			-0.0460	-0.0471
			(0.0708)	(0.0759)
R^2	0.300	0.190	0.311	0.201
δ for risk		-0.66		-1.02
Observations	550	550	531	531
Model	MLogit	OLS	MLogit	OLS

+ p< 0.15 * p< 0.10, ** p<0.05, *** p < 0.01. All estimates include enumerator and survey date fixed effects and the following additional controls: female, age, whether the child can read, if the child's mother is the only surviving parent, and whether the child is an orphan. Columns (3)-(4) also control for the number of siblings. In columns (1) and (3), coefficients are the marginal effects of a multinomial logit estimation with categories: 1) independent (base category), 2) sent by guardians, 3) joint decision, and R^2 is the pseudo-R^2. Standard errors clustered at the survey date level in parentheses. Wild cluster bootstrap p-values in brackets.

cally, we show consistent evidence that risk aversion is significantly correlated with an independent decision to work, suggesting a strategic decision by risk averse children who face a risky outside option in pastoralism. Moreover, we find that a child's risk preferences are uncorrelated with being sent to work by a parent, suggesting that parents in our study region do not consider child risk preferences when making decisions about child labor supply. Our findings are robust to a number specifications,

including testing for selection on unobservables and including proxies for household wealth and peer influence.

Our work makes an important contribution to the study of child decision-making by providing robust evidence that children also think and act strategically in their labor supply decisions. Moreover, we shed light on a neglected issue in the child labor literature by providing empirical evidence that some children have agency in the decision to work. This suggests that the existing theoretical modeling of household child labor decisions may warrant revision. Our findings have additional implications for the way that policy is designed. For instance, conditional cash transfers, often targeted to mothers or household heads, have been widely used to reduce the incidence of child labor and increase educational outcomes. While these interventions have been successful in some settings, new interventions may want to consider incentives for children, particularly in regions where the returns to education are low or in settings where children face clear tradeoffs in the risk profile of alternative activities.

References

Alix-Garcia, Jennifer, Anne Bartlett, Sarah Walker, and David Mayom, "Impact of Kakuma Refugee Camp on Local Hosts, Turkana Region, Kenya," 2015. Report to the World Bank.

Alix-Garica, Jennifer, Sarah Walker, Anne Bartlett, Harun Onder, and Apurva Sanghi, "Do Refugee Camps Help or Hurt Hosts? The Case of Kakuma," *Journal of Development Economics*, 2018, *130*, 66–83.

Baland, Jean-Marie and James A. Robinson, "Is Child Labor Inefficient?," *The Journal of Political Economy*, 2000, *108* (4), 663–79.

Basu, Kaushik, "Child Labor: Cause, Consequence, and Cure, with Remarks on International labor Standards," *Journal of Economic Literature*, 1999, *37*, 1083–1119.

_ , "Gender and Say: A Model of Household Behavior with Endogenously Determined Balance of Power," *Economic Journal*, 2006, *116*, 558–580.

_ **and Pham Hoang Van**, "The Economics of Child Labor," *The American Economic Review*, 1998, *88* (3), 412–27.

_ **and Ranjan Ray**, "The Collective Model of the Household and an Unexpected Implication for Child labor: Hypothesis and an Empirical Test," Working Paper Series: 2813 (The World Bank, Policy Research) 2002.

Brosig-Koch, J., T. Heinrich, and C. Helbach, "Exploring the Capability to Backward Induct: an Experimental Study with Children, Adolescents, and Young Adults," *European Econonmic Review*, 2015, *74*, 286–302.

Camerer, C.F., *Behavioral Game Theory. Experiments in Strategic Interaction*, Princeton University Press, Princeton, 2003.

Castillo, Marco, Jeff Jordan, and Ragan Petrie, "Children's Rationality, Risk Attitudes, and Field Behavior," *European Economic Review*, 2018, *102*, 62–81.

_ , **Paul Ferraro, Jeffrey Jordan, and Ragan Petrie**, "The Today and Tomorrow of Kids: Time Preferences and Educational Outcomes of Children," *Journal of Public Economics*, 2011, *95*, 1377–1385.

Charnes, Gary and Matthew Rabin, "Understanding Social Preferences with Simple Tests," *Quarterly Journal of Economics*, 2002, *117* (1), 817–869.

Charness, Gary, Uri Gneezy, and Alex Imas, "Experimental Methods: Eliciting Risk Preferences," *Journal of Economic Behavior and Organization*, 2013, *87*, 43–51.

Czermak, Simon, Feri Francesco, Daniela Glatzle-Rutzler, and Matthias Sutter, "How Strategic are Children and Adolescents? Experimental Evidence from Normal-Form Games," *Journal of Economic Behavior and Organization*, 2016, *128*, 265–285.

Dauphin, Anyck, Abdel-Rahmen El Lahga, Bernard Fortin, and Guy Lacroix, "Are Children Decision-Makers Within the Household?," *The Economic Journal*, 2011, *121*, 871–903.

Dyson-Hudson, Rada and J. Terrence McCabe, "Water Resources and Livestock Movements in South Turkana, Kenya," *Nomadic Peoplesl*, 1983, *14*, 41–46.

Eckel, C.C. and P.J. Grossman, "Sex Differences and Statistical Stereotyping in Attitudes Toward Financial Risk," *Evolution and Human Behavior*, 2002, *23* (4), 281–295.

Edmonds, Eric V., "Child Labor," in T.P. Schultz and J. Strauss, eds., *Handbook of Development Economics, Volume 4*, Elsevier Science, Amsterdam, North-Holland, 2007.

EM-DAT, "The International Disaster Database," Universit catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium. Last accessed on September 20, 2018) 2018.

Emerson, P. and A. Souza, "Chlid labor, School Attendance and Intra-Household Gender Bias in Brazil," *World Bank Economic Review*, 2007, *21* (2), 301–316.

Harbaugh, W.T., K. Krause, and T.R. Berry, "GARP for Kids: On the Develpoment of Rational Choice Behavior," *American Economic Review*, 2001, *91* (5), 1539–1545.

Higgins, Abigail, "Climate Change Could Devastate Africa. It's Already Hurting this Kenyan Town," The Washington Post: January 30, 2016 2016.

HSNP, "Registration dataset, Kenyan Hunger Safety Net Programme, 2012-2013," 2015. Financing from the National Drought Management Authority, Australian Aid, and DIFID.

Iversen, V., "Autonomy in Child Labor Migrants," *World Development*, 2002, *30*, 817–834.

KIHBS, "Kenya Integrated Household Budget Survey Basic Report," 2005. Government of Kenya, ISBN: 9966-767-07-X.

Langat, Anthony, "Why Kenya's Cattle Raids are Getting Deadlier," Al Jazeera: December 27, 2016 2016.

Lundberg, Shelly, Jennifer L. Romich, and Kwok Ping Tsang, "Decision-Making by Children," *Review of Economics of the Household*, 2009, *7*, 1–30.

Lybbert, T.J., C.B. Barrett, S. Desta, and D. Layne Coppock, "Stochastic Wealth Dynamics and Risk management Among a Poor Population," *Economic Journal*, 2004, *114* (498), 750–777.

McPeak, J.G. and C.B. Barrett, "Differential Risk Exposure and Stochastic Poverty Traps Among East African Pastoralists," *American Journal of Agricultural Economics*, 2001, *83*, 674–679.

Moehling, C., "She Has Suddenly Become Powerful: Youth Employment and Household Decision making in the Early Twentieth Century," *Journal of Economic History*, 2005, *65*, 414–438.

Notenbaert, An, Philip Thornton, and Mario Herrero, "Livestock Development and Climate Change in Turkana District, Kenya," International Livestock Research Institute Working Paper 2007.

Oster, Emily, "Unobservable Selection and Coefficient Stability: Theory and Evidence," *Journal of Business & Economic Statistics, DOI: 10.1080/07350015.2016.1227711*, 2016.

Pinney, Andrew, "Household Registration and Targeting in the Hunger Safety Net Programme 2," 2013. Report, Reading University for Evidence on Demand with the assistance of the UK Department for International Development (DFID).

Santos, Paulo and Christopher Barrett, "Heterogeneous Wealth Dynamics: On the Roles of Risk and Ability," NBER Working Paper No. 22626 2016.

sommarat Chantarat, Andrew G. Mude, Christopher B. Barrett, and Michael R. Carter, "Desiging Index-Based Livestock Insurance for managing Asset Risk in Northern kenya," *Journal of Risk and Insurance*, 2013, *80* (1), 205–237.

Sutter, Matthias, Martin G. Kocher, Daniela Glatzle-Rutzler, and Stefan T. Trautmann, "Impatience and Uncertainty: Experimental Decisions predict Adolescents' Field Behavior," *American Economic Review*, 2013, *103* (1), 510–531.

Udry, Christopher, "Child Labor," in Abhijit Banerjee, Roland Benabou, and Dilip Mookherjee, eds., *Understanding Poverty*, Oxford University Press, 2006, chapter 16.

UNICEF, "Factsheet: Child Labour," https://www.unicef.org/protection/files/child$_l$abour.pdf 2016.

Wawire, V., "Gender and the Social and Economic Impact of Drought on the Residents of Turkana District in Kenya," Gender Issues Research Report Series No. 21. Addis Ababa: OSSREA 2003.

World Bank, "Turkana household survey, Kenya," 2015.

Appendix A   Appendix
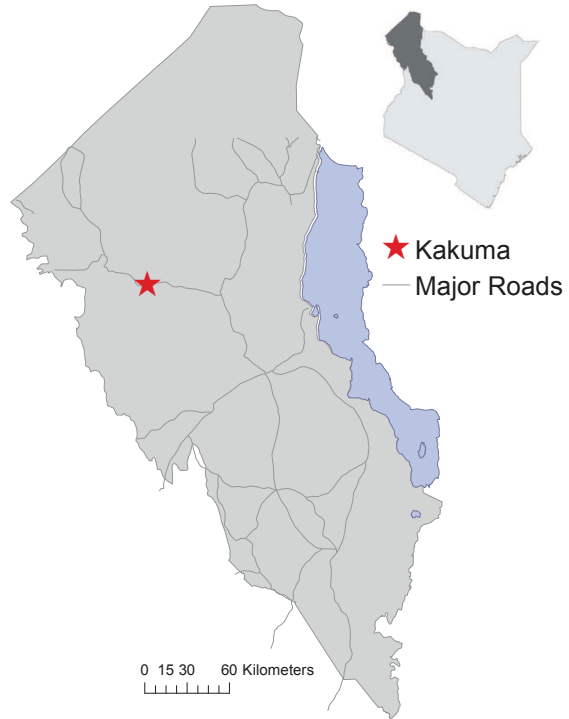
Figure A1: Turkana County

Table A1: Child Labor Trends in Turkana

	(1) Child laborer (for pay or family)	(2) Child laborer (for pay)	(3) Child laborer in HH (for pay)
Age	0.003*** (0.000)	0.0002*** (0.0000)	
Currently or ever attended school	-0.032*** (0.001)	-0.001** (0.000)	
Female	0.012*** (0.001)	0.0002 (0.0002)	
Age of HH Head			0.0001*** (0.0000)
Head of HH has some education			0.001 (0.001)
% of school-age children in school			-0.004** (0.002)
% of female children in HH			-0.001 (0.001)
Female head of HH			-0.0002 (0.001)
Poor			0.002** (0.001)
Ln(Km to Kakuma camp)			-0.002*** (0.001)
Log(precipitation mm)			-0.006** (0.003)
Unit of Analysis	Child	Child	Household
Fixed Effect Level	Household	Household	Sublocation
Observations	351567	351567	111787
Mean of DV	0.02	0.002	0.006

* $p < 0.10$, ** $p<0.05$, *** $p < 0.01$. Data come from the HSNP registration census conducted in 2011. Linear probability model specification. Standard errors are in parentheses and clustered at the level of the indicated fixed effect. The dependent variable in column (1) is a binary variable for whether the child works for pay or works unpaid for the family. The dependent variable in (2) is a binary variable for whether the child works for pay. The dependent variable in column (3) is a binary variable for whether there is a child in the household who works for pay. A child is defined as any person age 15 or younger.

Table A2: Differences in Consumption by Occupation

HSNP consumption index	Mean (1)	Mean (2)	P-value diff	Obs (1)	Obs (2)
Wage earner vs. No wage earner	627.000	485.394	0.000***	46976	92133
Herder vs. Non-herder	438.136	639.073	0.000***	73287	65822
Wage earner vs. Herder	627.000	443.669	0.000***	46976	58121

 * p< 0.10, ** p<0.05, *** p < 0.01. Data come from the HSNP registration census conducted in 2011. The HSNP consumption index is a proxy-means tested measure of per capita household consumption. The methodology used to create the proxy means test is a simplified poverty mapping exercise. Each household interviewed responded to 40 questions on household and household member characteristics. These characteristics were used to predict adult per capita consumption as measured in the Kenya Integrated Household Budget Survey (KIHBS) 2005-06 (Pinney, 2013)
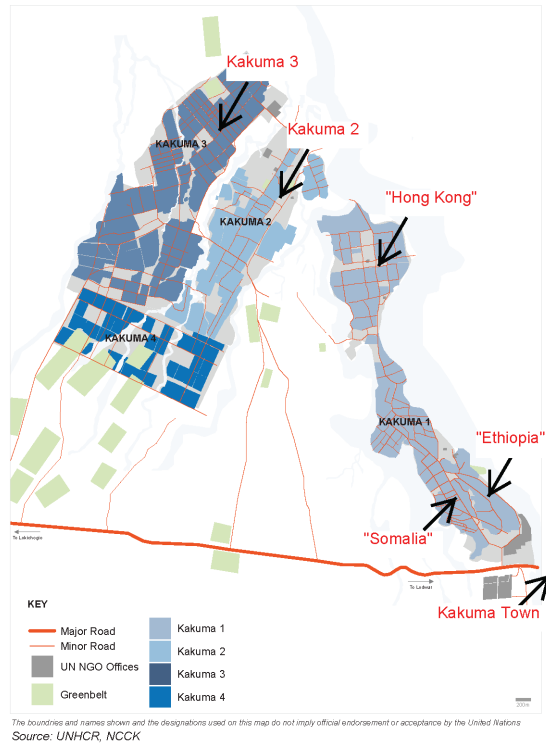
Figure A2: Market Centers in Kakuma

Table A3: Balance Test of Risk Preferences

	(1) σ Risk Choice	(2) Risk Choice	(3) Mean of DV	(4) P-value diff in means	(5) N
Age	0.0005 (0.0038)	-0.00717 (0.071)	12.12	0.079	550
Read	0.0000 (0.0005)	0.00236 (0.008)	0.36	0.264	550
Female	-0.0002 (0.0005)	-0.000815 (0.009)	0.22	0.373	550
Orphan (both parents dead)	-0.0003 (0.0009)	-0.00678 (0.015)	0.46	0.553	550
Orphan (does not live with any guardian)	0.0001 (0.0004)	-0.0072 (0.071)	0.07	0.934	550
Only mother living	0.0009* (0.0004)	0.0153 (0.010)	0.18	0.056*	550
Only father living	-0.0005 (0.0004)	-0.0103 (0.008)	0.09	0.194	550
Child lives on street	-0.0001 (0.0006)	-0.0052 (0.010)	0.30	0.192	550
# of siblings	0.0003 (0.0022)	0.007 (0.042)	2.17	0.373	548
Enrolled in primary school	0.0000 (0.0005)	0.0024 (0.011)	0.36	0.160	550
Some primary school	-0.0003 (0.0005)	-0.0040 (0.010)	0.52	0.441	550
# of animals owned by guardians	0.0733 (0.0476)	1.386 (0.836)	6.12	0.447	221
Paid in kind for at least 1 job	-0.0008 (0.0004)	-0.0157 (0.009)	0.18	0.282	550
Carry water	0.0000 (0.0004)	0.0008 (0.007)	0.35	0.598	550
Firewood	-0.0004 (0.0004)	-0.0081 (0.008)	0.2	0.487	550
Cleaning	0.0003 (0.0004)	0.00407 (0.009)	0.39	0.691	550
Sell things	-0.0005 (0.0005)	-0.0101 (0.012)	0.19	0.378	550
Beg	-0.0007 (0.0006)	-0.010 (0.012)	0.27	0.345	550

+ p< 0.15 * p< 0.10, ** p<0.05, *** p < 0.01. Each row represents an OLS regression in which the dependent variable displayed in the row is regressed on a set of enumerator and survey date dummy variables, as well as the risk measure indicated in the corresponding column. Two separate specifications, which correspond to the columns (1) and (2), were run for each risk measure. Standard errors clustered at the survey date level in parentheses.

Table A4: Female-Headed Households and Poverty in Turkana

	(1) Poor	(2) Poor
Female head of HH	0.057*** (0.005)	0.062*** (0.005)
Age of HH Head	-0.000** (0.000)	-0.000*** (0.000)
Head of HH has some education	0.036** (0.015)	0.038** (0.016)
# of school-age children in HH	-0.011*** (0.002)	-0.010*** (0.002)
Polygamous	-0.086*** (0.008)	-0.090*** (0.008)
Ln(Km to Kakuma camp)	-0.021*** (0.007)	-0.021*** (0.008)
Log(precipitation mm)	-0.209*** (0.046)	-0.203*** (0.048)
Unit of Analysis	Household	Household
Mean of DV	0.832	0.826
Observations	131875	106594

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Data come from the HSNP registration census conducted in 2011. Linear probability model specification. The dependent variable is a binary variable equal to 1 if the household is classified as "poor" or "very poor" by HSNP. Standard errors are in parentheses and clustered by sublocation (administrative unit above a village). Column (2) is restricted to households with school-age children (ages 5 to 18).

Table A5: Animal Ownership by Household Type

	(1) Animals	(2) Animals	(3) Animals	(4) Animals
Orphan	-5.3900** (1.7588)			-7.9011* (3.5790)
Only mother living		0.8264 (3.9827)		-2.6826 (6.1203)
Only father living			-4.4232 (3.4660)	-8.7833* (4.5123)
p-value Orphan=Father				0.68
Observations	222	222	222	222
R^2	0.081	0.070	0.073	0.091

* $p< 0.10$, ** $p<0.05$, *** $p < 0.01$. OLS estimates. All columns control for enumerator and survey date fixed effects. Standard errors clustered at the survey date level in parentheses.