The Effect of Microinsurance on Child Work and Schooling

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Abstract

Vulnerability to adverse weather shock interrupts adequate human capital investment of the poor in developing countries, but whether a formal insurance product mitigates this effect is understudied. This paper examines the effect of index-based microinsurance on children's work and schooling using Index-Based Livestock Insurance (IBLI) in northern Kenya and southern Ethiopia, using randomly distributed discount coupons to instrument insurance uptake. I find that insurance shifts children's activity from work to schooling and keeps children from increased participation in livestock-related tasks during drought. These effects work through the changes in herding strategies. Insurance increases periodic herd migration, which increases the marginal cost of maintaining simultaneously working and schooling. The effects are heterogeneous across age, birth order, and gender of a child, suggesting a more substantial benefit of the insurance towards younger children and highlighting the difference between the nature of girls' and boys' work.

JEL Classifications: G52, I20, J22, O15

Keywords: microinsurance, child labor, education, risk coping strategies

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1 Introduction

Poor households in developing countries often cannot make adequate investments in human capital. It is because the direct cost of education and the opportunity cost of pulling children out of work can be unaffordable to these households (Todd and Wolpin, 2006; Basu and Van, 1998; Edmonds and Schady, 2012). It becomes more difficult in the face of adverse income shocks such as droughts, floods, animal/crop disease, or illnesses since these households often resort to pulling children out of school and sending them to work to cope with these shocks (Beegle, Dehejia, and Gatti, 2006; Björkman-Nyqvist, 2013; Bandara, Dehejia, and Lavie-Rouse, 2015; Shah and Steinberg, 2017; Koohi-Kamali and Roy, 2021; Park, Behrer, and Goodman, 2021). Nevertheless, Policy responses to decrease child labor are often focused on increasing household income levels, while the variability of the income and the risk mitigation strategies are important aspects as well.

Access to financial markets, such as credit or insurance markets, can mitigate such impacts of the adverse shock on children's work participation and schooling by replacing the role of child labor within a household as a buffer stock (or an income source) during an adverse shock. Although insurance can play such a role, existing evidence has been mostly focused on access to credit markets (Beegle, Dehejia, and Gatti, 2006; Alvi and Dendir, 2011; Bandara, Dehejia, and Lavie-Rouse, 2015). Moreover, conventional insurance products are often not readily accessible for poor households due to their high implementation cost. Index insurance, which uses an index of a geographical area instead of individual claim to determine insurance payout, has received much attention due to its lower cost in actuarial data collection and claims validation (Jensen and Barrett, 2017) – Greatrex et al. (2015) report that the number of households insured by index insurance products is over millions worldwide. The existing studies reported index insurance could improve various measures of household well-being, including production, income, harmful risk-coping strategies (distress livestock sales and meal skipping), subjective well-being (Jensen, Barrett, and Mude, 2017; Janzen and Carter, 2019; Matsuda, Takahashi, and Ikegami, 2019) [1] However, there is scant evidence on how the index insurance would affect another well-known harmful risk coping strategy: children's work and schooling.

This paper examines the effects of index-based microinsurance uptake on children's participation in work and schooling, the two activities that are often considered to be negatively correlated with each other because they are the alternative ways to spend children's time. First I investigate the average effects of the insurance uptake and then disaggregate the effects across drought and non-drought periods. I also study through which channel the effects operate by examining related household outcomes such as herding strategies, herd size, household income, and other risk-coping strategies. Lastly, since the gender, age, and the birth order of a child play an important role in a households' decision on the child's activity, I examine the heterogeneity of the insurance effects by these characteristics of a child.

To investigate the question, I study Index-Based Livestock Insurance (IBLI) launched in Arid and Semi-Arid Lands (ASAL) of Northern Kenya and Southern Ethiopia, which targets pastoral households comprising most of the region's population.[2] The primary data source is a panel survey containing comprehensive information about the herding strategies and demographic characteristics of 924 Kenyan households and 528 Ethiopian households over six rounds of surveys in Kenya and four rounds in Ethiopia. The survey was part of the pilot program implemented to evaluate the welfare effects of the insurance where randomized discount coupons were distributed to households with varying discount rates every sales season. For causal identification, I exploit the variation in insurance premiums generated by the randomized discount coupon offers. The randomization was conducted every sales season, occurring twice a year, providing within-household variation in insurance premiums. Specifically, I instrument the cumulative IBLI uptake with cumulative

[1] Over 30 million farmers are insured in India through national index insurance programs, nearly 200,000 farmers in East Africa (Kenya, Rwanda, and Tanzania) through the Agriculture and Climate Risk Enterprise (ACRE), over 20,000 smallholder farmers in Ethiopia and Senegal through the R4 Rural Resilience Initiative, and more than 15,000 nomadic herders in Mongolia through Index-Based Livestock Insurance Project (IBLIP).

[2] For the details of the product design, please refer to Chantarat et al. (2013).

discount rates.

The main finding is that IBLI shifts children's activities from work to schooling, and that the insurance helps children avoid being drawn to work with adverse weather shocks. First, on average across drought adn non-drought seasons, the children from insured pastoral households are less likely to engage in child labor by 8.5 percentage points and in working and schooling simultaneously by 10.1 percentage points. On the other hand, the probability of a child being a full-time student increases by 12.2 percentage points. Secondly, the child labor of insured households during the drought seasons does not differ substantially from non-shock seasons. During the drought shock seasons, children from uninsured households are more likely to be engaged in child labor by 9.6 percentage points. The increase in child labor use disappears in insured households.

The shift from part-time work and schooling to full-time schooling is largely driven by the changes in secondary activities of children. The children of insured households are less likely to participate in both types of work – livestock related tasks and household tasks – for their secondary activity. At the same time, schooling as a secondary activity increases on average. On the other hand, protection effect of IBLI is observed with children's primary activities. Livestock related tasks are the type of work that increases for children during droughts, but IBLI is able to mitigate this effect.

These results are consistent with the "decreased uncertainty" story suggested by previous papers on the effect of insurance on child labor (Pouliot, 2006; Landmann and Frölich, 2015), or similarly, consistent with the households' effor to decrease harmful risk mitigation strategies (Jensen, Barrett, and Mude, 2017; Janzen and Carter, 2019). However, these direct mechanisms cannot be tested so I examine the effects on household-level behaviors that may help explain some indirect pathways that IBLI could have worked through to influence households' decision on children's activities.

Household behaviors relevant for pastoral production and child activities include herding strategies and livestock holdings. First, for the herding strategies, I find that the insured households increase herd mobility. Since herd mobility increases the cost of maintaining the part-time work and schooling, this helps explain the shift from part-time work and schooling to full-time schooling. Children whose primary activity is to go to school and the secondary activity is work may decrease work participation as a secondary activity since they put heavier weights on schooling, which contributes to the shift from part-time work and schooling to the full-time schooling. Households' expenditure on fodder for livestock also suggest that households partly replace children's work to gather fodder for livestock with purchasing fodder. On the other hand, I find no evidence of livestock diversification among insured households. Herd sizes do not explain the effects on children's activity choices as well.

The heterogeneity analysis reveals more nuanced effect of the insurance on children's activity, as well as presents usage of children's work during droughts among pastoral households. Without insurance the oldest siblings, older age children (age 13-17), and girls are more likely to be increase their participation in child labor during droughts. Moreover, the oldest siblings and older age children (age 13-17) tend to take up work as a primary activity during droughts, even full-time work. Older age children (age 13-17) and girls are more likely to decrease full-time schooling during droughts. All of these adverse effects, however, are mitigated by taking up the insurance. The shift from part-time work and schooling to full-time schooling mainly occurs among these subgroups. On the other hand, younger siblings and younger children (age 5-12) from insured households, especially the younger siblings, shift from full-time work to full-time schooling. They even decrease child labor during non-drought periods, suggesting that the older children within a household tend to take the responsibility to support their younger siblings, but an insurance product helps both children. The insurance effect for boys are concentrated on the shift from part-time work and schooling to full-time schooling.

This paper contributes to the growing literature on the effects of index insurance by adding rare evidence on the inter-generational effect of index insurance. Several studies find that index insurance can help invest in high-risk, high-return production strategies, shield households from adverse shocks that may drive them into a poverty trap, and improve the welfare of the insured household (Barnett, Barrett, and Skees, 2008; Dercon and Christiaensen, 2011; Karlan et al., 2014; Jensen and Barrett, 2017; Jensen, Barrett, and Mude, 2017; Janzen and Carter, 2019; Tafere, Barrett, and Lentz, 2019). However, there is little evidence on the effect of index insurance on children of the insured household. To my knowledge, the only other paper looked at this relation ship is Jensen, Barrett, and Mude (2017), where they examine the effect of IBLI on number of days a child was absent from school, where they find small and statistically insignificant effect. Considering a very low school attendance in the study area, and lack of further investigation on other activities children may take up, as well as the mechanisms through which it operates, there is a gap in this area. This paper take a deeper look at this issue by investigating choices on children's activities among full-time work to part-time work and schooling and full-time schooling, and disaggregates the effects across droughts and non-drought seasons.

This paper also builds on the literature on the effect of weather shock on children's work and schooling. The existing literature finds that the household income shocks induced by adverse weather shock, including droughts and floods, increase child labor and decreases schooling. These studies also find that access to credit mitigate the adverse effects on human capital investments on children (Beegle, Dehejia, and Gatti, 2006; Björkman-Nyqvist, 2013; Bandara, Dehejia, and Lavie-Rouse, 2015; Shah and Steinberg, 2017; Koohi-Kamali and Roy, 2021), while having more assets – whether they are the productive assets such as land, or durable assets – does not necessarily act as a buffer against shocks (Bandara, Dehejia, and Lavie-Rouse, 2015; Edmonds and Theoharides, 2020; Nordman, Sharma, and Sunder, 2021). A few recent papers showed that the positive weather shocks that increases household income could also increase children's work participation and decrease schooling due to an increase in the opportunity cost of children's schooling (Shah and Steinberg, 2017; Nordman, Sharma, and Sunder, 2021). This paper adds another evidence to the literature that adverse weather shock negatively affects children's participation in work and schooling. Moreover, it shows that access to formal insurance products could mitigate such effects.

Lastly, this paper expands the literature on the relationship between insurance and children's work and schooling. A few existing studies find that health insurance decreases children's work and increases educational attainment by protecting households from shocks to adult labor (Landmann and Frölich, 2015; Frölich and Landmann, 2018; Guarcello, Mealli, and Rosati, 2010). Agricultural and index insurance differs from health insurance in the sense that the first-order effect of the insurance is a change in the investment strategies, which could lead to an increase in productive assets. Moreover, since IBLI is one of the very few agricultural insurance products that insures assets rather than an income, it contributes to the studies on the relationship between child labor and a household's productive assets. The existing studies in this literature show that child labor complements productive assets (Basu, Das, and Dutta, 2010; Edmonds and Theoharides, 2020). By showing that IBLI shifts children's activities from work and schooling to schooling only, this paper shows that ensuring income stability increases investment in children's human capital.

The results of this paper shows that index insurance, which recently received growing attention, can contribute to long-term economic development by inducing human capital accumulation among insured households. In addition, while the child labor reduction policy has focused on supporting household income – directly or through providing productive assets to utilize – subsidizing index insurance could complement the existing child labor reduction policies, since microinsurance would allow households to make longer-term investments such as investment in children's human capital.

The paper proceeds as follows. Section 2 discusses a conceptual framework. Section 3 explains the study settings, and Section 4 describes the dataset and Section 5.1 the empirical strategy used for the estimation. We present the estimated results in section 6 and conclude in Section 7.

2 Conceptual Framework

The effect of microinsurance on child labor in a pastoral household is analytically ambiguous. Let a pastoral household produce livestock products such as milk, meat, or traded livestock. Inputs used to produce these outputs include labor, fodder, and livestock. Livestock is often considered capital since it is a source of input for production and a productive asset. Labor input consists of adult and child labor, where adult labor is inelastic. Children allocate their time among work, schooling, and leisure, unlike adults who spend their time on work and leisure only.[3]

Since the labor market for children is nearly nonexistent, children's work is restricted to within-household activities.[4] For children in pastoral households, livestock-related work is a strong candidate. Types of livestock-related work for children include animal herding, cleaning animals, caring for sick animals, feeding the animals kept at the main base camp, milking the lactating animals, or selling livestock-produced goods (FAO, 2013). Male children are more likely to herd animals once they reach a certain age (Kenea, 2019). Children's work is a complementary input to the herd size, but the wealthiest households who could afford to hire herders may choose to employ herders instead of sending children to work (Dillon, 2013).

One of the critical herding strategies is herd mobility (taking the livestock to grazing land to feed animals). It is a beneficial strategy for both the long-term and the short-term because it increases the quantity of animal feeding in the short-term and maintains the grazing land condition at a sustainable level in the long term (Hurst et al., 2012). It often takes up to 3 months per trip, and it is not uncommon for children to accompany the herders on this trip (Kenea, 2019). When they do, the cost of maintaining schooling and working increases as they move to a different area.

Let a pastoral household enjoy its utility from consumption, leisure, and chil-

[3] Note that a child can allocate her time to both work and schooling, leading to participation in both activities.

[4] For example, in Ethiopia, the labor market is generally sparser in southern Oromia, where Borena zone is part of it, than the other regions. Job opportunities and job-skill training institutions are insufficient (USAID, 2014).

dren's human capital. Children's time invested in schooling will increase their human capital. It leads to an increase in the household budget in future periods, thereby increasing the present value of the household utility. I assume the credit and labor markets are incomplete, so the production decisions are not separable from the consumption decisions. Therefore, children's work increases utility by increasing the household budget through production but decreases utility by decreasing leisure hours and time spent on schooling.

IBLI insures the livestock loss due to droughts in the area. Therefore, it affects multiple aspects of pastoralists' livelihood, including herding strategies, herd size, and the income from livestock rearing. With this setup in mind, I can hypothesize the direction of the effects of IBLI on children's activity status.

First, the IBLI can influence children's work and schooling status directly by changing the risk management strategy of a household. Uninsured risk exposure causes welfare losses that could induce more child labor. The existing evidence shows that uncertainty in productivity and child labor are negatively correlated (Pouliot, 2006; Landmann and Frölich, 2015). IBLI protects pastoralists from destructive risk mitigation strategies such as distress sales and reduction of consumption upon drought shocks (Jensen, Barrett, and Mude, 2017; Janzen and Carter, 2019). Therefore, if child labor is a form of self-insurance of a household, reducing uninsured risk exposure through programs such as IBLI may decrease labor allocations toward children.

However, based on Karlan et al. (2014), the effect of IBLI could be ambiguous. Under the imperfect credit and insurance markets, when access to the insurance increases without better access to credit markets, investments in hedging and risk assets are both likely to decrease. Therefore, introducing the IBLI product could decrease the investment in children's education, which would be a risky input, while child labor decreases as well since it would be a hedging input. [5]

IBLI could indirectly change children's work and schooling status as well through

[5] Education is considered a risky asset since it has higher net marginal productivity in the good season compared to the bad season. Child labor, conversely, is considered a hedging asset since the marginal productivity is higher in the bad seasons relative to the good season, by definition.

household behavior changes. A pastoral household could use IBLI to replace livestock savings as an inefficient means of insuring against a drought risk. Then, herd size would decrease with the introduction of IBLI, and so would child labor since child labor is complementary to herd size – the relationship I find from the data.[6] On the other hand, IBLI protects non-poor households from asset decumulation (Chantarat et al., 2013) and increases productivity-enhancing investment (Jensen, Barrett, and Mude, 2017). That is, IBLI could increase the risk-adjusted returns to livestock holding (Toth, 2017). Basu, Das, and Dutta (2010) and Edmonds and Theoharides (2020) showed that a household's productive asset could increase demand for child labor. The herd growth relevant to the increased return in livestock holding will stimulate child labor.

A pastoral household could also use IBLI to change herd migration patterns. Pastoral households insured through IBLI increase the number of days on temporary migration and spend more time at a further distance from the nearest watering point while decreasing the travel distance and average travel speed (Toth, 2017). The frequency and time spent in the remote area are more relevant for children's activity choices rather than the maximum distance and travel speed. If the frequency of travel and the number of days spent in migratory herding increases, the marginal cost of maintaining simultaneous schooling and working increases. It will have an ambiguous effect on children's work and schooling based on how much weight each child would put on work and schooling.

[6]Figure 1 plots the distribution of livestock on the horizontal axis and the probability of children's work engagement (Panel A) and hours of work each child participates conditional on a child working on the vertical axis (Panel B), demonstrates this relationship between children's work and the herd size. Panel A shows that the probability of a child's full-time engagement in work (presented in blue) increases as the herd size grows, while the probability of children's work and going to school (presented in red) decreases, and the probability of full-time schooling (presented in green) stays relatively constant. This pattern is more apparent among the households that own herd size between 0-20 TLU where full-time work participation and the herd size are positively correlated, and part-time work and schooling and even full-time schooling are negatively correlated with the herd size. Panel B also shows that the daily working hours of children (blue line) increase with the herd size, especially within the range of herd size 0-20 TLUs. However, hours spent on schooling (red line) and the adult household members' working hours (black line) are relatively similar across herd sizes. One thing to note is that the children from households with smaller herd sizes spent more time on schooling than work.

In addition, IBLI could work through income – Jensen, Barrett, and Mude (2017) showed that it increases income per adult equivalent.[7] By findings from a canonical model of Basu and Van (1998) and subsequent studies on the determinants of child labor, we expect that the positive income effect will decrease children's work (Edmonds and Schady, 2012; Edmonds, 2008).

Therefore, we cannot determine the direction of the effect of livestock insurance on the children's activity choices between work and schooling analytically, and it is an empirical question to be addressed. A piece of evidence on the effect of IBLI on child outcome suggested that the effects are negligible. The effects on school absenteeism were small and statistically insignificant (Jensen, Barrett, and Mude, 2017), but considering a very low school attendance and the range of children's activities from full-time work to part-time work and schooling and full-time schooling leaves room for further investigation on this domain.

3 Study Settings

3.1 Marsabit and Borena

Marsabit district of Kenya and the Borena zone of Ethiopia border each other, as depicted in Figure 2. Geographical proximity comes with being in the same agroecological zone. They are both arid and semi-arid lands (ASALs) where pastoral livelihood systems dominate – livestock herding is one of the income sources for 74 percent of the sample households, and 87 percent of the households have at least one of the household members engaged in livestock-related activities as their primary or secondary activity.

These areas are remotely located, densely populated, and often with a poor population. Lybbert et al. (2004) showed that there exist multiple herd sizes equilibria, where households below a critical herd size threshold (typically in the range of 10-

[7] An adult equivalent is defined as follows, where age is in years. AE=0.5 if age < 5, AE=0.7 if 4 < age < 16 or age > 60, AE=1 if 15 < age < 61.

20 tropical livestock units (TLU)[8]) are trapped in a low-level equilibrium poverty trap. Catastrophic livestock losses triggered by droughts can drive these pastoral households in the regions into poverty traps. The region has a substantial portion of the population at risk of being trapped in poverty. Figure 1 plots the distribution of herd size in TLU. I present the figure only up to 80 TLU for better visibility. The figure shows that most households own small herds while the number of owned animals varies up to 457 TLU. The mean herd size is 16.5 TLU, the median is 9.6, the 75th percentile is 19.9, and the 90th percentile is 36.3. So, more than three-quarters of the sample households own less than 20 TLUs of animals. Furthermore, climate change increases the frequency of droughts and may increase the probability of a larger pastoral population falling into a poverty trap in the absence of interventions to enable faster herd recovery from drought-related losses (Barrett and Santos, 2014).

In these pastoral economies, an imperfect labor market, coupled with the risk of animal theft and shirking, leads to a high demand for family laborers, including children. The children's participation in livestock-related tasks exposes them to dangers from cattle itself, cattle raiders, wildlife, and animal-bourne diseases. Despite these risks, livestock-rearing activities are the most often selected productive activities of children from pastoral households. For example, 70 percent of the children in the study sample aged 5 to 17 participated in any type of work, and 61 percent were engaged in livestock-related activities. The livestock-rearing activities include herding (the activity of keeping animals together as a group during the search for pasture or water, watching over animals' safety) and animal care (cleaning or caring for sick animals, collecting water or fodder) (FAO, 2013).

Moreover, due to the high demand for children's work for livestock rearing activities, children in the research areas are more likely to participate in work compared to the other areas of each country. They also tend to work longer hours due to the nature of livestock-related tasks – especially if they are involved in trekking animals.

[8]Tropical Livestock Unit (TLU) is an integrated unit for cattle, camel, sheep, and goats. TLU allows us to measure the number of different types of livestock in one unit. 1 TLU = 0.7 Camel = 1 Cattle = 10 Sheep/goats

Kenya Integrated Household Budget Survey 2015-2016, a nationally representative household survey, shows that an average of 19 percent of the Marsabit district children are engaged in any economic activities, excluding any help in household tasks, while 13 percent of children from the other parts of Kenya are engaged in economic activities. Therefore, Marsabit district children work 68 hours per week, while children in other parts of Kenya work only 20 hours per week on average[9]. Similarly, the Borena zone children work significantly more than the rest of Ethiopia. While 27 percent of Ethiopian children are engaged in economic activities on average, 56 percent of the Borena zone children work. Moreover, the Borena zone children work 31 hours per week, compared to 23 hours among children from another area (Data from Socioeconomic Survey 2015-2016). While the weekly working hours differ across countries due to measurement methods, it demonstrates that children in the study areas work more intensely than in other parts of the country.

High work participation rates and longer work hours would leave little room for educational investment. The population share without any education is 54 percent in Marsabit district, while only 10 percent in other regions of Kenya. Similarly, in Ethiopia, the population share without any education is 70 percent in the Borena zone, while 39 percent in other regions.

There are several reasons for the low educational attainment among pastoral households. Seasonal migration is critical in sustaining the herd size, considering spatiotemporal variability in forage and water access (Chantarat et al., 2017). Due to the seasonal and periodic movements of pastoral communities and the remoteness of villages, delivering quality education and attracting qualified teachers to the pastoral population is often challenging. For example, in Ethiopia, a standard target for school-to-home distance is 2.5 to 3 km, but in our study area, Borena, the school catchment area is currently 8 to 10 km in the pastoralist districts (Kenea, 2019). Recognizing such issues, the governments of Kenya and Ethiopia have tried to address the situation, such as mobile schools and Alternative Basic Education

[9] Working hours are measured by the usual hours of work for any economic activities that children are engaged in. However, the numbers are similar when the working hours are measured by the sum of actual working hours in the last seven days for a child's primary and secondary activities.

(ABE) for lower-level primary education.

Demand-side constraints also contribute to the low educational attainment of these regions. First, the opportunity cost of schooling is quite substantial considering the educational expenditure, loss of potential income from children's work, and the cost of hiring herding boys to replace a child in school (Mburu, 2017). Secondly, irrelevant curriculum and language of instruction have had very little significance to pastoral and nomadic populations. The inflexibility of the formal school system requiring the students to be sedentarized at one place for a while does not work well with pastoral livelihood where mobility is crucial. Moreover, some pastoralists have reported that children spending time away from their families and not learning productive animal production skills are not considered to be the best way to spend time (Ruto, Ongwenyi, and Mugo, 2009; FAO, 2013).

Figure A1 suggests that the latter – demand side constraints – seem to be a more prominent reason in the study areas. In the Marsabit district of Kenya, the two major reasons children never enrolled in school are parents' refusal to send their children to school and workloads at home, while the age restriction is a major issue in other areas, along with parents' refusal and school expenses. Similarly, Ethiopian children across regions never enrolled in school, mainly due to their work responsibilities at home, parents' perception of education, and age restrictions. Again, the supply-side issues are not the top reasons for the low enrollment in these areas.

Supply-side constraints are not affected by the insurance uptake of a household. However, demand-side constraints- a combination of households' beliefs and prospects on the benefit of schooling relative to work- can be affected by the insurance uptake decision of a household. Therefore, we can expect to observe changes in children's activities due to insurance purchases.

3.2 Index Based Livestock Insurance

Index-based livestock insurance (IBLI) is designed to cushion households against drought-related losses to accelerate recovery from shocks, build households' resilience to drought, and prevent collapses into poverty traps (Chantarat et al., 2013). The IBLI product description in this section is largely drawn upon from Jensen, Barrett, and Mude (2017) and Janzen and Carter (2019) for products sold in Marsabit and Takahashi et al. (2016) for products in Borena.

For index-based insurance, the indemnity payout is triggered if an index of the insurance area satisfies certain criteria. The predicted livestock mortality (Kenya) and Normalized Differenced Vegetation Index (Ethiopia) are used for payout decisions in each country. In Kenya, the indemnity payout is triggered if the predicted livestock mortality rate, which was constructed using NDVI and longitudinal household data on livestock mortality rates, is higher than 15 percent. In Ethiopia, the forage condition index ranked at the 15th percentile or higher on the Woreda-level historical distribution since 1981 is used as criteria for index triggers in Ethiopia. Chantarat et al. (2013) provides analytical detail about the modeling process. The index was computed at an index unit level. For example, Kenya's Marsabit district was divided into five insurance divisions, while the Borena Zone of Ethiopia was divided into eight Woredas. This way, the index better reflects the systematic differences in rangeland and climate conditions across areas.

By using NDVI – an index measure collected by an external organization at the area-aggregate level, the IBLI does not incur the cost of verifying individual loss claims and reduces the problems of household-level adverse selection and moral hazard. Moreover, using the combination of NDVI index and household data allowed IBLI to minimize the expected basis risk, which is a problem for index insurance in general. Within the study sample of Kenya, about 41.9 percent purchased IBLI at least once during the study period, and the average seasonal uptake was 16.2 percent (Jensen, Barrett, and Mude, 2017). It is a moderately high level of demand but much higher than other index-based insurance products.

There are two seasons in the study areas. Long-Rain, Long-Dry (LRLD) season spans from March to September, and the Short-Rain, Short-Dry (SRSD) season from October to February of the following year, as depicted in Figure 3. IBLI sales windows were two months preceding the two rainy seasons – January to February and August to September. The coverage lasts for one year, so if a household purchases insurance in two consecutive sales windows, there will be a period with overlapping insurance coverage. In Kenya, policies are sold in Tropical Livestock Units (TLUs), and the product of premium rate, insured livestock in TLU, and the price per TLU calculated the premiums. In Ethiopia, the premiums were calculated by the product of the Woreda-specific insurance premium rate and the total insured herd value (TIHV), which is a weighted sum of insured animals with species-specific animal price as a weight for each animal species. The local insurance companies that pastoralists are familiar with insurance products in both countries. Between 2010 and 2015, the period that this study covers, there were two payouts triggered in Marsabit, Kenya, in 2011 and 2012, while one in 2014 in Borena, Ethiopia (marked in yellow bar in Figure 3. Considering payouts are triggered only when a drought happened in the insurance area, there were five incidents of droughts in northern Kenya and one in southern Ethiopia during the study periods.

The International Livestock Research Institute (ILRI) and a team of researchers implemented evaluation pilot programs using various interventions to raise awareness of and demand for the product in the study area. The programs were implemented from 2009 to 2015 in Kenya and 2012 to 2015 in Ethiopia. Interventions included recorded tapes and cartoons with information on IBLI products (Borena), IBLI knowledge games (Marsabit), and discount coupons. The discount coupons were randomly distributed to the subsample of the households in each insurance area in each round. In other words, the randomization for the coupon-receiving households was administered every round – so a control group in one season may become a treatment group in another. The discount was applied to the first 15 TLUs insured, and the discount rate ranges from 10 to 60 percent in Kenya and 10 to 100 percent in Ethiopia at 10 percent intervals. Note that in rounds 5 and 6, some Kenyan participants also received a 70 to 80 percent discount. As depicted in Figure 4(a), 60 percent of the total sample received discount coupons in Kenya, while the remaining 40 percent did not in each season. In Ethiopia, 80 percent of the sample received coupons in each season. The amount of discount could be significant: The premium for the 15 TLUs could range from 8,285 to 16,575 ETB (equivalent to USD 466 to 932) in Ethiopia and 5,850 to 24,600 KSh (equivalent to 74 to 280

USD) in Kenya. Figure 4(b) shows that most households insured less than 15 TLU even with the discount since it was a significant amount for the households in these countries.

4 Data

To understand the effect of index-based livestock insurance on children's work and schooling decisions, information on households' choices on children's activities and of households' insurance purchase and premium discounts are required. I use the households' children's activity choice information from the household panel surveys conducted in an effort for continuous impact evaluation and assessment of the IBLI product, led by the International Livestock Research Institute (ILRI) and various academic researchers. The impact evaluation was conducted as part of the pilot program to promote product understanding among the client base and generate evidence to understand the product's effectiveness. The survey, therefore, collected information on households in the Marsabit district, Kenya, and the Borena zone, Ethiopia, and followed the households annually. In Marsabit district, the baseline survey was conducted in 2009, interviewing 924 households. In the Borena zone, the baseline survey was conducted in 2012 with 515 initial sample households. The survey collected comprehensive information on households' living standards and herding practices, children's participation, and working and schooling hours. The administrative data of insurance companies was used for the information on insurance purchases and premium discount rates each household received.

The variable of interest in this paper is the activity status of the children. I divide children's activity status into four categories to measure the work and schooling status of a child: Work full-time, part-time work and schooling, full-time schooling, and no activities. It is important to examine these different categories rather than using an aggregate measure of "Work" and "Going to school" since some children in this setting have a double, even triple burden of education, economic work, and domestic activities (FAO, 2013). To do so, I use the information on primary and secondary activity of a child over the last 12 months prior to the interview.[10]

When the only activity of a child is work - either as a primary or a secondary, a child is defined as working full-time. A child is doing part-time work and schooling if a child reports that one of his/her primary or secondary activities is work and the other is to be a student. Full-time schooling means that the only activity of a child, either as a primary or a secondary, is going to school. Lastly, "No activity" means that a child does not fall into any of the three previous categories. Thus, these four categories of children's activity are exhaustive and mutually exclusive.

Another set of outcome variables is the hours spent on activities. It is measured by the hours spent on each activity on a typical day. For hours spent on neither work nor schooling, I use the remaining hours after work and schooling.

I also use a measure of a child's work – criteria used by UNICEF to define child labor to complement the four categories of activities. According to this criteria, a child is classified as doing child labor if i) a child of age 5 to 11 years is engaged in at least 1 hour of economic work or 21 hours of unpaid household services per week, ii) a child of age 12 to 14 years in at least 14 hours of economic work or 21 hours of unpaid household services per week, or iii) a child of age 15 to 17 years in at least 43 hours of economic work per week.

This paper focuses on the age group of 5 to 17 years old, and this choice stems from several reasons. First, it follows a common practice in the child labor literature to study children aged 5 to 17. Second, I consider the two countries' minimum legal working and school age. Formal schooling begins at six in Kenya and seven in Ethiopia. Taking the lower bound of it and giving a year to observe progress from pre-primary age to primary school age, I use the age of five as the lower bound. The minimum legal working age is 17 in Kenya and 15 in Ethiopia. Also, the minimum legal age for hazardous work is 18 in both countries. Taking the upper bound of it,

[10]List of activities classified as work: Herding (household-owned) livestock, livestock production (e.g., milking, sale of livestock products), livestock trading/broker, petty trading (e.g., charcoal/water trading), shop/business owner, unpaid work in family's shop/business, casual labor (e.g., herding for pay), wage/salaried employment, farming (non-livestock), house/domestic work, fishing, poultry production, mining.

I use the age of 17 as the upper bound of age for the sample restriction.

Table 1 reports the summary statistics of the study sample by coupon receipt status and the balance between the groups. Within the study sample, heads of the households are 49 years old and 62 to 65 percent male. The average Household size, measured in adult equivalent, was between 4.6 and 4.9. An average household owns 13.6 to 14.1 Tropical Livestock Unit (TLU) of animals. (Panel A of Table 1). The differences in these household characteristics between coupon and no-coupon households are not statistically significant – the p-value from the joint F-test is 0.34.

Children in the study sample are 11 years old on average, and 46 percent female, for both coupon and no-coupon households (Panel B of Table 1). Among the study sample children, 41 to 42 percent work full-time, 28 to 29 percent work while going to school, and 19 to 20 percent go to school only. About 10 percent are not involved in any of the activities. Most of these children with no activity are children of young age. 86 percent of these children are younger than seven years old. The p-value from the joint F-test is 0.57 for individual characteristics, suggesting that the coupon distribution was well-balanced.

5 Empirical Strategy

5.1 The Effect of Insurance

The most straightforward design to investigate the impacts of microinsurance on child outcomes and its mechanisms would be to compare the outcome of uninsured and insured households by exploiting an exogenous variation of insurance coverage.

However, the insurance purchase decision is inherently endogenous, and IBLI was available to all sample households as stated in Section 3.2. The endogenous selection can bias the estimate if the criteria that drive the pastoralists' selection into the purchase of IBLI is correlated with their decision for children's activity. For example, Jensen, Mude, and Barrett (2018) shows that the demand for the IBLI product is driven by basis risk, participation in social groups, price of the insurance, financial liquidity, and spatio-temporal adverse selection in Kenya. Among these factors, financial liquidity is correlated with children's activities because low financial liquidity may increase children's participation in work and decrease schooling.

Since the insurance premium is one of the determinants of the demand for IBLI, randomly distributed coupons with varying rates of premium discount, create exogenous variations on the probability of purchasing an IBLI policy. I use these discount rates as an instrument for the actual insurance coverage, following Jensen, Barrett, and Mude (2017).

As the first stage, I estimate:

$$CIBLI_{hrt} = \gamma_0 + \gamma_1 DC_{hrt} + X'_{iht} \cdot \gamma_2 + \delta_h + \theta_t + \psi_r + \eta_{hrt} \tag{1}$$

where $CIBLI_{hrt}$ denotes the cumulative insurance uptake of the household h in region r covering the period t, and DC_{hrt} denotes the cumulative discount rate over the same sales seasons. Insurance uptake can be measured by whether a household purchased any policy or the number of animals insured in Tropical Livestock Units (TLU). Since the discount rates predict insurance uptake stronger than the coverage in TLU, the preferred specification is the one using the insurance uptake. Cumulative insurance uptake is the total number of insurance uptake incidents over the three consecutive sales seasons before the survey. Insurance coverage spans one year, and there are two sales periods in each round. The child outcome measures a child's primary activity during the 12-month period preceding the interview. Figure 3 shows that there could be up to three relevant IBLI sales periods that could affect a household's child labor decision. Therefore, $CIBLI_{hrt}$ denotes the total number of insurance uptakes over the three recent sales seasons, and $DChrt$ denotes the cumulative discount rate over the same sales seasons.[11] Figure A2 presents the distribution of cumulative discount rates and insurance uptake over one year. On average, the coupon recipients were provided with 63 percent discount rates, and 26 percent of the households purchased at least once a year.

[11] For example, in round 3 of Ethiopia, the August-September 2012, January-February 2013, and August-September 2013 sales seasons are relevant.

Household-level characteristics that are time-varying, X'_{hrt}, are included, as well as household-, time-, and region-fixed effects to control for time-invariant household characteristics, common time trends across regions, and region-specific characteristics. η_{hrt} denotes the error term clustered at the household level. The error term is clustered at the household level to allow for intra-household correlations.

Using the predicted values from the Equation (1), I estimate the following second-stage regression equation:

$$y_{(i)hrt} = \beta_0 + \beta_1 CIB\hat{L}I_{hrt} + X'_{(i)hrt}\beta_2 + \delta_{i \text{ or } h} + \theta_t + \psi_r + \varepsilon_{(i)hrt} \tag{2}$$

where y_{ihrt} is the outcome of child i in household h living in region r at period t. Other notations are the same as used in the previous equation. For some of the outcome variables measured at the household level, the dataset is collapsed at the household level. Since the unit of the randomization was at the household level, but individual-level outcomes are of interest while the observations are dependent within households, weight using the inverse of the number of children in the household to adjust these individual-level outcomes was used. They include indicators for the probability of and hours spent on child work (full-time and part-time), schooling (full-time), and no activity. These four categories are exhaustive and mutually exclusive. Household-level outcomes include the size of the livestock that the households own, herd, that are adults, at home, and lactating at the time of the survey. β_1 is the coefficient of interest, which captures the average effect of insurance on children's activity status.

5.2 The Effect of Insurance upon shock

During the study period, droughts occurred in two sales seasons in Marsabit and one in Borena. Using this information, I also estimate the effect of insurance when the drought shock hits the region. The estimating equation for the first stage would be:

$$
\begin{aligned}
CIBLI_{hrt} = & \gamma_0 + \gamma_1 Shock_{rt} + \gamma_2 DC_{hrt} + \gamma_3 Shock \cdot DC_{hrt} + X'_{iht} \cdot \gamma_4 \\
& + \delta_h + \theta_t + \psi_r + \eta_{hrt}
\end{aligned}
\tag{3}
$$

where all variables share the same definition as in Equation (1) except for $Shock_{rt}$, which is an indicator that equals one if the region r experienced drought shock in period t. Here, period t is 12 12-month period before the interview. Note that the recall period for the child outcome is 12 months before the survey, but the drought shock was measured at the end of each agricultural season, so it was computed twice per year. Moreover, payouts were triggered after each agricultural season. Therefore, the estimates in this regression capture the effect of insurance on outcome variables as a mixture of ex-ante and ex-post risk-coping strategies. For example, survey round 4 in the Borena zone collects information on child outcomes from March 2014 to February 2015. There was a payout in November 2014, meaning some regions experienced drought shock in the Long-Rain, Long-Dry season 2014. Hence, the estimates of the insurance effect on child outcome capture the average of the household's response to the shock and the payouts.

Since the matter of interest is in the differential response across insured and uninsured households upon shock, two endogenous variables were used: The insurance uptake dummy and the interaction of the insurance uptake dummy and the drought shock dummy.

Using the predicted values from the Equation (3),I estimate the following second-stage regression equation:

$$
\begin{aligned}
y_{(i)hrt} = & \beta_0 + \beta_1 Shock_{rt} + \beta_2 CIB\hat{L}I_{hrt} + \beta_3 Shock_{rt} \cdot \hat{} CIBLI_{hrt} + X'_{(i)hrt}\beta_4 \\
& + \delta_{i \text{ or } h} + \theta_t + \psi_r + \varepsilon_{(i)hrt}
\end{aligned}
\tag{4}
$$

where $CIB\hat{L}I_{hrt}$ is the predicted value from Equation 3. Here, β_1 captures the effect of drought shock on households without insurance coverage, and β_2 captures the effect of insurance uptake on children's activities from households with livestock insurance coverage. β_3, on the other hand, captures the difference between the children from insured and uninsured households upon drought shock. Therefore, whether the insurance protects households from the drought shock can be estimated by the sum of β_2+β_4, which is presented at the bottom of each table separately.

5.3 Validity of the instruments

Instruments are valid when the two following assumptions are satisfied: i) independence of the instrument and ii) exclusion restriction. Since the instrument is from the randomized encouragement design, it should not correlate with any observed and unobserved heterogeneity in principle. To ensure the random distribution of the coupon, I tested the balance of demographic characteristics between households that received and did not receive coupons. Table 1 presents the summary statistics and the mean difference of the variables between coupon recipients and non-recipients. I present both the mean difference of these sets of variables and the p-value of the joint orthogonality test of the variables to the coupon distribution to show that the two groups do not differ in observables. Presenting these two complementary measures is necessary since the local insurance company distributed the coupons, and there were differences in the actual distribution and what the research team had planned. I use administrative records of discount coupon distributions and insurance purchases to avoid concern about this non-compliance and check the potential imbalance of the characteristics.

Exclusion restriction requires the instrument to be correlated with endogenous variables while not correlated with the unobserved heterogeneity, denoted by ε_{ihrt}. The assumption cannot be tested empirically, but it is reasonable to assume that the randomized discount coupons affect households' decisions on child time allocation only through insurance uptake decisions.

Another concern about the instrumental variables approach would be the strength of instruments. Table 2 shows the result from the first stage estimation – Equation 3 and 1. Columns (1) and (2) show the correlation between the two endogenous variables and the two instruments employed in Equation 3. The results show that the cumulative coupon discount rate in non-drought periods strongly predicts the cumulative insurance uptake in the non-drought periods. The cumulative discount rates in the drought period strongly predict the cumulative insurance uptake in the drought period. Columns (3) and (4) present the correlation coefficients from estimating Equation 1. In contrast, Column (3) presents the coefficients using cumulative insurance uptake and discount rates among the three latest sales seasons. The estimated coefficients are positive and statistically significant at the 1 percent level, suggesting strong predictive power at the first stage.

In addition, first-stage F-statistics are presented, which jointly tests if all coefficients of the first-stage regression equals zero as a measure of the strength of the instrument. Under heteroskedastic error, the effective first-stage F-statistic of Olea and Pflueger (2013) is commonly used to test the weak instrument problem. This method can be used when there is one endogenous variable since calculating effective F-statistic under two endogenous variables is yet to be developed. These effective F-stats are presented (denoted by F_{eff}) at the bottom of the tables whenever possible. For the coefficients from Equation 4, technically there are two endogenous variables, but since $Shock_{rt}$ is exogenous to the local economic conditions, including the interaction of $Shock_{rt}$ and $CIBLI_{hrt}$ should not constrain the predictive power at the first stage. Therefore, the Kleibergen-Paap rk Wald F-statistic and the p-value of the Anderson and Rubin test [12] are presented as complementary measures of first-stage predictive power.

[12]The Anderson and Rubin test assures that the second stage estimate is robust in the case of multiple endogenous variables. In all cases where the estimates are statistically significant, the AR p-value is also below 0.05.

6 Results

6.1 Effects of insurance uptake on children's activity choices

The effects on a series of indicators for children's activities, child labor, full-time work, part-time work and schooling, full-time schooling, and neither work nor schooling are examined. The four categories – full-time work, part-time work and schooling, full-time schooling, and neither work nor schooling – are mutually exclusive categories of children's activities that comprehensively cover all activities children undertake in this setting. Child labor is an additional indicator used to investigate the effects on a more intensive engagement in work.

First, the average effect of insurance on children's activity choices is examined. The insurance uptake over the past year decreased the probability of children's participation in child labor, part-time work and schooling, while increasing full-time schooling. The results presented in Panel A of Table A3 show that for an additional insurance uptake experience over the three past seasons, the probability of child labor decreased by 8.6 percentage points, part-time work and schooling by 9.8 percentage points, and full-time schooling increases by 11.9 percentage points. These estimates are statistically significant at five and one percent levels, respectively. The effects are large in magnitude. Compared to the mean of the outcome variables of the non-coupon recipients, child labor decreased by 20.1 percent, part-time work and schooling by 36.1 percent, and full-time schooling by 75 percent. The average insurance uptake rate covering one year is about 32 percent, so the *de facto* effect would be a third of the estimated coefficients. However, it is a substantial change in children's activity choices. The effect on the probability of working full-time is estimated to decrease by 2.5 percentage points, and the probability of participating in none of the activities is estimated to increase by 0.5 percentage points, but the coefficients are not statistically significant. Effective F-statistics are larger than the 5 percent critical value for all specifications, indicating a low probability of a weak instrument.

Next, I disaggregate the average effects to the effects that occurred during the drought and non-drought periods. It is to find from which season the average effects are driven by since it will reveal if we find the average effects because the insurance is cushioning the adverse impacts of the droughts on children's work or because insurance uptake changes households' strategies. The estimated impact presented in Panel B of Table A3 shows that the shift of children's activity choice from part-time work to full-time schooling was driven by the effects in non-drought periods and the decrease in child labor can be attributed to the insurance working as a protection for children during drought seasons. The estimates presented in the second row of each panel show results consistent with that of Panel A. Children from the insured households during non-drought periods decreased part-time work and schooling by 8.7 percentage points and increased full-time schooling by 10.9 percentage points. The estimates are statistically significant at 10 and 1 percent level, respectively. However, the average negative effects on child labor are not driven by the effects in non-shock periods. The coefficient on child labor is negative but small in magnitude and statistically insignificant.

The coefficients on *Shock* show that households with no insurance increase child labor upon droughts by 9.1 percentage points, which is a 17 percent increase. However, the insurance offsets the increase in child labor – the coefficient on $Shock \times Uptake$ is -0.198, statistically significant at the 10 percent level. As a result, the effects on the children from insured households during drought shock are indistinguishable from zero, as shown by the sum of the two coefficients. In other words, child labor increases during the drought shock without IBLI, while it doesn't with IBLI. Other activities do not change substantially during the shock periods, even without insurance. This result can be reconciled using the effects on children's working hours presented in Table A4. It suggests that working children increase hours spent on work upon shock without insurance, supporting the finding on child labor.

As explained in Section 5.1, appropriate 1st stage F-statistics in case of multiple endogenous variables with multiple instruments is not yet developed. To complement this and to ensure that the weak first-stage estimates do not threaten the estimates, I repeat the estimation in Panel B of Table A3 using a single endogenous variable and present the results in A1 with effective F-statistic. Panel A shows that the cumulative insurance uptake indicator does not suffer from a weak instrument problem since the effective F-statistic is higher than the 5 percent critical value threshold for all models. While the effective F-statistic presented in Panel B is smaller than the 10 percent critical value, it is due to mechanical reasons. Since the interaction term suppresses the insurance uptake decisions in non-shock periods, the exogenous variables – cumulative discount rate and its interaction with the shock period – naturally have weaker predictive power for the endogenous variable. However, since I showed that the predictive power is strong enough for the endogenous variable without interacting with the shock indicator, I confidently present that the estimates do not suffer from the weak instrument problem.

The survey collected information on children's activity over the last 12 months separately by primary and secondary activity, and the type of activity children participated in. I examine the effects on these specific types of children's activity to find a source of the decrease in children's work participation. The results presented in Panel A of table 4 show that the IBLI decreased children's work as a secondary activity by 19.5 percentage points, which seems to be the source of the shift from work to schooling. Consistently, insurance uptake increases schooling as a secondary activity by three percentage points. Moreover, Panel B shows that the effects on secondary activities are concentrated in the insured households in non-drought periods, also consistent with the results from A3. Most of the children (97.5 percent) who work and go to school simultaneously do so by going to school as a primary activity and work as a secondary activity. Therefore, the decrease in work as a secondary activity is consistent with the shift from part-time work and schooling to full-time schooling.

None of the primary activities were substantially affected by IBLI on average. However, the results in Panel B show that IBLI protects children from increasing work participation upon drought shock. Without insurance, the children increase their participation in livestock-related work as their primary activity in drought periods by 5.5 percentage points, and the estimate is statistically significant at a 5 percent level. On the other hand, IBLI offsets such an increase, and children with insurance do not experience an increase in livestock-related work participation.

6.2 Potential Mechanisms

The previous subsection presented two main findings about the effect of IBLI on children's activities. First, on average, it shifts children from part-time work and schooling to full-time schooling. And during drought shock, households increase children's engagement in livestock-related work as children's primary activities, but having an insurance can offset this. To understand the mechanism behind these findings, this section will examine the effects on household outcomes such as herding strategies, expenditure, and livestock holding. Since effects during the non-shock periods drive the average effects, I focus on the disaggregated effects in this subsection. Relevant average effects are reported in the Appendix.

Herd mobility is an important herding strategy for households which would have strong implications on the opportunity cost of children's schooling. I measure mobility in two ways; whether a household is partially or fully mobile and the share of livestock holdings kept away from home. The two measures are positively correlated but highlight different aspects of herding behavior. While the indicator for mobility focuses on whether a household is mobile, the share of kept away livestock is the intensity of the herd mobility.

Columns (1) and (2) of Table 5 show that both measures increased during the non-shock period, suggesting that the households are more likely to be mobile. During the non-drought seasons, the an additional seasons where a household is insured increases the likelihood of being mobile by 24.1 percentage point (a 40 percent increase). But during the drought season, IBLI decreases the mobility of a household by 19 percentage points. The estimated coefficients are statistically significant at one and ten percent level, respectively. Similarly, the share of livestock kept away from the base camp increased by 21.6 percentage points (34 percent increase) during the non-drought season, but decreased by 17 percentage points during the drought seasons. The results suggest that while IBLI allows households to resort to saving energy by not increasing their mobility during the droughts in expectation of indemnity payouts from the insurance, it increases the mobility during the non-drought seasons to utilize diverse grazing opportunities in the remote areas.

The changes in the mobility pattern explains the shift from part-time work and schooling to full-time schooling. As explained previously, most of the children who are participating in work and schooling simultaneously choose schooling as a primary activity and work as a secondary activity. When a household chooses to increase the mobility of the herd, which requires staying at satellite camps for months, children previously engaged in work as their secondary activity are more likely to drop work than to drop out of school since already heavier weight was put on schooling, thus increasing the probability of full-time schooling.

Diversification is another strategy that households can choose to cope with drought risks. I measure diversification in two ways – Simpson's diversification index[13] for livestock and income sources. The results reported in Table 5, Columns (3) and (4) show that IBLI uptake did not have substantial effects on both measures of livelihood diversification in general, during shock periods, and non-shock periods.

In addition, I observe an increase in livestock-related expenditure during the non-shock periods. Table 6 shows that livestock-related expenditure, especially expenditure on livestock food (e.g., water, fodder, and supplementary feeding for livestock), increases during the non-shock periods. It suggests that the pastoralists increase investments in livestock production, which is consistent with the findings of Jensen, Barrett, and Mude (2017). An increase in livestock expenditure is consistent with the story where as households increase their expenditures on fodder, it decreases the demand for children's work to collect fodder, thus decreasing part-time work of children.

Another potential channel is livestock holding considering the complementary

[13]Simpson (1949) introduced the index to measure the degree of concentration. In economics literature, Hirschman (1964) uses the formula to measure market concentration. Here, I subtract the sum of square of the share of each animal out of the animals owned (or the share of income from each income source out of the total household income), to obtain a measure of diversity, instead of concentration.

of children's work with herd size. Estimates presented in Table 7 show that uninsured households increase their livestock holding when the drought shocks occur, and the insurance offsets this. The effects are similar to the case for owned livestock, herding livestock, adult animals, and lactating animals. I further examine the heterogeneous effects of shock and insurance across initial herd sizes: I divided the sample into quintiles using the herd size at baseline and estimated the effects within each group. The results presented in Panel A of Table 8 show that the increase in herd size is driven by the households from the top quintile of the distribution. It indicates that the households with largest herd size at baseline increase herd size upon drought perhaps to use the arbitrage. In fact, households with the lowest quintile herd sizes decrease herd size during the drought periods when they are not insured. However, the results presented in Panel B show that children from all quintiles seem to increase participation in livestock related tasks during drought periods without insurance. Therefore, an increase in child labor and livestock-related tasks during drought periods among uninsured households is another evidence of using children as a means of self-insurance.

For the effects of insurance protecting children from increasing their participation in work, it could be driven by the households replacing children's work as a measure of self-insurance with an insurance product. However, if the timing of the indemnity payout came right before the school enrollment decisions, it could make it easier for insured households to send their child to school. Going back to the results in Table A3, Columns (3) and (4) of Panel B should present any statistically significant effect of shock and the insurance uptake for this story to hold, but they do not. Moreover, the timing of the drought shocks and the survey recall periods show that the beginning of school calendar years were during the shock, not after the payouts for both countries. Therefore, the households did not make these choice after receiving the indemnity payouts – they, in most cases, made these decisions during the drought shock. [14]

[14] Kenyan school calendar starts in January. Payout (shock) occurred in October-November 2011 (March-September 2011), March-April 2012 (October 2011-February 2012), March -April 2013 (October 2012-February 2013). So survey round 4 would capture the school enrollment decision after the first payout but in the middle of the second shock. Also survey round 5 would capture the

6.3 Heterogeneity of the Effects

Age and gender are also critical factors for children's work and schooling engagement. Households reported to prefer first-born sons for herding and sending younger siblings to school, prefer to send girls for education (Kenea, 2019). Figure 5 plots the probability of a child working at each age by gender. It shows that for both genders, 40 percent of children either work or study at age five, and almost 60 percent are involved in no activities, which drops to almost 0 by age ten. It also shows that while full-time work increases with age for both boys and girls, part-time work and schooling show an inverted U-shape as a child ages, peaking at 12. One notable difference between genders is that boys are most likely to work full-time at all ages. At the same time, girls are more likely to be doing part-time work and schooling between the ages of 8 and 15 – the primary education age group. It is because the girls participate in household tasks while the boys participate in livestock-related work, which makes it challenging to maintain the joint status of working and schooling. Therefore, I examine the heterogeneity of the effects by age, birth order, and gender.

Panel A of Table 9 shows that the average effects are not statistically different between the younger age group (5-12 years old) and older age group (13-17 years old). However, the estimates suggest that the younger children experience a decrease in more intensive activities, child labor, while older children decreased part-time work and schooling. Both age groups increase full-time schooling.

Panel B and C shows a bit different story. Younger age group increase child labor by 10.5 percentage points during droughts if they are not insured, but insurance mitigates this probability by 24.3 percentage points, estimated at 10 percent significance level. But it is clear that the older age group is more easily utilized when a household face drought shock. They are more likely to increase child labor, full-time work, work as a primary activity and decrease full-time schooling during

school enrollment decision during the third shock. Ethiopian school calendar starts in September. One payout occurred in Ethiopia was in November 2014, meaning that shock happened sometime between March to September 2014. So Survey round 4 must have collected information on school enrollment decision of September 2014, when the shock had strong impact on the decision.

droughts without insurance although, insurance mitigates these adverse effects on older age group children during droughts. Moreover, it is older age group children who shift from part-time work and schooling to full-time schooling during non-drought seasons, and decrease work as a secondary activity accordingly. Younger age group children, on the other hand, also decrease participation in work as a secondary activity during non-drought periods, it does not lead to decrease in part-time work and schooling. Note that IBLI also increased older age children's work as a primary activity by 10.2 percentage points, statistically significant at 10 percent level, which would suggest for older children, the decrease in part-time work and schooling are fed into two activities – full-time work as well as schooling.

A similar but more evident pattern arises in the heterogeneity by birth order presented in Table 10. All children increase participation in full-time schooling on average. However, the oldest sibling only decreases part-time work and schooling while the younger ones decrease child labor, full-time work participation, and work as a primary activity. The difference in these variables across the two groups is statistically significant (Panel A). Panel B and C shows the same pattern during non-drought periods. Additionally, they show that the first-borne child without insurance increases their participation in various types of work – child labor, full-time work, work as primary – during drought periods, although it is mitigated substantially by insurance. Also, the younger siblings decrease full-time work instead of part-time work and schooling during non-drought seasons to increase their participation in full-time schooling.

The heterogeneity across gender reveals a more nuanced difference of children's work between the two gender. First, it shows that girls are more likely to engage in part-time work and schooling while boys in full-time work and child labor. The average effects are statistically similar between genders in general, but disaggregated effects show that boys decrease their work during non-drought periods while girls during drought periods due to insurance. Table 11, Panel A shows that both genders switched from part-time work and schooling to full-time schooling, and none of the average effects and statistically significant. The magnitude of a decrease in child labor was much higher among girls – they decrease child labor by 11.9 percentage points, which is statistically significant at 5 percent level, while boys did not substantially. The results suggest that the households prioritized decreasing girls' participation in more severe forms of work than in boys. However, it does not lead to an increase in girls' full-time schooling disproportionately. Panel B shows a more stark difference. During drought periods, girls increase participation in work (child labor, part-time work and schooling) and decrease full-time schooling substantially, all of which were mitigated by insurance. On the other hand, boys shifted from part-time work and schooling to full-time schooling during non-drought periods, and did not show any substantial changes during drought periods.

6.4 Robustness check

I check if the results are robust to various specifications. First, Jensen, Barrett, and Mude (2017) points out that the effect of lapsed insurance may accumulate towards the future to affect the behaviors of the households. Therefore, they analyzed the effect of current and past insurance purchases simultaneously. In the specification used for the analyses, the cumulative IBLI uptake measures the number of IBLI uptake over the three latest sales seasons due to the recall period of child outcomes. Therefore, past purchases must have happened at least four sales seasons ago, and the lagged effect of past purchases from a long time ago may have dissipated. It is still possible that these longer-term lagged effects survived, so I show the estimates, including the cumulative past insurance uptake as a second endogenous variable. In this case, I cannot adequately test for the weaknesses of the instrument, so I focus on the estimated results. Table A9 shows that the results are robust to the inclusion of the past insurance purchases.

Another set of results uses the insurance coverage as an endogenous variable instead of the insurance uptake, measured by Tropical Livestock Units. Table A10 shows the results are robust to a different measure of insurance coverage. It also shows that not only at the extensive margin of insurance uptake, but also at the intensive margin of insurance has effect on children's activity choices. The results suggest that an additional TLU of livestock insured decreases child labor by 1.7 percentage points, part-time work and schooling by 1.9 percentage points, and increase full-time schooling by 2.3 percentage points.

Although the two regions – Marsabit district and Borana zone – are adjacent areas sharing pastoral livelihood, children from these two areas are different in school enrollment. In Marsabit district, children listed schooling as their primary or secondary activity was 58 percent, while it was only 34 percent in Borana zone. Work engagement is lower in Marsabit district. 68 percent of Marsabit children indicated the engagement in work while it was 77 percent in Borana zone. Child labor was higher in Borana zone (64 percent), compared to that of Marsabit district (38 percent). While I include individual fixed effects and area (sub-region) fixed effects to control for time-invariante country-specific characteristics, the year-specific situations within a country could have separate effects. Therefore, we include country $\times$ year fixed effects in the analysis as a robustness check. By including country $\times$ year fixed effects, I may absorb the variations necessary to identify the effects. Results presented in Table A11 show the qualitatively the same story as the main results, while the size of the coefficients become smaller and the estimates are no longer statistically significant anymore. Specifically, the table shows that child labor decreases by 9.2 percentage points on average. A shift from part-time work and schooling to full-time schooling (i.e., negative coefficients on part-time work and schooling and positive coefficients on full-time schooling) can be found, but the estimates are not statistically significant.

Lastly, I examine the robustness of the results using balanced panel households and the children who are 5 to 17 years old at the baseline survey year to ensure that my results do not come from a sample composition. Table A12 and A13 shows that this is not the case, and the results are robust to different ways to restrict the sample.

7 Conclusion

Drought-prone areas often lack access to formal insurance markets where households can purchase insurance products to mitigate the risk of adverse shocks. Due to the strong demand for within-household labor and limited opportunities for quality education, children from drought-prone pastoral communities are exposed to more child labor and low school enrollment. Especially during drought periods, the situations deteriorate for children – it increases children's involvement in work while decreasing time spent on schooling. Index-Based Livestock Insurance (IBLI), designed to protect the household's welfare from such adverse shocks, has the potential to address this concern of low investment in children's human capital, but such effects are not well understood. This paper fills this gap using the exogenous variation in the price of IBLI, created by coupons randomly distributed to the households in the Marsabit district of Kenya and the Borena zone of Ethiopia, employing the discount coupons to instrument insurance uptake with individual fixed effects.

Insurance increases households' investment in children's schooling. On average, children decrease participation in child labor and part-time work and schooling and increase full-time schooling, which is mostly driven by the effects that occurred in non-drought seasons. Moreover, insurance prevents using children's work for livestock-related work as a self-insurance measure during drought periods. The effects are robust to various specifications and sample restriction criteria. The changes in herding strategies drive the effects in non-drought season – increased herd mobility and expenditure on livestock fodder. The increased herd mobility increases the marginal cost of maintaining part-time work and schooling, so it decreases children's secondary work which, for most children doing part-time work and schooling, is work. The increased expenditure for livestock fodder could replace children's work in collecting the fodder.

The insurance effects differ depending on the demographic characteristics of children. Although insurance coverage increases full-time schooling among all children, children of primary school age and younger siblings are more likely to reduce participation in heavier types of work (child labor, full-time work). In contrast, teenagers and the oldest siblings shift from part-time work to full-time schooling during non-drought seasons. However, the teenagers and the oldest siblings are the ones who decrease their work during drought seasons due to insurance. In addition, while differences in the effects across genders are statistically significant, insurance coverage protected girls from being pushed from full-time schooling into work during shocks when their non-insured peers were pushed into work. At the same time, IBLI coverage increased full-time boy students, even though their full-time student status does not seem sensitive to droughts.

These results suggest that income-stabilizing policies such as index insurance can increase human capital investments for children. It is in line with the literature that access to credit mitigates the adverse effects of covariate shock on children's human capital investments (Beegle, Dehejia, and Gatti, 2006; Landmann and Frölich, 2015; Bandara, Dehejia, and Lavie-Rouse, 2015; Shah and Steinberg, 2017). Therefore, it highlights that investing in developing insurance markets in low-income countries can complement poverty reduction programs focusing on income growth.

The paper does not examine whether the increase in investment in children's education leads to the accumulation of human capital, which would require further examination along several dimensions. First, it requires an evaluation of the effect on children's human capital in the long term. Analyzing the long-term effects of IBLI on household outcomes, including children's human capital accumulation, requires a long-term follow-up data collection and analysis in more recent years, which is an ongoing effort. Second, it requires a more accurate and nuanced measurement of child labor. An essential aspect of child labor is whether the activity could harm or expose a child to a harmful environment – such as work in hazardous labor conditions. Whether this decreases or not is not discussed due to data limitations. Lastly, it requires a more specific measure of human capital, such as academic achievement or life skills. Since life skills are a type of human capital that can be applied generally in life and can be obtained through work, the measurement of child labor in various dimensions can enrich the discussion of the effect of insurance on children's human capital. All of these aspects should be the topic of further research.

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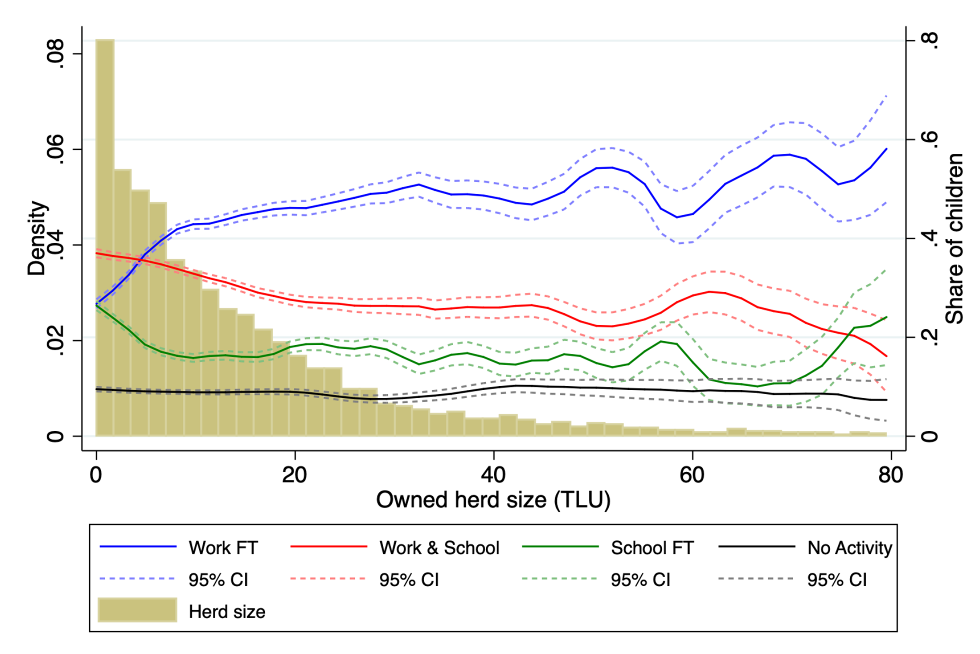
Figure 1: Children's activity by herd size

(a) Participation



(b) Hours, equals to zero if not participating

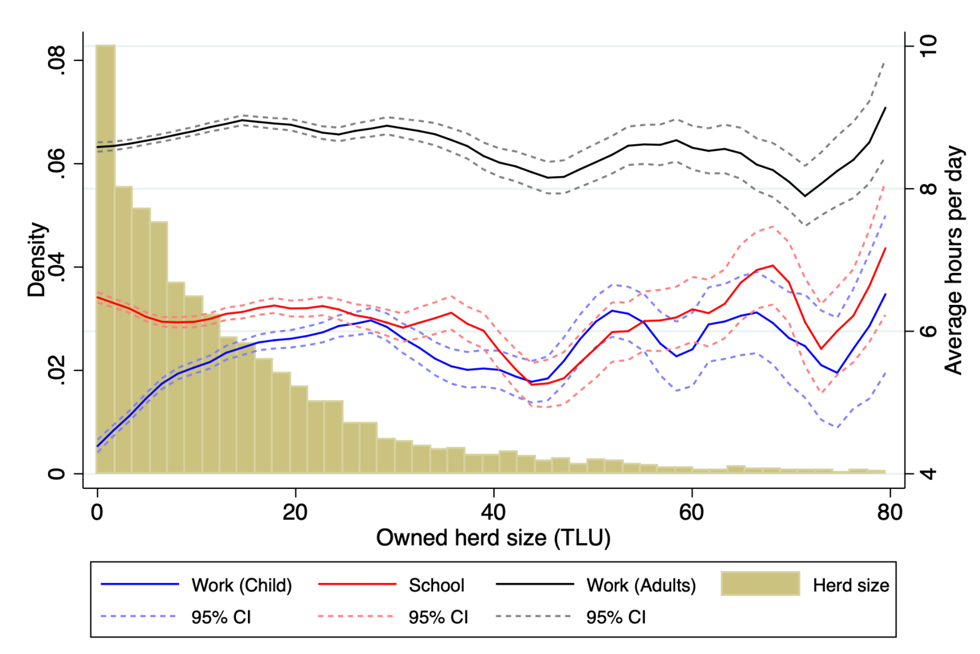


Figure 2: Map of project areas

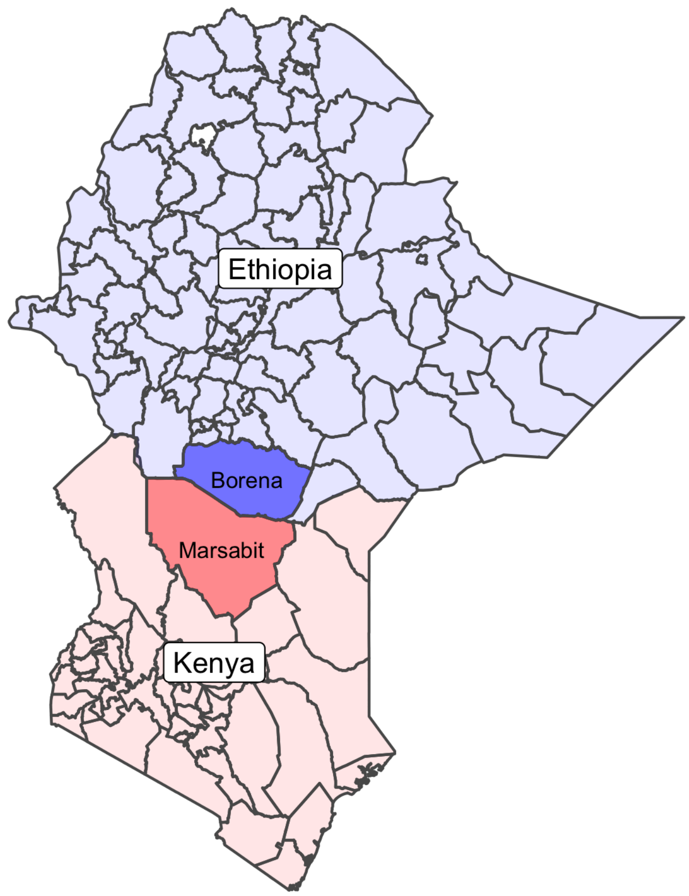
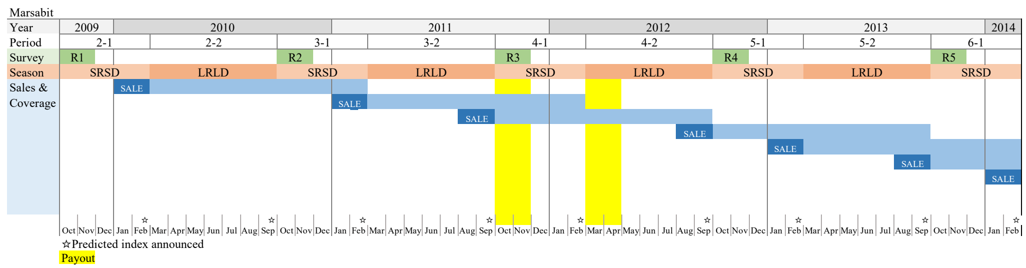


Figure 3: Timeline of the projects

(a) Marsabit District, Kenya



(b) Borena Zone, Ethiopia

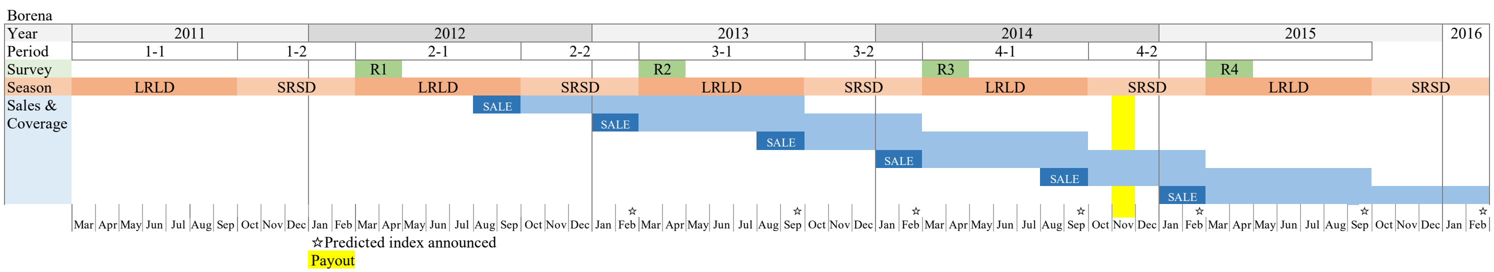
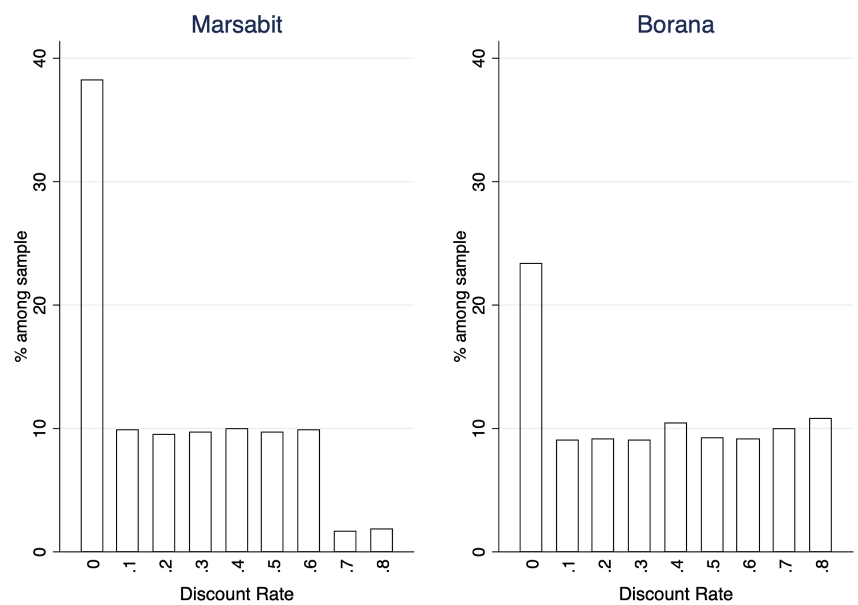


Figure 4: Discount Rate and Insured Livestock

(a) Discount Rates



(b) Livestock (TLU) insured, conditional on insurance purchase

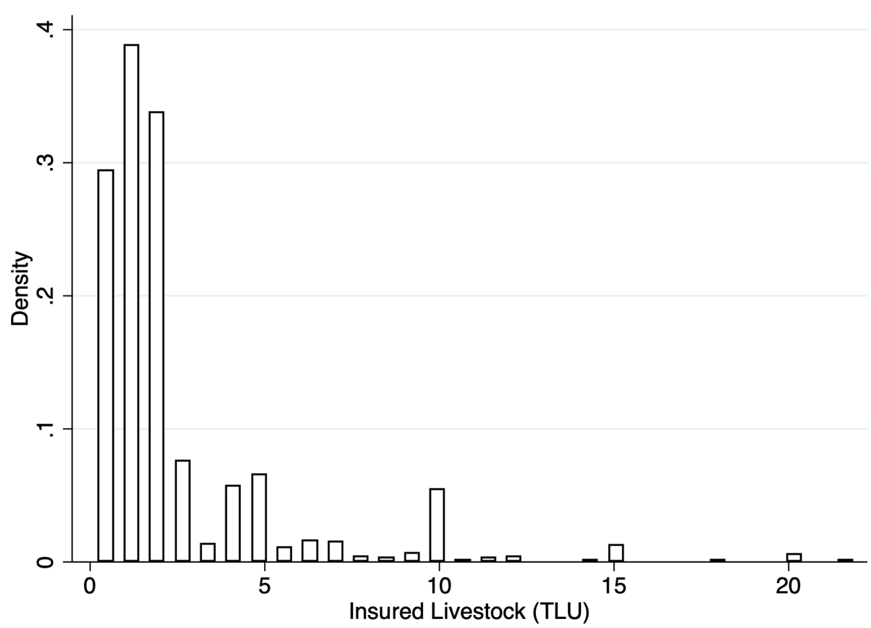
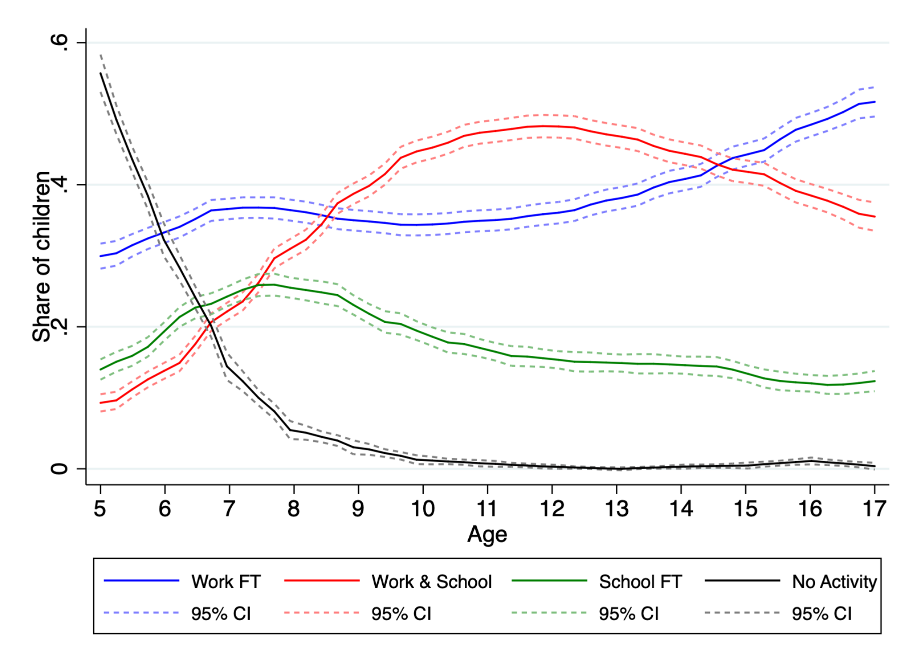


Figure 5: Children's activity by age and gender

(a) Girls



(b) Boys

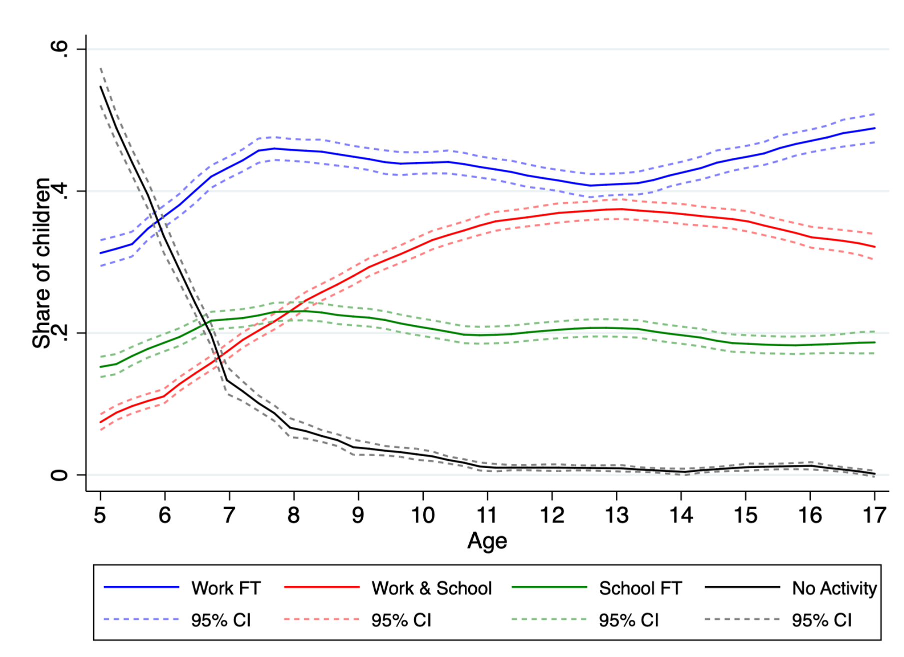


Table 1: Balance between recipients and non-recipients of coupon

	Coupon		No Coupon		Coupon vs. No Coupon		
	Mean (1)	SD (2)	Mean (3)	SD (4)	Difference (5)	SE (6)	N (7)
Panel A: Household Characteristics							
Head age	49.0	[17.8]	49.1	[16.2]	1.12	(0.678)	7530
=1 if Male-headed household	0.648	[0.478]	0.624	[0.484]	0.00126	(0.0177)	7533
Adult Equivalent	4.63	[2.02]	4.90	[2.06]	0.0928	(0.0727)	7553
Herd size (TLU)	14.4	[23.3]	12.2	[18.4]	0.426	(0.713)	7561
Consumption expenditure (ETB)	21.5	[25.1]	24.3	[25.5]	-0.126	(1.21)	6657
Livestock expenditure (ETB)	0.511	[1.51]	0.638	[2.00]	-0.146**	(0.0647)	7547
Joint test, p-val:					0.143		
Panel B: Individual Characteristics							
Age	11.3	[3.60]	11.7	[3.51]	-0.130	(0.0981)	8657
Female	0.479	[0.500]	0.469	[0.499]	0.00565	(0.0152)	8657
=1 if Work FT	0.450	[0.498]	0.413	[0.492]	0.0170	(0.0157)	8638
=1 if Work and school	0.278	[0.448]	0.292	[0.455]	-0.00647	(0.0158)	8638
=1 if School FT	0.182	[0.386]	0.221	[0.415]	-0.00808	(0.0173)	8638
=1 if No Activity	0.0897	[0.286]	0.0740	[0.262]	-0.00247	(0.00805)	8638
Hr: Work	3.89	[4.27]	3.32	[4.13]	0.0234	(0.123)	8638
Hr: School	2.73	[3.65]	2.94	[3.75]	-0.0946	(0.114)	8638
Hr: Leisure	17.4	[4.45]	17.8	[4.61]	0.0733	(0.107)	8657
Joint test, p-val:					0.823		

Notes: Column 1 to 4 reports mean and stadard deviation of variables for subjects received and not received discount coupon. Columns 5 and 6 report mean differences between the two groups. Standard deviations are in brackets, and standard errors are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01.

Table 2: 1st Stage Correlation

	Insurance Uptake (Cum.)	Shock $\times$ Insurance Uptake (Cum.)	Insurance Uptake (Cum.)
	(1)	(2)	(3)
Discount rate (Current + Cum.)	0.333***	0.048***	0.362***
	(0.031)	(0.011)	(0.030)
Shock $\times$ Discount rate (Cum.)	0.001	0.003***	
	(0.001)	(0.001)	
N	11319	11319	11319

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Discount rate (Cum.) is the sum of discount rates provided by the coupon over the latest three seasons. Relevant periods for insurance uptake are the same as those of the discount rate. All specifications include individual-, insurance area-, survey year- fixed effects, adult equivalent, age and age-squared, female dummy, age and sex of the household head, and tge number of children in the household.

Table 3: Impact on Child Activities

	Child Labor	Work FT	Work and School	School FT	Neither Work Nor School
	(1)	(2)	(3)	(4)	(5)
Panel A: Average Effects					
Insurance Uptake (Cum.)	-0.086**	-0.025	-0.098***	0.119***	0.005
	(0.042)	(0.032)	(0.037)	(0.034)	(0.025)
N	12243	12243	12243	12243	12250
F_{eff}	54.577	54.577	54.577	54.577	54.581
5% Critical Value	37.418	37.418	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109	23.109	23.109
AR test p-val.	0.036	0.427	0.008	0.000	0.854
Mean of Dep. Var.	0.426	0.374	0.271	0.163	0.193
Panel B: Disaggregated Effects					
Shock	0.091**	0.014	0.036	-0.028	-0.022
	(0.040)	(0.022)	(0.035)	(0.036)	(0.018)
Insurance Uptake (Cum.)	-0.034	-0.018	-0.087*	0.109***	-0.004
	(0.053)	(0.043)	(0.046)	(0.042)	(0.034)
Shock × Insurance Uptake (Cum.)	-0.198*	-0.028	-0.056	0.046	0.039
	(0.102)	(0.066)	(0.089)	(0.090)	(0.054)
Shock+Uptake × Shock (coef.)	-0.108	-0.014	-0.020	0.018	0.017
Shock+Uptake × Shock (p-val.)	0.140	0.783	0.756	0.774	0.685
N	11319	11319	11319	11319	11326
K-P F-stat	23.929	23.929	23.929	23.929	23.917
AR test p-val.	0.007	0.591	0.025	0.002	0.685
Mean of Dep. Var.	0.535	0.406	0.314	0.180	0.100

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year-fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table 4: Impact on Various Types of Child Activities

	Primary Activity				Secondary Activity			
	Any work	Livestock related tasks	HH tasks	School	Any work	Livestock related tasks	HH Tasks	School
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Average Effects								
Insurance Uptake (Cum.)	0.009	0.014	0.001	-0.007	-0.195***	-0.068*	-0.083*	0.030**
	(0.033)	(0.030)	(0.028)	(0.029)	(0.053)	(0.038)	(0.044)	(0.013)
N	12242	12242	12242	12242	12243	12243	12243	12243
F_{eff}	54.509	54.509	54.509	54.509	54.577	54.577	54.577	54.577
5% Critical Value	37.418	37.418	37.418	37.418	37.418	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109	23.109	23.109	23.109	23.109	23.109
AR test p-val.	0.780	0.644	0.975	0.818	0.000	0.072	0.052	0.017
Mean of Dep. Var.	0.376	0.252	0.105	0.429	0.398	0.121	0.249	0.005
Panel B: Disaggregated Effects								
Shock	0.026	0.055**	-0.026	-0.004	0.046	-0.036	0.062	0.031***
	(0.022)	(0.022)	(0.020)	(0.022)	(0.047)	(0.028)	(0.044)	(0.010)
Insurance Uptake (Cum.)	0.025	0.036	-0.005	-0.012	-0.193***	-0.068	-0.089*	0.040**
	(0.044)	(0.042)	(0.036)	(0.037)	(0.067)	(0.050)	(0.053)	(0.018)
Shock × Insurance Uptake (Cum.)	-0.058	-0.096	0.035	0.015	-0.038	0.027	-0.032	-0.048
	(0.063)	(0.067)	(0.056)	(0.061)	(0.126)	(0.072)	(0.111)	(0.032)
Shock+Uptake × Shock (coef.)	-0.032	-0.041	0.010	0.011	0.007	-0.009	0.030	-0.017
Shock+Uptake × Shock (p-val.)	0.511	0.420	0.818	0.809	0.936	0.866	0.702	0.485
N	11318	11318	11318	11318	11319	11319	11319	11319
K-P F-stat	23.961	23.961	23.961	23.961	23.929	23.929	23.929	23.929
AR test p-val.	0.650	0.324	0.782	0.951	0.000	0.334	0.087	0.061
Mean of Dep. Var.	0.412	0.310	0.089	0.487	0.446	0.152	0.270	0.009

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year- fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table 5: Impact on Herding Stratgeies

	Mobile	Share of livestock kept away	Livestock Diversity Index	Income Diversity Index
	(1)	(2)	(3)	(4)
Shock	-0.062	0.045	-0.019	0.015
	(0.048)	(0.037)	(0.021)	(0.031)
Insurance Uptake (Cum.)	0.241***	0.216***	-0.010	0.060
	(0.079)	(0.060)	(0.023)	(0.042)
Shock $\times$ Insurance Uptake (Cum.)	-0.127	-0.215**	0.058	-0.078
	(0.132)	(0.101)	(0.050)	(0.080)
Shock+Uptake $\times$ Shock (coef.)	-0.189	-0.170	0.038	-0.063
Shock+Uptake $\times$ Shock (p-val.)	0.056	0.024	0.273	0.275
N	4327	4145	4327	4327
K-P F-stat	25.486	24.784	25.486	25.486
AR test p-val.	0.002	0.000	0.503	0.358
Mean of Dep. Var.	0.600	0.633	0.409	0.215

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01.

Table 6: Impact on Household Expenditures in Response to Shock

	Food expenditure	Non-food expenditure	Livestock expenditure (Total)	Livestock food	Livestock Veterinary
	(1)	(2)	(3)	(4)	(5)
Shock	-1.717*	-0.198	0.220	0.063	0.067
	(0.946)	(1.276)	(0.180)	(0.128)	(0.047)
Insurance Uptake (Cum.)	-1.318	0.832	0.433*	0.269**	-0.044
	(1.301)	(1.357)	(0.234)	(0.134)	(0.051)
Shock × Insurance Uptake (Cum.)	1.016	-3.362	-0.818	-0.480	0.011
	(2.488)	(2.906)	(0.498)	(0.388)	(0.135)
Shock+Uptake × Shock (coef.)	-0.701	-3.560	-0.597	-0.417	0.077
Shock+Uptake × Shock (p-val.)	0.692	0.073	0.105	0.130	0.416
N	4324	4317	4315	4315	4315
K-P F-stat	25.517	25.431	25.275	25.275	25.275
AR test p-val.	0.572	0.493	0.099	0.107	0.675
Mean of Dep. Var.	15.844	8.182	0.624	0.334	0.185

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01.

Table 7: Impact on Herd Size

	Herd size (own)	Herd size (herding)	Adult animals	Lactating animals
	(1)	(2)	(3)	(4)
Shock	2.630**	3.667***	2.002**	0.840
	(1.050)	(1.267)	(0.944)	(0.580)
Insurance Uptake (Cum.)	2.123	-0.054	-1.241	-1.367*
	(1.896)	(2.284)	(1.651)	(0.719)
Shock × Insurance Uptake (Cum.)	-4.021	-3.587	-1.800	-0.105
	(2.624)	(3.105)	(2.162)	(1.416)
Shock+Uptake × Shock (coef.)	-1.391	0.080	0.202	0.735
Shock+Uptake × Shock (p-val.)	0.458	0.970	0.890	0.442
N	4327	4327	4327	4327
K-P F-stat	25.486	25.486	25.486	25.486
AR test p-val.	0.297	0.372	0.317	0.107
Mean of Dep. Var.	13.507	14.772	9.783	3.972

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01.

Table 8: Impact on Herd Size and Children's work by Initial Herd Size

	Smallest Quintile	Second Quintile	Third Quintile	Fourth Quitile	Largest Quintile
	(1)	(2)	(3)	(4)	(5)
Panel A: Effects on Herd size					
Shock	-2.307*	0.242	2.745	0.151	8.592**
	(1.220)	(0.646)	(1.786)	(2.097)	(4.232)
Insurance Uptake (Cum.)	-0.243	5.345**	1.304	2.641	4.253
	(1.759)	(2.186)	(3.486)	(2.442)	(4.482)
Shock × Insurance Uptake (Cum.)	5.754	-3.981	-6.732	1.932	-10.987
	(4.941)	(2.512)	(4.113)	(3.957)	(7.122)
Shock+Uptake × Shock (coef.)	3.447	-3.739	-3.988	2.083	-2.394
Shock+Uptake × Shock (p-val.)	0.372	0.077	0.179	0.394	0.606
N	910	948	936	926	939
K-P F-stat	1.417	10.256	6.342	10.831	10.336
AR test p-val.	0.138	0.020	0.170	0.202	0.326
Mean of Dep. Var.	3.599	7.786	14.394	29.840	.
Panel B: Effects on Children's Livestock-related Tasks					
Shock	0.083	0.017	0.078	0.080	0.050
	(0.073)	(0.045)	(0.068)	(0.052)	(0.057)
Insurance Uptake (Cum.)	0.077	0.176	-0.009	0.014	-0.044
	(0.137)	(0.150)	(0.180)	(0.069)	(0.057)
Shock × Insurance Uptake (Cum.)	-0.211	-0.285	-0.010	-0.050	-0.057
	(0.326)	(0.174)	(0.196)	(0.110)	(0.108)
Shock+Uptake × Shock (coef.)	-0.128	-0.268	0.068	0.030	-0.008
Shock+Uptake × Shock (p-val.)	0.628	0.064	0.650	0.718	0.918
N	1757	1998	2114	2108	2346
K-P F-stat	1.309	6.552	4.569	9.810	8.036
AR test p-val.	0.779	0.186	0.991	0.894	0.407
Mean of Dep. Var.	0.202	0.272	0.367	0.368	.

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01.

Table 9: Impact on Child Activities, by Age

	Child Labor	Work FT	Work and School	School FT	Work as Primary	Work as Secondary
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Heterogeneity of Average Effects						
Age 5-12 × Insurance Uptake (Cum.)	-0.149***	-0.032	-0.072	0.101**	-0.006	-0.196***
	(0.057)	(0.046)	(0.046)	(0.041)	(0.047)	(0.063)
Age 13-17 × Insurance Uptake (Cum.)	-0.045	-0.004	-0.196***	0.181***	0.050	-0.267***
	(0.069)	(0.045)	(0.073)	(0.065)	(0.044)	(0.099)
Difference	-0.103	-0.028	0.124	-0.080	-0.057	0.071
	(0.088)	(0.064)	(0.082)	(0.072)	(0.064)	(0.109)
N	12197	12197	12197	12197	12196	12197
Panel B: Disaggreagted Effects, Children of Age 5-12						
Shock	0.107**	0.013	0.005	0.016	0.022	0.011
	(0.054)	(0.032)	(0.042)	(0.043)	(0.033)	(0.054)
Insurance Uptake (Cum.)	-0.085	-0.022	-0.051	0.087*	-0.002	-0.170**
	(0.072)	(0.062)	(0.056)	(0.050)	(0.063)	(0.078)
Shock × Insurance Uptake (Cum.)	-0.248*	-0.036	-0.057	0.022	-0.030	-0.074
	(0.141)	(0.092)	(0.104)	(0.110)	(0.095)	(0.144)
Shock+Uptake × Shock (coef.)	-0.141	-0.023	-0.052	0.039	-0.008	-0.063
Shock+Uptake × Shock (p-val.)	0.165	0.744	0.494	0.623	0.918	0.547
N	6862	6862	6862	6862	6862	6862
Mean of Dep. Var.	0.549	0.375	0.279	0.191	0.378	0.374
Panel C: Disaggreagted Effects, Children of Age 13-17						
Shock	0.126**	0.048*	0.078	-0.123**	0.065**	0.092
	(0.057)	(0.025)	(0.061)	(0.062)	(0.026)	(0.075)
Insurance Uptake (Cum.)	-0.011	0.017	-0.215**	0.173**	0.099*	-0.304**
	(0.084)	(0.059)	(0.089)	(0.075)	(0.059)	(0.121)
Shock × Insurance Uptake (Cum.)	-0.186	-0.091	-0.002	0.110	-0.180**	0.036
	(0.139)	(0.073)	(0.157)	(0.153)	(0.077)	(0.201)
Shock+Uptake × Shock (coef.)	-0.059	-0.043	0.076	-0.013	-0.115	0.128
Shock+Uptake × Shock (p-val.)	0.550	0.452	0.496	0.904	0.059	0.382
N	3846	3846	3846	3846	3846	3846
Mean of Dep. Var.	0.510	0.458	0.373	0.162	0.468	0.568

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year- fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table 10: Impact on Child Activities, by Birth Order

	Child Labor	Work FT	Work and School	School FT	Work as Primary	Work as Secondary
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Heterogeneity of Average Effects						
1st born × Insurance Uptake (Cum.)	-0.042	0.076	-0.224***	0.144**	0.133**	-0.341***
	(0.077)	(0.059)	(0.068)	(0.057)	(0.060)	(0.098)
Others × Insurance Uptake (Cum.)	-0.131**	-0.095**	-0.036	0.119***	-0.069*	-0.146***
	(0.051)	(0.040)	(0.039)	(0.039)	(0.040)	(0.056)
Difference	0.089	0.171**	-0.188**	0.025	0.202***	-0.195*
	(0.091)	(0.071)	(0.075)	(0.064)	(0.072)	(0.106)
N	12197	12197	12197	12197	12196	12197
Panel B: Disaggreagted Effects, Oldest siblings						
Shock	0.130**	0.049*	0.000	-0.021	0.073***	-0.024
	(0.053)	(0.027)	(0.047)	(0.048)	(0.027)	(0.058)
Insurance Uptake (Cum.)	0.095	0.124	-0.219**	0.124*	0.214**	-0.415***
	(0.103)	(0.087)	(0.090)	(0.075)	(0.088)	(0.134)
Shock × Insurance Uptake (Cum.)	-0.377**	-0.134	-0.011	0.055	-0.219**	0.172
	(0.150)	(0.100)	(0.135)	(0.136)	(0.093)	(0.181)
Shock+Uptake × Shock (coef.)	-0.247	-0.085	-0.011	0.034	-0.146	0.148
Shock+Uptake × Shock (p-val.)	0.035	0.329	0.919	0.744	0.071	0.302
N	3670	3670	3670	3670	3670	3670
K-P F-stat	0.523	0.464	0.350	0.154	0.471	0.539
Panel C: Disaggreagted Effects, Younger siblings						
Shock	0.040	-0.012	0.028	-0.001	-0.013	0.048
	(0.051)	(0.036)	(0.043)	(0.042)	(0.036)	(0.055)
Insurance Uptake (Cum.)	-0.131**	-0.103*	-0.050	0.133***	-0.089	-0.157**
	(0.067)	(0.056)	(0.050)	(0.048)	(0.057)	(0.073)
Shock × Insurance Uptake (Cum.)	-0.031	0.028	0.014	-0.035	0.063	-0.011
	(0.126)	(0.094)	(0.101)	(0.098)	(0.098)	(0.136)
Shock+Uptake × Shock (coef.)	0.009	0.017	0.043	-0.036	0.050	0.038
Shock+Uptake × Shock (p-val.)	0.917	0.802	0.540	0.595	0.486	0.691
N	6968	6968	6968	6968	6967	6968
K-P F-stat	0.541	0.372	0.293	0.196	0.377	0.393

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year- fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table 11: Impact on Child Activities, by Gender

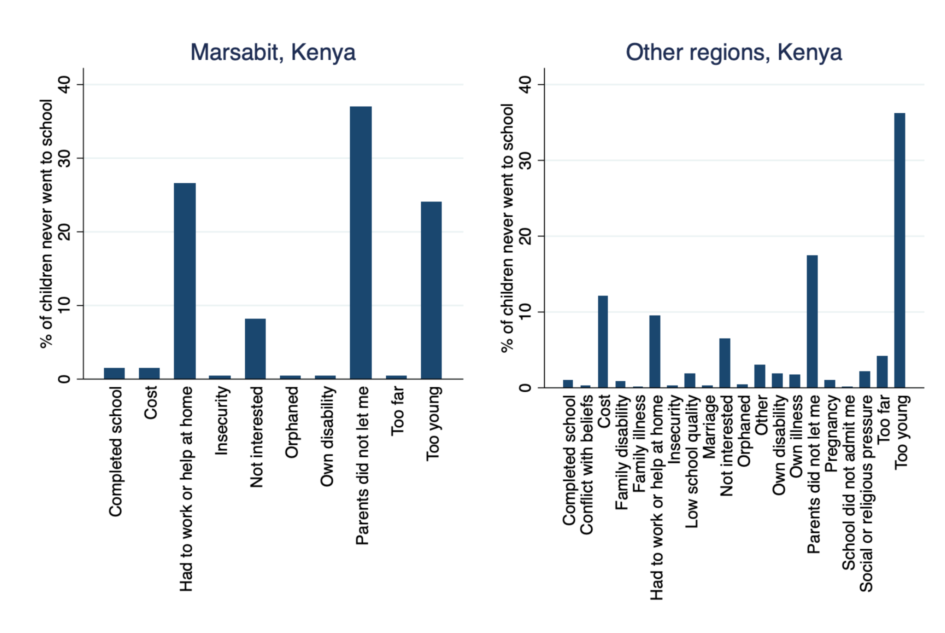
	Child Labor	Work FT	Work and School	School FT	Work as Primary	Work as Secondary
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Heterogeneity of Average Effects						
Female × Insurance Uptake (Cum.)	-0.119**	-0.042	-0.093*	0.102**	0.017	-0.175***
	(0.057)	(0.046)	(0.050)	(0.040)	(0.047)	(0.068)
Male × Insurance Uptake (Cum.)	-0.056	-0.015	-0.101**	0.141***	-0.004	-0.214***
	(0.058)	(0.043)	(0.050)	(0.051)	(0.043)	(0.071)
Difference	-0.063	-0.026	0.008	-0.039	0.021	0.038
	(0.079)	(0.062)	(0.067)	(0.060)	(0.062)	(0.091)
N	12197	12197	12197	12197	12196	12197
Panel B: Disaggreagted Effects, Girls						
Shock	0.191***	0.004	0.108**	-0.115**	0.021	0.099
	(0.066)	(0.033)	(0.054)	(0.054)	(0.032)	(0.075)
Insurance Uptake (Cum.)	-0.015	-0.014	-0.032	0.029	0.050	-0.076
	(0.076)	(0.065)	(0.065)	(0.054)	(0.066)	(0.089)
Shock × Insurance Uptake (Cum.)	-0.393**	-0.070	-0.229*	0.261*	-0.095	-0.312
	(0.176)	(0.094)	(0.138)	(0.145)	(0.095)	(0.205)
Shock+Uptake × Shock (coef.)	-0.202	-0.066	-0.121	0.145	-0.074	-0.213
Shock+Uptake × Shock (p-val.)	0.099	0.356	0.216	0.156	0.310	0.140
N	5395	5395	5395	5395	5395	5395
K-P F-stat	0.490	0.380	0.352	0.165	0.387	0.504
Panel C: Disaggreagted Effects, Boys						
Shock	0.006	0.026	-0.030	0.049	0.031	0.001
	(0.046)	(0.028)	(0.042)	(0.044)	(0.028)	(0.056)
Insurance Uptake (Cum.)	-0.056	-0.029	-0.140**	0.195***	-0.006	-0.304***
	(0.074)	(0.057)	(0.062)	(0.063)	(0.056)	(0.094)
Shock × Insurance Uptake (Cum.)	-0.004	0.017	0.122	-0.172	-0.018	0.230
	(0.121)	(0.087)	(0.107)	(0.107)	(0.083)	(0.152)
Shock+Uptake × Shock (coef.)	0.003	0.043	0.092	-0.122	0.014	0.231
Shock+Uptake × Shock (p-val.)	0.977	0.534	0.244	0.112	0.836	0.041
N	5840	5840	5840	5840	5839	5840
K-P F-stat	0.576	0.429	0.279	0.195	0.434	0.393

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year- fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

A Appendix: Additional Figures and Tables

Figure A1: Reason why children never attended school

(a) Marsabit District, Kenya



(b) Borena Zone, Ethiopia

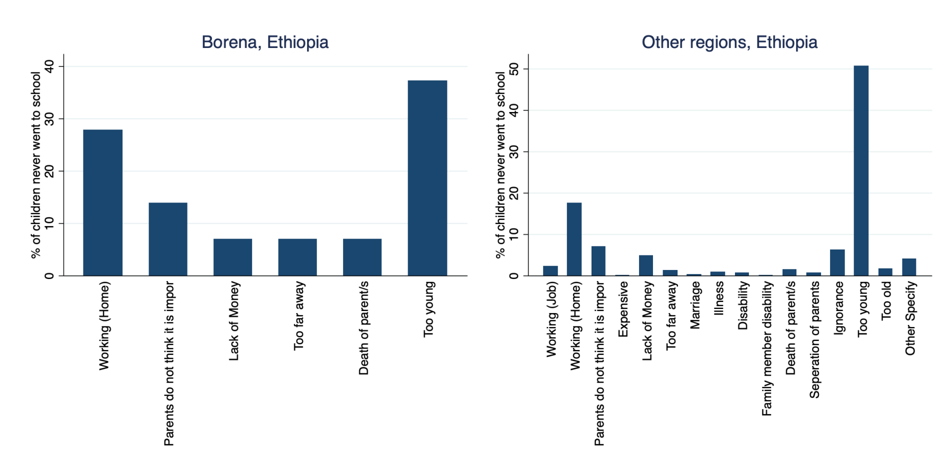
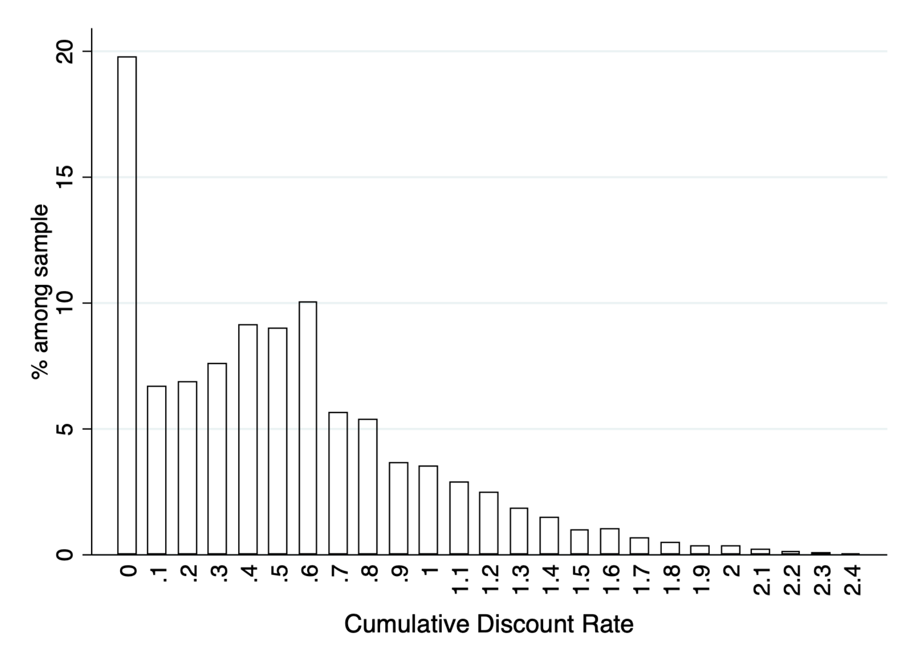


Figure A2: Cumulative discount rate and Insurance uptake

(a) Cumulative Discount Rates, the three recent sales seaons



(b) Total number of Insurance uptake, the three recent sales seasons

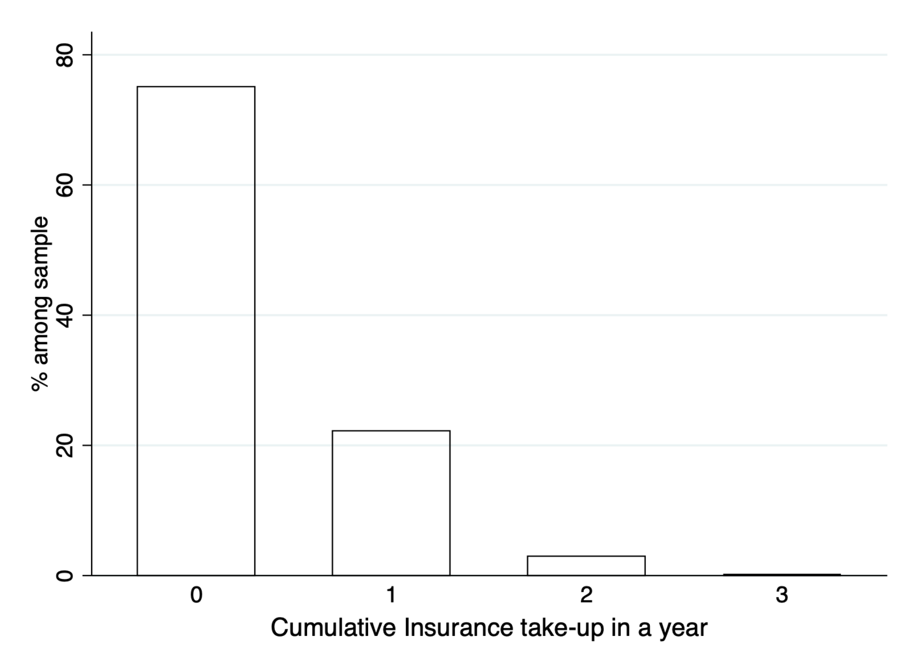


Table A1: First-stage predictive power of Table A3, Panel B

Panel A					
Shock	0.042*	0.003	0.032	-0.024	-0.006
	(0.023)	(0.015)	(0.021)	(0.021)	(0.012)
Insurance Uptake (Cum.)	-0.110**	-0.027	-0.114***	0.133***	0.036
	(0.047)	(0.035)	(0.041)	(0.039)	(0.027)
N	11744	11744	11744	11744	11744
F_{eff}	24.714	24.714	24.714	24.714	24.714
5% Critical Value	6.278	4.450	4.874	5.179	7.221
10% Critical Value	4.819	3.771	4.010	4.185	5.366
AR test p-val.	0.009	0.672	0.017	0.001	0.383
Mean of Dep. Var.	0.431	0.392	0.251	0.164	0.111
Panel B					
Shock	0.102***	0.012	0.061*	-0.056	-0.008
	(0.039)	(0.021)	(0.034)	(0.035)	(0.017)
Shock × Insurance Uptake (Cum.)	-0.223***	-0.040	-0.141*	0.160**	0.025
	(0.085)	(0.050)	(0.076)	(0.076)	(0.039)
N	11744	11744	11744	11744	11744
F_{eff}	14.274	14.274	14.274	14.274	14.274
5% Critical Value	31.459	31.456	31.456	31.456	31.462
10% Critical Value	19.617	19.615	19.615	19.615	19.619
AR test p-val.	0.009	0.672	0.017	0.001	0.383
Mean of Dep. Var.	0.431	0.392	0.251	0.164	0.111

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. Shock is an indicator if an insurance area is affected by the drought in that year. All specifications include individual-, insurance area-, survey year- fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table A2: Impact on Child Activities (ITT)

	Child Labor	Work FT	Work and School	School FT	No activity
	(1)	(2)	(3)	(4)	(5)
Panel A: Average Effects					
Discount rate (Current + Cum.)	-0.034**	-0.010	-0.039***	0.047***	0.002
	(0.015)	(0.011)	(0.013)	(0.012)	(0.009)
N	12250	12250	12250	12250	12259
Mean of Dep. Var.	0.535	0.406	0.314	0.180	0.100
Panel B: Disaggregated Effects					
Shock	0.051*	0.006	0.015	-0.006	-0.015
	(0.026)	(0.015)	(0.024)	(0.024)	(0.012)
Discount rate (Current + Cum.)	-0.022	-0.008	-0.034***	0.041***	0.001
	(0.015)	(0.012)	(0.013)	(0.012)	(0.010)
Shock $\times$ Discount rate (Cum.)	-0.001**	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Shock+Uptake $\times$ Shock (coef.)	0.050	0.006	0.015	-0.005	-0.015
Shock+Uptake $\times$ Shock (p-val.)	0.055	0.676	0.534	0.819	0.217
N	12250	12250	12250	12250	12259
K-P F-stat	0.535	0.406	0.314	0.180	0.100

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year-fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table A3: Impact on Child Activities (OLS using insurance uptake)

	Child Labor	Work FT	Work and School	School FT	Neither Work Nor School
	(1)	(2)	(3)	(4)	(5)
Panel A: Average Effects					
Insurance Uptake (Cum.)	0.003	0.006	-0.019	0.013	-0.000
	(0.013)	(0.009)	(0.012)	(0.011)	(0.007)
N	12197	12197	12197	12197	12204
Mean of Dep. Var.	0.535	0.406	0.314	0.180	0.100
Panel B: Disaggregated Effects					
Shock	0.015	-0.005	0.002	0.006	-0.002
	(0.022)	(0.015)	(0.021)	(0.020)	(0.012)
Insurance Uptake (Cum.)	0.012	0.007	-0.029**	0.018	0.005
	(0.015)	(0.011)	(0.015)	(0.013)	(0.009)
Shock $\times$ Insurance Uptake (Cum.)	-0.026	-0.000	0.024	-0.012	-0.013
	(0.023)	(0.015)	(0.023)	(0.023)	(0.011)
N	12197	12197	12197	12197	12204
Mean of Dep. Var.	0.548	0.426	0.302	0.164	0.108

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year-fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table A4: Impact on Children's Working Hours Conditional on Working

	Child Labor	Work FT	Work and School	School FT	No activity
	(1)	(2)	(3)	(4)	(5)
Panel A: Average Effects					
Insurance Uptake (Cum.)	-0.230	-0.762*	0.413	-2.125	0.505
	(0.349)	(0.430)	(0.296)	(1.301)	(0.309)
N	6376	4767	3738	2062	11744
F_{eff}	32.731	30.106	18.371	2.388	52.715
5% Critical Value	37.418	37.418	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109	23.109	23.109
AR test p-val.	0.506	0.063	0.161	0.046	0.097
Mean of Dep. Var.	5.870	7.319	3.001	6.941	17.166
Panel B: Disaggregated Effects					
Shock	0.114	0.182	0.376*	-3.298	-0.428*
	(0.304)	(0.522)	(0.206)	(8.284)	(0.253)
Insurance Uptake (Cum.)	-0.776	-1.759***	0.820**	-22.144	0.722*
	(0.474)	(0.609)	(0.370)	(58.999)	(0.393)
Shock $\times$ Insurance Uptake (Cum.)	1.260	2.441**	-1.423**	20.017	-0.191
	(0.838)	(1.205)	(0.562)	(52.866)	(0.667)
Shock+Uptake $\times$ Shock (coef.)	1.374	2.623	-1.047	16.719	-0.620
Shock+Uptake $\times$ Shock (p-val.)	0.030	0.001	0.013	0.708	0.205
N	5110	3864	2902	1133	10811
K-P F-stat	12.342	7.227	11.672	0.068	25.457
AR test p-val.	0.199	0.004	0.017	0.062	0.113
Mean of Dep. Var.	6.824	8.149	2.993	7.115	16.274

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year-fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table A5: Impact on Various Types of Child Activities

	Primary Activity				Secondary Activity			
	Any work	Livestock related tasks	HH tasks	School	Any work	Livestock related tasks	HH Tasks	School
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Average Effects								
Insurance Uptake (Cum.)	-0.496	-0.509	-0.250	-0.291	0.126	0.419	-0.206	4.976
	(0.363)	(0.392)	(1.403)	(0.305)	(0.190)	(0.293)	(0.343)	(3.027)
N	4849	3724	1005	5691	5280	1833	3147	124
F_{eff}	29.700	21.888	5.909	25.266	27.318	18.463	14.222	6.025
5% Critical Value	37.418	37.418	37.418	37.418	37.418	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109	23.109	23.109	23.109	23.109	23.109
AR test p-val.	0.168	0.195	0.859	0.333	0.514	0.137	0.539	0.440
Mean of Dep. Var.	6.514	7.182	5.329	6.750	2.742	2.709	2.773	3.428
Panel B: Disaggregated Effects								
Shock	0.375	0.205	1.321	-0.031	-0.023	0.262	-0.030	12.986**
	(0.398)	(0.410)	(1.081)	(0.145)	(0.167)	(0.358)	(0.260)	(5.447)
Insurance Uptake (Cum.)	-1.142**	-1.248**	-0.432	-0.229	0.053	0.595*	-0.298	4.976
	(0.510)	(0.571)	(1.279)	(0.401)	(0.245)	(0.331)	(0.423)	(3.027)
Shock $\times$ Insurance Uptake (Cum.)	1.413	1.674	-0.996	-0.108	0.170	-0.858	0.188	0.000
	(1.012)	(1.066)	(3.046)	(0.414)	(0.375)	(0.634)	(0.672)	(.)
Shock+Uptake $\times$ Shock (coef.)	1.788	1.879	0.325	-0.139	0.146	-0.596	0.158	12.986
Shock+Uptake $\times$ Shock (p-val.)	0.012	0.016	0.879	0.673	0.603	0.136	0.750	0.017
N	3919	2993	425	5009	3893	865	2057	17
K-P F-stat	6.336	7.460	1.079	22.164	21.614	20.738	7.521	10.948
AR test p-val.	0.056	0.058	0.882	0.539	0.794	0.122	0.770	0.440
Mean of Dep. Var.	7.269	7.772	5.568	7.078	2.827	2.754	2.860	3.188

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year- fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table A6: Impacts on Household Outcome

	Fully Settled	Share of livestock kept away from home	N of type of livestock	N of income sources
	(1)	(2)	(3)	(4)
Insurance Uptake (Cum.)	-0.128**	-0.157***	0.051	-0.129
	(0.054)	(0.042)	(0.051)	(0.099)
N	4959	4735	4959	4959
F_{eff}	163.414	154.725	163.414	163.414
5% Critical Value	37.418	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109	23.109
AR test p-val.	0.015	0.000	0.321	0.193
Mean of Dep. Var.	0.445	0.400	1.777	1.516

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01.

Table A7: Impacts on Household Outcome

	Food expenditure	Non-food expenditure	Education expenditure	Livestock expenditure (Total)	Livestock food	Livestock Veterinary	Saving
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Insurance Uptake (Cum.)	446.330	-0.020	-0.140	0.269	0.061	-0.031	-11013.290
	(305.208)	(1.029)	(0.312)	(0.187)	(0.040)	(0.050)	(7075.257)
N	4956	4950	4950	4948	4946	4946	4958
F_{eff}	162.193	163.302	163.302	163.541	163.439	163.439	163.518
5% Critical Value	37.418	37.418	37.418	37.418	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109	23.109	23.109	23.109	23.109
AR test p-val.	0.142	0.985	0.653	0.148	0.129	0.541	0.120
Mean of Dep. Var.	37.461	6.103	0.774	0.755	0.079	0.148	629.303

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01.

Table A8: Impacts on Household Herd Size

	Herd size (own)	Herd size (herding)	Adult animals	Lactating animals	Milk Production	Milk Sale
	(1)	(2)	(3)	(4)	(5)	(6)
Insurance Uptake (Cum.)	2.055	0.709	-0.493	-0.872	-5.194	82.169
	(1.364)	(1.710)	(1.330)	(0.558)	(376.932)	(227.277)
N	4959	4959	4959	4959	4959	4959
F_{eff}	163.414	163.414	163.414	163.414	163.414	163.414
5% Critical Value	37.418	37.418	37.418	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109	23.109	23.109	23.109
AR test p-val.	0.137	0.679	0.712	0.119	0.989	0.717
Mean of Dep. Var.	13.510	15.269	9.504	3.313	2585.088	356.914

Table A9: Impact on Child Activities with lapsed insurance

	Child Labor	Work FT	Work and School	School FT	No activity
	(1)	(2)	(3)	(4)	(5)
Insurance Uptake (Cum.)	-0.134	-0.037	-0.181**	0.220***	-0.001
	(0.082)	(0.057)	(0.077)	(0.074)	(0.045)
Insurance Updatke (Lapsed)	-0.110	-0.027	-0.191	0.231	-0.013
	(0.148)	(0.093)	(0.140)	(0.141)	(0.078)
N	11319	11319	11319	11319	11326
K-P F-stat	29.105	29.105	29.105	29.105	29.129
AR test p-val.	0.098	0.723	0.015	0.000	0.966
Mean of Dep. Var.	0.535	0.406	0.314	0.180	0.100

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year- fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table A10: Impact on Child Activities using IBLI Coverage in TLU

	Child Labor	Work FT	Work and School	School FT	No activity
	(1)	(2)	(3)	(4)	(5)
Insurance coverage (TLU)	-0.017*	-0.005	-0.019**	0.023***	0.001
	(0.009)	(0.006)	(0.008)	(0.008)	(0.005)
N	12219	12219	12219	12219	12226
F_{eff}	9.168	9.168	9.168	9.168	9.170
5% Critical Value	37.418	37.418	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109	23.109	23.109
AR test p-val.	0.034	0.432	0.007	0.000	0.877
Mean of Dep. Var.	0.427	0.374	0.272	0.161	0.193

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year- fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table A11: Impact on Child Activities (Country × Year FE)

	Child Labor	Work FT	Work and School	School FT	No activity
	(1)	(2)	(3)	(4)	(5)
Panel A: Average Effects					
Insurance Uptake (Cum.)	-0.092*	-0.013	-0.074	0.050	0.038
	(0.055)	(0.043)	(0.051)	(0.045)	(0.033)
N	12243	12243	12243	12243	12250
F_{eff}	30.083	30.083	30.083	30.083	30.086
5% Critical Value	37.418	37.418	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109	23.109	23.109
AR test p-val.	0.089	0.771	0.144	0.265	0.253
Mean of Dep. Var.	0.426	0.374	0.271	0.163	0.193
Panel B: Disaggregated Effects					
Shock	0.104**	0.025	0.059	-0.078*	-0.005
	(0.044)	(0.026)	(0.039)	(0.040)	(0.021)
Insurance Uptake (Cum.)	-0.001	0.009	-0.030	-0.015	0.038
	(0.073)	(0.061)	(0.067)	(0.058)	(0.048)
Shock × Insurance Uptake (Cum.)	-0.230**	-0.053	-0.110	0.164*	-0.002
	(0.113)	(0.076)	(0.100)	(0.098)	(0.062)
Shock+Uptake × Shock (coef.)	-0.126	-0.029	-0.051	0.086	-0.007
Shock+Uptake × Shock (p-val.)	0.110	0.611	0.465	0.196	0.885
N	11319	11319	11319	11319	11326
K-P F-stat	26.918	26.918	26.918	26.918	26.942
AR test p-val.	0.009	0.648	0.144	0.111	0.476
Mean of Dep. Var.	0.535	0.406	0.314	0.180	0.100

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year-fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table A12: Impact on Child Activities using Balanced Panel

	Child Labor	Work FT	Work and School	School FT	No activity
	(1)	(2)	(3)	(4)	(5)
Insurance Uptake (Cum.)	-0.084*	-0.028	-0.101***	0.117***	0.012
	(0.043)	(0.032)	(0.039)	(0.035)	(0.025)
N	10633	10633	10633	10633	10640
F_{eff}	48.790	48.790	48.790	48.790	48.796
5% Critical Value	37.418	37.418	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109	23.109	23.109
AR test p-val.	0.045	0.384	0.008	0.000	0.623
Mean of Dep. Var.	0.412	0.380	0.248	0.161	0.214

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year- fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.

Table A13: Impact on Child Activities with Children who were 5-17 at baseline

	Child Labor	Work FT	Work and School	School FT	No activity
	(1)	(2)	(3)	(4)	(5)
Insurance Uptake (Cum.)	-0.078*	0.003	-0.105**	0.138***	-0.036
	(0.046)	(0.034)	(0.044)	(0.039)	(0.023)
N	8525	8525	8525	8525	8530
F_{eff}	49.567	49.567	49.567	49.567	49.553
5% Critical Value	37.418	37.418	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109	23.109	23.109
AR test p-val.	0.082	0.935	0.016	0.000	0.115
Mean of Dep. Var.	0.489	0.453	0.332	0.191	0.026

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. Insurance uptake (Cum.) is the sum of discount rates provided by the coupon over the three seasons prior to the interview. All specifications include individual-, insurance area-, survey year- fixed effects, adult equivalent, age, age-squared, female dummy, age and sex of the household head, number of children in the household.