The Effect of Microinsurance on Child Work and Schooling

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Abstract

This paper investigates the impact of index-based livestock insurance (IBLI) on children's work and schooling in pastoral households, utilizing randomized premium discounts as instrumental variables for insurance uptake. The findings reveal that insured households significantly reduce child labor and part-time work, shifting children's activities toward full-time schooling, although overall school attendance does not increase significantly. The results highlight a dual role of insurance during both drought and non-drought periods: uninsured households tend to increase child labor during droughts, an effect that insurance mitigates. The shift from part-time work and schooling to full-time schooling is primarily observed during non-drought periods, driven by increased herd mobility and a reduction in herd size. Heterogeneous impacts are observed across age, birth order, and gender: first-born and female children often serve as buffer labor, an effect offset by insurance, while the shift from part-time to full-time schooling is more pronounced among older children, first-borns, and male children who typically bear a heavier work burden.

JEL Classifications: G52, I20, J22, O15

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1 Introduction

Many households in low- and middle-income countries struggle to invest in human capital due to high education cost and the necessity for children to contribute to household income through work (Basu and Van, 1998; Todd and Wolpin, 2006; Edmonds and Schady, 2012). Particularly in times of economic shocks. These shocks, whether positive or negative, often lead to decisions that compromise children's education. During adverse economic conditions, households may withdraw children from school to help cope with financial shortfalls (Beegle, Dehejia, and Gatti, 2006; Björkman-Nyqvist, 2013; Bandara, Dehejia, and Lavie-Rouse, 2015; Dumas, 2020; Koohi-Kamali and Roy, 2021; Park, Behrer, and Goodman, 2021), while in periods of positive productivity shocks, they may send children to work to exploit new opportunities (Shah and Steinberg, 2017; Bai and Wang, 2020; Nordman, Sharma, and Sunder, 2021). However, current policy responses tend to focus predominantly on raising household income, often overlooking the critical role of income variability and the risk management strategies households employ to mitigate these fluctuations.

Access to financial markets, particularly through credit or insurance, can play a crucial role in mitigating the impact of adverse shocks on children's work and schooling. Given that child labor often serves as a precautionary buffer against economic instability, insurance appears to be a natural intervention to reduce the reliance on such harmful strategies. While existing research has shown that index-based insurance can improve household well-being by reducing distress sales of assets and improving food security (Jensen, Barrett, and Mude, 2017; Janzen and Carter, 2019; Matsuda, Takahashi, and Ikegami, 2019), there is relatively little evidence on how such insurance affects children's work and schooling. Moreover, while health insurance has been shown to reduce child labor (Landmann and Frölich, 2015; Frölich and Landmann, 2018), the effects of microinsurance products, such as crop or livestock insurance—which address risks that are particularly sensitive to climate-induced crises—remain underexplored. This study seeks to fill this gap by examining how livestock insurance impacts the allocation of children's time between work and schooling in pastoral communities.

This paper examines how index-based microinsurance impacts children's participation in work and schooling, typically considered as negatively correlated with each other due to conflicting demands on children's time. First, it analyzes the average effects, and then the effects disaggregated by drought and non-drought periods. This distinction between drought and non-drought periods is crucial, as insurance serves a preventive role in non-drought periods by stabilizing household labor demands and an adaptive role during droughts by mitigating the need for child labor in response to economic shocks. Additionally, it investigates the underlying mechanisms by studying related household outcomes such as household income, production strategies, and herd size. Additionally, to corroborate that the suggested mechanisms indeed explain the main findings, the paper explores the heterogeneous effects of insurance by child characteristics like gender, age, and birth order.

To investigate these questions, I focus on the Index-Based Livestock Insurance (IBLI) program launched in the Arid and Semi-Arid Lands (ASAL) of Northern Kenya and Southern Ethiopia, which targets pastoral households constituting the majority of the region's population. I focus on this product unlike conventional insurance which is often inaccessible due to high implementation costs, index insurance, which uses geographical area indices, is more accessible due to its lower cost in data collection and claims validation (Jensen and Barrett, 2017; Greatrex et al., 2015).[1][2] The primary data source is a panel survey containing comprehensive information on herding strategies and demographic characteristics of 924 Kenyan households and 528 Ethiopian households over six and four rounds of surveys, respectively. This survey was part of a pilot program implemented to evaluate the welfare effects of insurance, where randomized discount coupons were distributed to households with varying discount rates each sales season. To establish causality, I leverage the variation in insurance premiums generated by randomized discount coupon offers, which were conducted biannually, providing within-household variation in insurance premiums. Specifically, I instrument cumulative IBLI uptake with cumulative discount rates.

Insurance uptake has a substantial impact on shifting children's activities from work to schooling, particularly during non-drought periods. On average, children from insured pastoral households experience a significant reduction in child labor by 8.9 percentage points and a decrease in overall work participation by 12.1 percentage points. However, there is no significant change in overall school attendance, suggesting that the main impact of insurance is on the quality and nature of schooling, rather than on the decision to attend school.

A notable shift is observed in the distribution of children's time between part-time work and schooling. Participation in part-time work and schooling decreases by 9.6 percentage points, while the likelihood of being a full-time student increases by 11.8 percentage points. This shift is primarily attributed to a reduction in secondary work activities, highlighting how insurance enables children to dedicate more time to education.

The reduction in herd size and the enhancement of herd mobility during non-drought periods emerge as key mechanisms behind these shifts. The reduction in herd size decreases the demand for

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

[2]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).

child labor, as households require less labor to manage smaller herds. Conversely, increased herd mobility complicates balancing between schooling and work, as children involved in herding are more likely to shift towards full-time schooling due to the logistical challenges of maintaining both activities. These factors collectively drive the observed shift from part-time work and schooling to full-time schooling, particularly during non-drought periods. Further analysis rules out other candidate mechanisms – income effects or transfer from payouts – as the primary driver of these results.

The effects of insurance are notably heterogeneous across different demographic groups, particularly in terms of age, birth order, and gender. Older children and first-borns, who traditionally bear more significant labor responsibilities within pastoral households, are disproportionately impacted by the insurance uptake. These children show a more pronounced shift from part-time work and schooling to full-time schooling, with a larger decrease in part-time work and a higher likelihood of transitioning to full-time education compared to their younger or later-born siblings. This shift is especially evident during non-drought periods when the reduced herd size and increased herd mobility further diminish the need for child labor. Additionally, the analysis reveals that boys and girls are affected differently by insurance uptake, with boys, who are often more involved in labor-intensive tasks, benefiting more from the reduction in work demands while girls are also protected by insurance from being drawn to more work during drought periods. These findings highlight the importance of considering household dynamics and individual roles when evaluating the impact of insurance, as the benefits of IBLI are not uniformly distributed but rather vary significantly depending on the child's position within the household structure.

This study highlights the critical role of formal insurance in mitigating the impact of adverse weather shocks on children's human capital investments, a topic that has received less attention in the existing literature compared to access to credit. While previous research has shown that access to credit can alleviate the adverse effects of weather shocks on children's education and work, the role of formal insurance remains underexplored. Discussions on insurance mechanisms have often focused on informal strategies, such as asset holdings, which have produced mixed and sometimes ambiguous results. For instance, Beegle, Dehejia, and Gatti (2006) found that adverse income shocks like crop loss increase the likelihood of child labor and decrease school enrollment in Tanzania, but these effects could be mitigated by access to credit and asset holdings. Similarly, Bandara, Dehejia, and Lavie-Rouse (2015) reported that credit offers protection against increased child labor, while asset holdings do not, in a Tanzanian context. In Bangladesh, Alvi and Dendir (2011) observed that child labor only rises after a flood shock in households that lack credit access. Moreover, Koohi-Kamali and Roy (2021) noted that social safety net programs fail to fully offset the negative impact of environmental shocks, such as drought. This paper demonstrates that while adverse weather shocks – such as droughts – tend to increase child labor and reduce schooling, access to formal insurance, specifically designed to address climate-related risks, can effectively protect children from being drawn into such situations.

Additionally, this paper contributes to the literature on the overall effects of financial products on children's work and schooling, extending beyond the role of these products in mitigating the risk of increased work during crises. Credit constraints are often cited as a key determinant of child labor(Dehejia and Gatti, 2005; Edmonds, 2006). However, Islam and Choe (2013) and Maldonado and González-Vega (2008) demonstrate that participation in microcredit programs can actually increase children's work and decrease their schooling. While several studies have explored the relationship between insurance and children's work and schooling, these studies have primarily focused on health insurance. The literature documents that health insurance can decrease child labor and help maintain educational investments by protecting against potential income loss when an adult household member falls ill (Landmann and Frölich, 2015; Frölich and Landmann, 2018; Guarcello, Mealli, and Rosati, 2010). This paper presents findings that are align with these earlier results: a decrease in children's participation in work and an increase in full-time schooling. However, the effects observed in this paper differ from previous findings in several key respects. First, IBLI covers climatic risks, such as droughts, which directly threaten livestock—often the primary source of income for pastoral households—while health insurance covers the financial costs associated with illnesses and health-related emergencies. Therefore, while health insurance primarily operates through adult-child labor substitution, IBLI's impact on children's work can be more comprehensive, including changes in production strategies, which can have lasting impacts on households. Additionally, IBLI covers the loss of livestock, which is a complementary input for household production. Furthermore, because the climate risks covered by IBLI are covariate shocks, this study provides a more nuanced understanding by highlighting the insurance's protective role during drought periods and its precautionary role during non-drought periods.

Finally, this paper provides rare insights into the intergenerational effects of index insurance. Despite the significant academic and policy attention that index insurance has received over the last decade, there is limited evidence on its impact on children. Previous studies have shown that index insurance can facilitate investment in high-risk, high-return production strategies, protect households from adverse shocks that may lead to poverty traps, enhance the subjective well-being of insured households, and decrease the likelihood of local conflicts (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; Gehring and Schaudt, 2024). To the best of my knowledge, the only other study that has analyzed the impact of index insurance on children, even as a secondary outcome, is Jensen, Barrett, and Mude (2017), which investigates the effect of IBLI on the number of days a child is absent from school. That study finds no significant effects, either economically or statistically. Given the lack of further investigation into other activities that children may undertake, as well as the mechanisms through which insurance may influence child outcomes, a clear gap exists in this area. This paper addresses that gap by delving deeper into the issue, demonstrating that index insurance can improve children's work and educational outcomes, which has longer-term implications for household welfare.

The paper proceeds as follows. Section 2 explains the study settings. Section 3 describes the dataset and the empirical strategy used for the estimation. Main results are discussed in Section 4. Then conceptual framework to hypothesize potential mechanisms is presented in Section 5 and 6 offers empirical evidence on the suggested mechanisms. Section 7 concludes.

2 Study Settings

2.1 Marsabit and Borena

Marsabit County in Kenya and the Borena Zone in Ethiopia are adjacent arid and semi-arid lands (ASALs), as depicted in Figure 2. These regions rely predominantly on pastoral livelihoods, with 74 percent of sampled households citing livestock herding as one of their income sources. Additionally, 87 percent of households have at least one member engaged in livestock-related activities as their primary or secondary economic activities as both adult and children's labor is an essential input to livestock production along with other inputs such as fodder and livestock.

These areas are characterized by remote locations, low population density, and widespread poverty. Moreover, a significant portion of the population faces the risk of poverty traps, exacerbated by the frequent occurrence of droughts induced by climate change. These droughts can lead to substantial livestock losses, potentially pushing households below a critical threshold of herd size, typically ranging from 10 to 20 tropical livestock units (TLU)[3]. Below this threshold, households may become trapped in a low-level equilibrium poverty trap, as demonstrated by Lybbert et al. (2004).[4]

In pastoral economies, the high demand for family labor results in significant children's involve-

[3]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

[4]Figure 1 shows that the average herd size of the household is small, while the maximum herd size reaches up to 457 TLUs. 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. More than three-quarters of the sample households own less than 20 TLUs of animals.

ment in work, primarily within the household [5], often focusing on tasks related to livestock herding and animal care. For instance, 70 percent of children aged 5 to 17 in the study sample engage in work, with 61 percent involved in livestock-related activities such as herding and animal care.[6]

These children work longer hours, particularly if they're involved in trekking animals. Data from the Kenya Integrated Household Budget Survey 2015-2016 reveals that children in the Marsabit district work substantially more than those in other parts of Kenya, averaging 68 hours per week compared to 20 hours.[7] Similarly, in the Borena zone of Ethiopia, where 56 percent of children work compared to the national average of 27 percent, children work an average of 31 hours per week, significantly higher than the 23 hours reported in other areas (Data from Socioeconomic Survey 2015-2016). Despite variations in measurement methods, these figures underscore the notably intense child labor in these study regions compared to the rest of their respective countries. Moreover, the activities they are engaged in expose children to risks such as livestock raids, and dangers from wildlife and diseases.

Male children, in particular, are commonly involved in herding as they grow older (Kenea, 2019). However, the decision to engage children in work is influenced by factors such as household wealth, access to hired herders, and mobility strategies, such as herd mobility for grazing purposes.[8]

Particularly, herd mobility 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.

High work participation rates and longer work hours would leave little room for educational investment in pastoral households. In the Marsabit district of Kenya, 54 percent of the population did not receive any education, compared to 10 percent in other regions of Kenya. Similarly, in

[5] The labor market for children is nearly nonexistent. 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 also insufficient in these areas (USAID, 2014).

[6] Herding includes the activity of keeping animals together as a group during the search for pasture or water, watching over animals' safety. On the other hand, animal care includes activities such as feeding, cleaning or caring for sick animals, collecting water or fodder for animals (FAO, 2013).

[7] 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.

[8] The wealthiest households who could afford to hire herders may choose to employ herders instead of sending children to work (Dillon, 2013).

Ethiopia's Borena zone, 70 percent of the population lacks education, while it's 39 percent in other regions.

Several factors contribute to low educational attainment in these regions. Seasonal migration, critical for sustaining herd size, makes delivering quality education challenging due to the remoteness of villages and the seasonal movements of pastoral communities. In the Borena zone, for instance, the school catchment area is 8 to 10 km, far exceeding the standard target of 2.5 to 3 km (Kenea, 2019). In response, governments have introduced measures such as mobile schools and Alternative Basic Education (ABE) programs.

Demand-side constraints also hinder educational attainment. The opportunity cost of schooling, including educational expenses and loss of potential income from children's work, is substantial (Mburu, 2017). Moreover, irrelevant curriculum and language of instruction, along with the inflexibility of the formal school system, pose challenges for pastoral populations where mobility is crucial and animal production skills are considered important (Ruto, Ongwenyi, and Mugo, 2009; FAO, 2013). Figure A1 illustrates that parents' refusal to send children to school and household workloads are major reasons for non-enrollment in the Marsabit district, while age restrictions are significant in other areas. In Ethiopia, children's work responsibilities, parental attitudes toward education, and age restrictions are primary reasons for non-enrollment.

Supply-side constraints are unaffected by household insurance uptake, but demand-side constraints, driven by households' perceptions of schooling's benefits relative to work, may change with insurance uptake decisions. Thus, changes in children's activities can be expected due to insurance purchases.

2.2 Index-Based Livestock Insurance

Index-based livestock insurance (IBLI) is designed to protect households from drought-induced losses, foster recovery from shocks, and prevent collapses into poverty traps (Chantarat et al., 2013). The description of IBLI products in this section is primarily drawn from studies on products sold in Marsabit by Jensen, Barrett, and Mude (2017) and Janzen and Carter (2019), and in Borena by Takahashi et al. (2016).

IBLI triggers indemnity payouts based on specific criteria met by an index of the insurance area. Predicted livestock mortality rates (in Kenya) and Normalized Difference Vegetation Index (NDVI) values (in Ethiopia) inform payout decisions. For instance, in Kenya, a predicted livestock mortality rate exceeding 15 percent triggers payouts, while in Ethiopia, the forage condition index ranking at the 15th percentile or higher on the Woreda-level historical distribution serves as the trigger criterion. The index is computed at an area-aggregate level referred to as index units, such as dividing Kenya's Marsabit district into five insurance divisions and Ethiopia's Borena Zone into eight Woredas.[9] Utilizing NDVI, collected at an area-aggregate level by external organizations, minimizes the need for verifying individual loss claims and mitigates adverse selection and moral hazard issues.

Sales windows precede the long-rain, long-dry (LRLD) and short-rain, short-dry (SRSD) seasons by two months, with coverage lasting one year, as depicted in Figure 3. Due to a year of coverage period, there will be a period with overlapping insurance coverage if a household purchases insurance in two consecutive sales windows.[10] Between 2010 and 2015, the period that this study covers, there were two payouts triggered in Kenya, in 2011 and 2012, and one triggered in 2014 in Borena, Ethiopia (marked in yellow bar in Figure 3).

The International Livestock Research Institute (ILRI) and the research team implemented evaluation pilot programs to raise awareness of and demand for the product in the study areas. Implemented between 2009 and 2015 in Kenya and 2012 to 2015 in Ethiopia, interventions included informational recordings, games, and discount coupons. Coupons, distributed randomly to households in each insurance area, offered discounts ranging from 10 to 80 percent on premiums for the first 15 insured TLUs.[11] The randomization for the coupon-receiving households was administered every round. Despite discounts, most households insured less than 15 TLUs (Panel B of Figure A2), highlighting the magnitude of the potential discounts.[12]

3 Data and Empirical Strategy

3.1 Dataset

To investigate the impact of index-based livestock insurance (IBLI) on children's work and schooling decisions, data on households' insurance purchases, premium discounts, and children's activity choices are essential. The primary data source of this paper is household panel surveys conducted

[9] Chantarat et al. (2013) provides analytical detail about the modeling process.

[10] In Kenya, policies are sold in Tropical Livestock Units (TLUs). The premiums were calculated by the product of premium rate, insured livestock in TLU, and the price per TLU. In Ethiopia, the premiums were calculated by the product of the Woreda-specific insurance premium rate and the total insured herd value (TIHV), a weighted sum of insured animals with species-specific animal price as a weight for each animal species.

[11] The discount rate ranged from 10 to 60 percent in Kenya and 10 to 100 percent in Ethiopia at 10 percent intervals. In rounds 5 and 6, some Kenyan participants also received a 70 to 80 percent discount.

[12] 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.

by the International Livestock Research Institute (ILRI) and academic researchers as part of continuous impact evaluations of the IBLI product (Alulu, Jensen, and Ikegami, 2023; International Livestock Research Institute, 2018). Baseline surveys were conducted in 2009 and 2012, respectively, gathering detailed information on living standards, herding practices, children's participation, and schooling and working hours. Administrative data from insurance companies provided information on households' insurance purchases and the premium discount rates they received.

The primary variable of interest is the activity status of children, categorized into four groups to capture their work and schooling status: full-time work, part-time work and schooling, full-time schooling, and no activities. This disaggregation is crucial as children in these contexts often bear multiple burdens, including education, economic work, and domestic tasks (FAO, 2013). Primary and secondary activities over the preceding 12 months prior to the survey were considered, with a range of activities classified as work, such as herding livestock, petty trading, and domestic work.

The classification of children's activity status is as follows: i) Working full-time: When a child's only reported activity, either primary or secondary, is work, ii) Part-time work and schooling: If a child reports one primary or secondary activity as work and the other as attending school, iii) Full-time schooling: When the child's sole activity, either primary or secondary, is attending school, iv) No activity: If the child does not fit into any of the above categories. These four categories provide a comprehensive and mutually exclusive framework for categorizing children's activities.

Furthermore, a measure of child labor, aligned with UNICEF criteria, is employed. Children aged 5 to 11 are classified as engaging in child labor if they devote at least 1 hour per week to economic work or 21 hours to unpaid household services. Similarly, children aged 12 to 14 are considered engaged in child labor with at least 14 hours of economic work or 21 hours of unpaid household services per week, while those aged 15 to 17 qualify if they commit at least 43 hours per week to economic work.

I focus on children aged 5 to 17 years old for several reasons. Firstly, this age group aligns with common practices in the child labor literature, facilitating comparability with existing research. Secondly, it reflects the minimum legal working and school age in both countries. In Kenya, formal schooling begins at age five, while it begins at age six in Ethiopia. Therefore, the lower bound is set at age five. The minimum legal working age is 17 in Kenya and 15 in Ethiopia, with hazardous work prohibited until age 18 in both countries. Thus, the upper age limit for the sample is set at 17 to adhere to legal restrictions.

Table 1 presents the summary statistics of the study sample categorized by coupon receipt status, along with the balance between the groups. The average age of household heads is 49 years old, with 62 to 65 percent being male. Household size, measured in adult equivalent, ranges from 4.6

to 4.9 on average. Additionally, the average household owns 13.6 to 14.1 Tropical Livestock Units (TLU) of animals (Panel A of Table 1).

In terms of children's demographics, the average age of children in the study sample is 11 years old, with 46 percent being female across both coupon and no-coupon households (Panel B of Table 1). Among these children, 41 to 42 percent are engaged in full-time work, while 28 to 29 percent work while attending school, and 19 to 20 percent solely attend school. Approximately 10 percent of children are not involved in any of these activities, with the majority being younger than seven years old.

3.2 Empirical Strategy

3.2.1 The Average Effects of Insurance

The most straightforward approach to study the impacts of microinsurance on child outcomes and its underlying mechanisms is to compare the outcome of households with and without insurance coverage, leveraging exogenous variations in insurance uptake.

However, the decision to purchase insurance is not independent and may be influenced by various factors, leading to endogenous selection. For instance, factors such as basis risk, participation in social groups, insurance price, financial liquidity, and spatio-temporal adverse selection can drive pastoralists' decisions to purchase insurance (Jensen, Mude, and Barrett, 2018), and some of these factors may be correlated with children's activities. For example, low financial liquidity may increase children's involvement in work and reduce school attendance.

To address this potential endogeneity issue, I exploit exogenous variations in the probability of purchasing insurance created by randomly distributed coupons with varying premium discount rates. These discount rates serve as instruments for actual insurance coverage, allowing for a more robust estimation of the insurance's impact on child outcomes, following the approach of Jensen, Barrett, and Mude (2017).

As the first stage, I estimate:

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

where $CIBLI_{hrt}$ represents the total number of number of times the household h in region r purchased insurance covering that year preceding the survey round t. This accumulation spans three sales seasons because up to three recent IBLI sales periods may influence a household's decision regarding child labor. Child outcomes are determined based on a child's primary activity during the 12-month period prior to the interview. Since the survey was conducted annually, there are two sales periods between each survey round. Insurance coverage lasts for one year. Therefore, as illustrated in Figure 3, the three recent IBLI sales periods constitute the relevant time frame for assessing the insurance effect on child outcomes.[13] DC_{hrt} denotes the cumulative discount rate over the three consecutive sales seasons preceding the survey.[14]

The model incorporates time-varying household-level characteristics denoted by X'_{hrt} along with household-, year-, and region-fixed effects, denoted by ν_h, θ_t, and ψ_r, respectively. These fixed effects control for common time trends across regions and region-specific characteristics. η_{hrt} represents the error term clustered at the household level, allowing for intra-household correlations across children and across years.

Using the predicted value of cumulative insurance uptake from the Equation (1), I estimate the following second-stage regression equation:

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

where y_{ihrt} denotes the outcome of child i in household h living in region r at survey round t, and $CIB\hat{L}I_{hrt}$ represents the predicted value of cumulative insurance uptake. The other notations are consistent with those used in Equation 1. As the unit of randomization was at the household level, but the focus is on individual-level outcomes, adjustments were made using the inverse of the number of children in the household. For certain outcome variables measured at the household level, the dataset is aggregated at the household level.[15] The coefficient β_1 is the coefficient of interest as it captures the average impact of insurance.

3.2.2 Disaggregating the Effects of Insurance upon Shock

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

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

[14] Figure 4 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.

[15] 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.

$$
\begin{aligned}
CIBLI_{hrt} = & \gamma_3 + \gamma_4 Shock_{rt} + \gamma_5 DC_{hrt} + \gamma_6 Shock \cdot DC_{hrt} + X'_{iht} \cdot \gamma_7 \\
& + \nu_h + \theta_t + \psi_r + \eta_{hrt}
\end{aligned} \tag{3}
$$

where all notations remain consistent with those used in Equation 1 except for $Shock_{rt}$, which is an indicator that equals one if the region r experienced drought shock in round t. Region is considered to have experienced drought shock during round t if the insurance payout was triggered in one of two the sales seasons covered by round t. It is important to note that the recall period for the child outcome is also 12 months before the survey, and payouts were triggered after each agricultural season. Therefore, the estimates in this regression capture a blend of ex-ante risk mitigation effect and ex-post payout effect of insurance on outcome variables.[16]

Since the focus is on the differential response across insured and uninsured households upon shock, two endogenous variables were used: The insurance uptake indicator (DC) and the interaction of the insurance uptake and the drought shock indicator ($Shock \cdot DC$).

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

$$
\begin{aligned}
y_{(i)hrt} = & \beta_3 + \beta_4 Shock_{rt} + \beta_5 CIB\hat{L}I_{hrt} + \beta_6 Shock_{rt} \cdot \hat{C}IBLI_{hrt} + X'_{(i)hrt} \beta_7 \\
& + \theta_t + \psi_r + \varepsilon_{(i)hrt}
\end{aligned} \tag{4}
$$

where $CIB\hat{L}I_{hrt}$ is the predicted value of cumulative insurance uptake from Equation 3. Here, β_4 captures the effect of drought shock on households without insurance coverage, while β_5 represents the effect of insurance uptake on children's activities during non-drought periods. Furthermore, β_6 captures the difference in the outcome of children from insured and uninsured households when a drought shock occurs. Therefore, to assess whether insurance protects households from drought shock, we estimate the sum of β_4 and β_6, which is presented separately at the bottom of each table.

[16]For example, consider survey round 4 in the Borena zone, which collects information on child outcomes from March 2014 to February 2015. Some regions experienced drought shock in the Long-Rain, Long-Dry season of 2014, and payout was triggered in November 2014. Consequently, the estimates of the insurance effect on child outcomes encapsulate the average of the adverse impact of the shock and the recovery from it due to payouts.

4 Results

4.1 Validity of the Instruments and the First Stage Results

Instruments are valid under two essential conditions: i) independence of the instrument and ii) exclusion restriction. In principle, instruments from a randomized encouragement design should not correlate with any observed or unobserved heterogeneity. To ensure the random distribution of coupons, I tested the balance of demographic characteristics between households that received and did not receive coupons. Table 1 provides summary statistics and mean differences of variables between coupon recipients and non-recipients, along with the p-value of the joint orthogonality test of variables to the coupon distribution. The differences in 15 household and individual characteristics between coupon and no-coupon households are not statistically significant, except for livestock expenditure, where coupon recipients spent 0.15 USD less than the non-coupon recipient. The p-value from the joint significance test for household characteristics is 0.34, and 0.57 for individual characteristics is 0.57, indicating that the coupon distribution was well-balanced.

The exclusion restriction requires that the instrument correlates with endogenous variables but not with unobserved heterogeneity (ε_{ihrt}). In this study, the concern is whether the cumulative discount rates offered to pastoralists influenced their behavior through channels other than insurance uptake. Premium discounts may impact the outcome only when the discounts were applied to the premium, that is, when a pastoralist purchases an insurance policy. It is reasonable to assume that randomized discount coupons influence household decisions regarding child time allocation solely through insurance uptake decisions. However, the exclusion restriction could be violated if there is a social spillover effect. Employing a framework similar to that of Barrett et al. (2024), which addresses this concern, I first examine whether a household's cumulative discount rate affects the average number of cumulative insurance uptakes among its village members, or whether the average cumulative discount rate of the village members influences the number of insurance uptakes. Table A1 demonstrates that, once the own discount rate is controlled for, no statistically significant effects are found, suggesting the absence of social spillovers over the multiple sales seasons. This cross-relationship of discount rates and insurance uptake between pastoral households and their neighbors would have served as the first stage of the estimation had there been any observable relationship. Since no strong relationship is found, it is unlikely that the exclusion restriction is violated in our case.

Another potential concern about the instrumental variables approach is the strength of instruments. Table 2 shows the result from the first stage estimation – Equation 1 and 3. Columns (1) presents the correlation coefficients from estimating Equation 1. The estimated coefficients are positive and statistically significant at the 1 percent level, suggesting strong predictive power at the first stage. Columns (2) and (3) 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.

Moreover, I present effective F-statistics under heteroskedastic error, as proposed by Olea and Pflueger (2013), as a measure of instrument strength, at the bottom of the tables whenever possible (denoted by F_{eff}). When the estimated results of Equation 4 is reported, alternative measures of first-stage predictive power, were presented as effective F-statistic under two endogenous variables is yet to be developed.[17] The alternative measures reported include Kleibergen-Paap rk Wald F-statistic and Anderson and Rubin test p-values (AR p-values). AR p-values are presented to ensure robustness of second-stage estimates.[18]

4.2 Children's Activity Choices

In drought-prone regions, families often resort to sending children to work as a coping mechanism. This section explores whether insurance can alter this dynamic and improve educational outcomes. The initial analysis focuses on overall trends in children's work and schooling participation, followed by a more detailed examination of how children allocate their time between different types of activities – particularly distinguishing between primary and secondary roles – to pinpoint the specific sources of the observed changes.

I begin by analyzing the effect of insurance uptake on children's participation in children's work and schooling. The results, presented in Panel A of Table 3, indicate that, on average, insurance uptake significantly reduces child labor and overall work participation, but it does not substantially change the schooling rates. Specifically, each additional season of insurance uptake reduces child labor by 8.9 percentage points and overall work by 12.1 percentage points (Columns 1 and 2). This reduction is substantial: without insurance, 42.7 percent of children engage in child labor and 64.5 percent participate in some form of work. Insurance uptake led to a 20.8 percent decrease in child labor and an 18.7 percent in work participation.

To explore these effects further, I disaggregate the effects by seasons, distinguishing between

[17]There are two endogenous variables, technically, 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.

[18]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.

periods when droughts trigger insurance payouts and those without such shocks. Panel B of Table 3 provides this breakdown of insurance effects by interacting the insurance uptake with an indicator for drought periods, as outlined in Eq. (4). Column (1) shows that in uninsured pastoral households, child labor increases by 9 percentage points during droughts, but insurance significantly mitigates this increase, thereby reducing overall child labor. Conversely, Column (2) shows that the reductions in children's overall work participation are primarily driven by insurance uptake during non-drought seasons. Since child labor represents a more intensive form of work compared to general work activities, these findings suggest that insurance reduces both child labor during droughts and general work participation during non-drought periods, thus providing a protective effect in varying conditions.

Given that many children juggle both work and schooling simultaneously, it is important to understand how insurance uptake influences the specific activities they engage in, particularly by analyzing primary and secondary roles separately. This will help clarify how these shifts in participation are reflected in the time children allocate to different tasks. To explore this, I estimate the effect of insurance uptake on children's activity status – whether they engage in full-time work, part-time work and schooling, full-time schooling, or none of the above. The results in Panel A of Table 4 show that on average, insurance uptake encourages a shift toward full-time schooling rather than balancing both work and schooling. Specifically, each additional season of insurance reduces participation in work and schooling by 9.6 percentage points, and increase full-time schooling by 11.8 percentage points, statistically significant at the five and one percent levels, respectively (Columns 3 and 4). These are substantial shifts, given that 27 percent of children participate in part-time work and schooling, and 16 percent engage in full-time schooling. No significant changes were observed in full-time work or no activity (Columns 2 and 5). Additionally, Panel B shows that the effects on part-time work and schooling, as well as full-time schooling, are primarily driven by insurance uptake during non-drought periods (Columns 3 and 4).

While the average school enrollment rate does not increase, the shift from part-time work and schooling to full-time schooling represents a notable change in how children allocate their time. This shift indicates that insurance uptake can lead to more consistent engagement in schooling, particularly in non-drought periods, even if it does not result in higher overall enrollment numbers.

To confirm these patterns, I also examine how insurance uptake affects the time children spend on various activities. The impact of insurance uptake on children's time allocation further confirms a decrease in their engagement in work. Table 5 shows that, on average, children from insured households reduce their time spent on work, conditional on working, by 0.5 hours (12.8 percent decrease), statistically significant at the ten percent level. I do not find a significant change in time spent on schooling, conditional on attending school. As a result, there is a calculated increase in leisure time by 0.6 hours per day, as leisure is derived by subtracting the sum of work and schooling hours from 24. However, it is important to note that the data may not fully capture time spent on out-of-school study, and the extent to which students in this context engage in studying after school hours remains unclear

To further understand the impact of insurance uptake on children's participation in work and schooling, I analyze primary and secondary activities separately, as well as different types of work. This distinction is important because children's work often involves multiple roles, and the effects of insurance may differ depending on whether the activity is primary or secondary. Additionally, analyzing these specific activity types will help pinpoint the sources of the observed decrease in children's work participation.

The results in Table 6 indicate that the shift towards full-time schooling is driven by changes in secondary activities, especially during non-drought seasons. Specifically, each additional season of insurance uptake decreases the likelihood of a child working as a secondary activity by 19 percentage points and increases the likelihood of full-time schooling as a secondary activity by 3.1 percentage points, with statistical significance at the one and five percent levels, respectively (Columns 5 and 8). Secondary work in livestock and household tasks decreases significantly by 6.4 percentage points and 8.8 percentage points, statistically significant at the ten and five percent levels, respectively (Columns 6 and 7). These changes are primarily driven by non-drought periods, while no significant changes are observed in primary activities on average. Since 97.5 percent of the children who balance work and schooling do so by attending school as their primary activity and working as a secondary one, these findings explain the observed shift from part-time work and schooling to full-time schooling.

4.3 Robustness Check

To ensure the reliability of the findings presented, this section conducts a series of robustness checks designed to validate the stability of the results across different model specifications and to address potential concerns regarding the validity of the instruments used.

Given the strong evidence that insurance uptake affects children's work and schooling, it is crucial to verify the robustness of these findings by addressing any concerns about weak instruments. To this end, I have repeated the estimation in Panel B of Table **??** using a single endogenous variable and presented the results in Table A2 with an effective F-statistic. This step is necessary because appropriate first-stage F-statistics for models with multiple endogenous variables and multiple instruments have not yet been fully developed, as discussed in Section 3.2. Panel A confirms that the cumulative insurance uptake does not suffer from weak instrument issues, as the effective F-statistic exceeds the 5 percent critical value threshold in all models, ensuring that the estimates remain reliable. Notably, the effective F-statistic in Panel B is smaller than the 10 percent critical value due to mechanical reasons: since the interaction term suppresses insurance uptake decisions in non-shock periods, the exogenous variables – the cumulative discount rate and its interaction with the shock period – naturally exhibit weaker predictive power for the endogenous variable.

Analyzing the Intent-To-Treat effects of cumulative discount rates further supports the main findings. Panel A of Table A3 indicates that a ten percent increase in cumulative premium discount rates decreases the likelihood of children participating in child labor by 3.1 percentage points, overall work participation by 4.6 percentage points, and part-time work and schooling by 4.1 percentage points, while increasing full-time schooling by 3.8 percentage points, with statistical significance at the one to five percent levels. The results also show that the changes were driven by the discount rates during the non-drought periods.

Following Jensen, Barrett, and Mude (2017), I also consider the cumulative effect of current and lapsed insurance, as the effects of lapsed insurance may accumulate over time. The cumulative IBLI uptake measure used in the main specification accounts for the number of IBLI purchases over the three latest sales seasons, given the recall period for child outcomes. Thus, past purchases must have occurred at least four sales seasons ago. These past purchases are included as a second endogenous variable. Table A5 demonstrates that the results remain robust to the inclusion of past insurance purchases. Moreover, full-time schooling increases with lapsed insurance policies, suggesting that the increase in full-time schooling accumulates over time.

Another set of results uses insurance coverage measured by Tropical Livestock Units as an endogenous variable. Table A6 demonstrates the robustness of the findings to this alternative measure of insurance coverage. Specifically, 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, statistically significant at the one to five percent level.

While Marsabit district in Kenya and the Borena zone in Ethiopia share a pastoral livelihood, children's activities differ between these areas. In Marsabit, 58 percent of children prioritize schooling, compared to 34 percent in the Borena zone, with work engagement also lower in Marsabit (68 percent) than in the Borena zone (77 percent). Despite including region- and year-fixed effects to control for time-invariant characteristics and common trends across areas, nation-wide events each year may still influence household choices regarding children's activities. Therefore, I test the robustness of the results by including country $\times$ year fixed effects. The results in

Table A7 align qualitatively with the main findings, although the coefficients are smaller and not statistically significant except for the decrease in child labor.

I further investigate this by looking at the effects in each country separately. Table A8 shows that although the sign of the coefficients remains the same across countries, the effects are larger and more precisely estimated in Kenya than in Ethiopia. A notable pattern from this analysis is that in Kenya, insurance uptake significantly increases children's participation in primary work activities during non-drought periods, while this is not the case in Ethiopia.

Lastly, I assess the robustness of the results using balanced panel households and the children who are 5 to 17 years old at the baseline survey year ensuring that the findings are not driven by sample composition. Table A9 and A10 demonstrate that the results remain robust to different sample restrictions.

These empirical findings demonstrate significant reductions in child labor and increases in full-time schooling among households covered by IBLI. However, to fully understand the implications of these results, it is essential to explore the underlying mechanisms that drive these changes. In particular, the shifts in household production strategies and the dual role of IBLI in responding to both drought and non-drought periods likely play a critical role in shaping these outcomes. The following section delves into these mechanisms, providing a deeper insight into how IBLI influences household decisions and ultimately impacts children's work and schooling.

5 Conceptual Framework

This section outlines a conceptual framework to hypothesize the potential mechanisms by which index-based livestock insurance (IBLI) impacts children's labor and schooling in pastoral communities. Drawing from the theoretical underpinnings of risk management and human capital investments, this framework anticipates how changes in household economic behavior due to IBLI may influence child labor and schooling, thereby shedding light on the nuanced ways insurance affects children's activities in pastoral households.

Household Utility and Decision-Making

Pastoral households derive utility from consumption, children's human capital, and leisure. Due to the inseparability of consumption and production decisions, which are shaped by incomplete credit and labor markets, decisions about children's schooling and work are heavily influenced by household economic strategies. While investing in education theoretically increases a child's future earning potential and long-term household utility, it competes with the immediate need for labor contributions that support current household economic stability – not only during covariate shocks such as droughts but also as part of everyday life.

It should be noted that the setup of this study does not allow for the comparison between *ex ante* and *ex post* effects of the insurance, as Frölich and Landmann (2018) and Tafere, Barrett, and Lentz (2019) do. *Ex ante* effects arise when insurance coverage induces behavioral changes by reducing exposure to uninsured risks, potentially altering economic decisions and risk management strategies before any insurance payout occurs. In contrast, *ex post* effects refer to the impacts of receiving lump-sum payments from insurance claims, which directly affect household resources. Given the structure of the empirical analysis, which is more aligned with examining *ex ante* effects, the study focuses on how anticipated protection through IBLI might alter household strategies before any payout is realized. This distinction is crucial as it underscores the preventive rather than the compensatory role of insurance in shaping pastoral households' economic behaviors.

Changes in Households' Risk Coping Strategies

First, by providing financial stability, IBLI offers households an alternative to relying on children's labor as a form of risk management, particularly during crises like droughts when the demand for labor intensifies. Traditionally, pastoral communities have utilized children's labor both routinely and as a crisis response due to high labor demands and an incomplete labor market. By mitigating the financial impacts of such shocks, IBLI could allow households to shift their focus from immediate labor contributions to longer-term investments in education, potentially decreasing both routine and crisis-induced child labor. This mechanism is supported by theoretical predictions (Pouliot, 2006) and empirical findings that observed reductions in child labor following the extension of health insurances through microinsurance companies in Pakistan (Landmann and Frölich, 2015; Frölich and Landmann, 2018). Evidence from other studies suggests that IBLI protects pastoralists from engaging in destructive risk mitigation strategies (Jensen, Barrett, and Mude, 2017; Janzen and Carter, 2019). This mechanism could explain our main findings, which show an increase in child labor among uninsured households and a significant decrease in such labor due to insurance uptake during drought periods.

Further examination is needed to understand the shifts from part-time work and schooling to full-time schooling, exploring how IBLI influences household behavior and its potential effects on children.

Changes in Herd Size

Child labor in pastoral households often correlates with the size and management of productive assets, especially in settings with incomplete factor markets. Edmonds and Theoharides (2020) finds that productive asset transfer programs can increase child labor in the Philippines, illustrating complex interactions between asset ownership and labor dynamics. Conversely, Basu, Das, and Dutta (2010) demonstrates an inverted U-shaped relationship between children's work participation and land size, suggesting that the net effect of asset enhancement on child labor is not straightforward and is influenced by accompanying income effects. In our study area, there is a positive correlation between children's work and herd size. As depicted in Figure 1, Panel A, an increase in herd size leads to a higher likelihood of children engaging in full-time work, with a corresponding decrease in their participation in schooling, a trend that is particularly notable in households owning between 0-20 Tropical Livestock Units (TLUs). Panel B underscores that children's work hours increase with herd size, especially within this range, while schooling hours remain relatively unchanged.

The impact of IBLI on herd size introduces further complexities. While IBLI might discourage less efficient risk mitigation strategies, such as depleting savings or liquidating livestock assets—behaviors often exacerbated during crises but also prevalent under normal conditions—it could lead to either an increase or decrease in herd sizes. Enhanced insurance coverage might encourage households to invest in more livestock, potentially increasing herd sizes as a form of productive asset accumulation (Chantarat et al., 2013; Toth, 2017). However, another empirical evidence suggests that insured households may actually reduce their herd sizes as a decreased need for precautionary savings diminishes the incentive to maintain larger herds (Jensen, Barrett, and Mude, 2017).

Given the observed general decline in children's work on average, I hypothesize that in our context, herd size would decrease if this mechanism explains the main findings. This would suggest that the motivation for precautionary savings has overshadowed the risk-adjusted returns motive, thus decreasing household labor demand by reducing herd size. Moreover, if such mechanism is at play, the impact could be especially pronounced among older children, firstborn siblings, or males, who traditionally undertake more substantial labor roles in pastoral societies. Conversely, younger siblings and females may be less affected.

Changes in Household Income

Effective risk management through IBLI could yield higher household income. In fact, Jensen, Barrett, and Mude (2017) demonstrated that IBLI increased income per adult equivalent in Kenya, and Matsuda, Takahashi, and Ikegami (2019) showed that it increased household in Ethiopia.[19] Literature on child labor typically finds income effects will reduce the necessity for child labor (Basu and Van, 1998; Edmonds, 2008; Edmonds and Schady, 2012). If I observe similar income increases with my set up, this channel could potentially explain the main findings.

Changes in Households' Production Strategies

Lastly, IBLI may influence migration patterns and economic strategies, potentially affecting the balance between children's schooling and their labor contributions.

Insured households might engage in longer migration days but over shorter distances, as suggested by Toth (2017). This adjustment could increase the costs associated with managing schooling and herding duties for children simultaneously, potentially impacting their ability to maintain consistent school attendance. However, the resulting effects on children's work and schooling are ambiguous and may depend on each child's prioritization of these activities. If children place greater emphasis on schooling than work, they are likely to continue their education and forego labor activities. Given that most children balancing both school and work typically regard work as their secondary activity, increased migration among pastoral households could align with my findings. This adaptation might lead to a shift from part-time work and schooling to full-time schooling, particularly during non-drought periods, reflecting a strategic response to enhanced mobility facilitated by IBLI.

6 Potential Mechanisms

This section explores the potential mechanisms through which IBLI influences children's labor and schooling activities within pastoral households, building on the theoretical foundations discussed in Section 5. Specifically, we examine how the shifts in household decision-making, as hypothesized, manifest in practice. Specifically, we seek to identify the pathways through which IBLI affects children's activity choices by analyzing the impact on household outcomes such as income, herd size, and production strategies and the heterogeneity of the effects,

[19] Adult equivalent is defined based on age: AE=0.5 if under 5 years, AE=0.7 for children 4-16 years and elders over 60, and AE=1 for adults 15-60 years

6.1 Household Outcomes

First, I analyze the impact on household income since any income effect resulting from insurance is expected to reduce children's participation in work and increase schooling by alleviating financial constraints on human capital investment, as discussed in Section 5. Table 7 shows that insurance uptake has no statistically significant effect on total annual income, annual income per capita, food expenditure, or non-food expenditure, with all coefficient estimates being negative in non-drought seasons. This finding suggests that the income effect is not the primary channel through which insurance impacts child labor and schooling. Instead, it underscores the importance of the other mechanisms that were anticipated in the conceptual framework to drive these effects.[20]

Next, I examine the effect of insurance uptake on herd size, as children's work is closely linked to it. I hypothesized that insurance could alter household labor demands through its impact on herd size – potentially reducing the need for child labor if herd sizes decrease due to reduced precautionary motives. Table 8 presents results indicating a general decrease in livestock holdings during non-drought periods, except for the number of owned animals. In Panel A, where values are winsorized at the 99th percentile, no significant effects on herd size are observed, though it appears that pastoralists increase herd size during droughts. Moving to Panel B and C, with values winsorized at the 95th and 90th percentiles respectively, we observe a clearer pattern: the previously noted growth in herd size during droughts diminishes, and the negative impact of insurance on herd size becomes more pronounced and statistically significant. This suggests that, apart from a few pastoralists with very large herds, insurance generally leads to herd reduction. Specifically, an additional season of IBLI uptake results in significant decreases in the number of animals herded by the household – 3.6 TLU in total, 2.3 TLU in adult animals, and 1.6 TLU in lactating animals – representing reductions of 27 to 45 percent during non-drought periods. These findings, which align with those from Matsuda, Takahashi, and Ikegami (2019), corroborate the observed decrease in overall work participation and the shift from part-time work and schooling to full-time schooling during non-drought seasons.

Further, I investigate the impact on production strategies, particularly herd mobility, livestock expenditure, and diversification. Herd mobility, essential for pastoralism, significantly affects children's schooling due to its opportunity costs. Using two indicators – whether a household is partially or fully mobile, and the proportion of livestock kept away from home – I find that insurance

[20] Annual income encompasses earnings from all sources – sale of livestock, livestock products, crops, salaried employment, casual labor, business, petty trading, and others – over the past 12 months. Food expenditure reflects the total value of food consumed in the last 7 days, while non-food expenditure covers the value of non-food items consumed in the past 12 months.

uptake enhances both aspects of mobility during non-drought periods.[21] Columns (1) and (2) of Table 9 indicate a 22.3 percentage point increase (37 percent) in the likelihood of being mobile and a 21.9 percentage point rise (35 percent) in the share of livestock kept away from the base camp due to insurance uptake, both significant at the one percent level. These shifts suggest that insured households are leveraging IBLI to access better grazing areas further during stable periods.

The enhanced mobility may also explain the transition from part-time work and schooling to full-time schooling observed in Table 6. As families increase herd mobility, maintaining a balance between work and schooling becomes more challenging, leading children to prioritize schooling over work. This adjustment is primarily observed in how children shift from secondary work activities to focusing more on schooling as their primary activity. This is consistent with my hypothesis from Section 5, which posits that enhanced herd mobility, enabled by insurance, could shift children's activities to full-time schooling.

Despite these shifts, neither livestock-related expenditures nor income diversification, as measured by Simpson's diversification index, indicate significant changes in production strategies due to IBLI uptake during drought or non-drought periods (Columns 3 to 6).[22]

Finally, the timing of insurance payouts relative to the school calendar suggests that these are unlikely to directly influence school enrollment decisions. This observation supports the emphasis on *ex ante* effects of insurance in the conceptual framework, where the anticipation of financial stability, rather than the receipt of payouts, drives changes in household decision-making related to child labor and schooling. With most payouts occurring after the school year starts in both Kenya and Ethiopia, and given that the significant effects are observed primarily during non-drought seasons, direct financial contributions to schooling costs from payouts do not appear to be a driving mechanism in our findings.[23]

6.2 Heterogeneity of the Effects

Age, birth order, and gender critically influence children's work and schooling engagements, echoing the dynamics discussed in our conceptual framework. Figure 5 illustrates the engagement trends of children in work or schooling, highlighting that by age five, approximately 40 percent of

[21] These indicators are positively correlated but emphasize different aspects of herding behavior. While the mobility indicator focuses on household mobility, the share of kept-away livestock reflects the intensity of the herd mobility.

[22] Simpson (1949) introduced this index to measure concentration, adapted by Hirschman (1964) for market analysis. I modify it to assess diversity by subtracting the sum of squares of the income shares from different sources from one.

[23] The Kenyan school calendar starts in January, while payouts occurred in October-November 2011, March-April 2012, and March-April 2013. The Ethiopian calendar starts in September, with one payout occurred in November 2014.

children are already participating in these activities. This early involvement escalates to nearly 100 percent by age ten, reflecting the community's reliance on child labor. In this setting, first-born sons often prioritize herding roles, aligning with their higher responsibilities in livestock-related tasks, while younger siblings, especially girls, are more inclined towards schooling, as they are frequently tasked with household duties (Kenea, 2019). This nuanced engagement across different age groups, birth orders, and genders offers a deeper understanding of how insurance uptake could differentially impact children's labor and educational outcomes, reflecting the adaptive household strategies outlined in the conceptual framework.

Results from Table 10 indicate that insurance impacts vary significantly between younger (age 5-11) and older children (age 12-17), with older children, who are in higher labor demand, experiencing more pronounced effects. While Panel A shows no statistically significant differences in average effects between these age groups, detailed analysis reveals nuanced outcomes: younger children show a decline in intensive activities like child labor, whereas older children reduce part-time work and schooling, with both groups increasing their full-time schooling. Specifically, during non-drought periods, older children not only increase their involvement in primary work activities but also decrease secondary work activities. Moreover, during droughts, older children are more likely to engage in primary and full-time work while decreasing full-time schooling—effects that are mitigated by insurance uptake.

A more pronounced pattern emerges when analyzing heterogeneity by birth order, as detailed in Table 11. First-born children, who typically shoulder significant work responsibilities, show a marked increase in full-time and primary work activities while decreasing part-time work and schooling, as well as secondary work activities, compared to their younger siblings; these differences are statistically significant. Panels B and C highlight similar trends during non-drought periods. Additionally, these panels reveal that first-born children without insurance intensify their engagement in various work types—child labor, full-time work, and primary work activities—during drought periods, although this is substantially mitigated by insurance. Conversely, younger siblings reduce child labor and full-time work in favor of part-time work and schooling during non-drought seasons to enhance their participation in full-time schooling, deriving the greatest benefit.

Regarding heterogeneity across genders, the data reveal that female children, on average, significantly reduce their participation in child labor, demonstrating stronger effects in comparison to boys, whose labor is in higher demand. This aligns with the conceptual framework and observed heterogeneous effects across other categories, although the differences between boys and girls are not statistically significant. Disaggregated effects in Panel B suggest that girls' labor primarily serves as a secondary input for households. Without insurance, girls increase their participation in child labor and part-time work and schooling while decreasing full-time schooling. This is consistent with findings in Björkman-Nyqvist (2013) which showed that the older girls labor supply is more likely serve as a buffer. However, insurance uptake effectively mitigates these shifts. Conversely, Panel C reveals that boys predominantly shift from part-time work and schooling to full-time schooling during non-drought periods, with no substantial changes observed during drought periods.

7 Conclusion

Children in drought-prone pastoral communities frequently encounter increased demand for child labor and reduced school enrollment, particularly during periods of drought. This paper examines how Index-Based Livestock Insurance (IBLI) influences children's activity choices by exploiting exogenous variations in insurance premiums through randomized discount coupons distributed to pastoral households in northern Kenya and southern Ethiopia. By instrumenting insurance uptake with these coupons, I find that IBLI provides financial stability that not only mitigates the necessity for child labor during droughts but also fosters a shift towards full-time schooling. Specifically, an additional season of insurance uptake decreases children's engagement in labor by 8.9 percentage points, reduces overall work by 12.1 percentage points, cuts part-time work and schooling by 9.6 percentage points, and increases full-time schooling by 11.8 percentage points. These shifts are particularly significant during non-drought periods, indicating that consistent insurance coverage plays a crucial role in enhancing investments in children's education.

Decreased herd size and enhanced herd mobility emerge as channels through which these effects occur. Insured households decrease herd size due to reduced motivation for precautionary savings, leading to decreased labor demand. Furthermore, insurance enables more aggressive herding strategies by increasing herd mobility, which raises the cost of balancing work and schooling, compelling households to forego secondary work activities. This mechanism aligns with observed heterogeneous effects: while a decrease in child labor during drought periods is evident across age groups, the shift from part-time work and schooling to full-time schooling during non-drought periods is more prominent among older children, first-borns, and boys, who are more likely to engage in livestock herding and periodic migration with livestock.

These findings, coupled with the null effect on household income, suggest that changes in insured households' production strategies significantly influence children's activity choices by altering their marginal productivity and reducing the need for child labor during crises (Shah and Steinberg, 2017; Nordman, Sharma, and Sunder, 2021). Furthermore, the way insurance shifts responsibilities based on age, birth order, and gender underscores the pivotal role that effective risk management can play in enhancing human capital accumulation (Landmann and Frölich, 2015; Frölich and Landmann, 2018). This emphasizes the potential of financial products like IBLI to significantly impact economic outcomes along with other benefits of IBLI (Jensen and Barrett, 2017; Matsuda, Takahashi, and Ikegami, 2019; Janzen and Carter, 2019).

The findings of this study offer policy implications for improving educational outcomes and reducing child labor in pastoral regions. By demonstrating that consistent insurance coverage during non-drought periods significantly fosters educational engagement, this research highlights the role of insurance not only in alleviating immediate economic pressures but also in supporting environments conducive to long-term investments in children's human capital. The study also points to the necessity of tailoring insurance schemes to local educational and labor dynamics to optimize outcomes, reflecting regional variations in the effects of insurance uptake between Marsabit and the Borena zone. Additionally, integrating educational policies with these financial products can maximize the benefits of schooling and reduce the educational disruptions caused by seasonal and financial uncertainties.

This study focuses on immediate behavioral changes, with long-term effects on educational outcomes remaining uncertain. To address this, ongoing research, conducted in collaboration with a team of co-authors, is investigating the long-run impacts of IBLI on educational achievements, household income, and production strategies. This future research aims to provide a more comprehensive understanding of IBLI's long-term benefits and its potential to transform pastoral communities sustainably.

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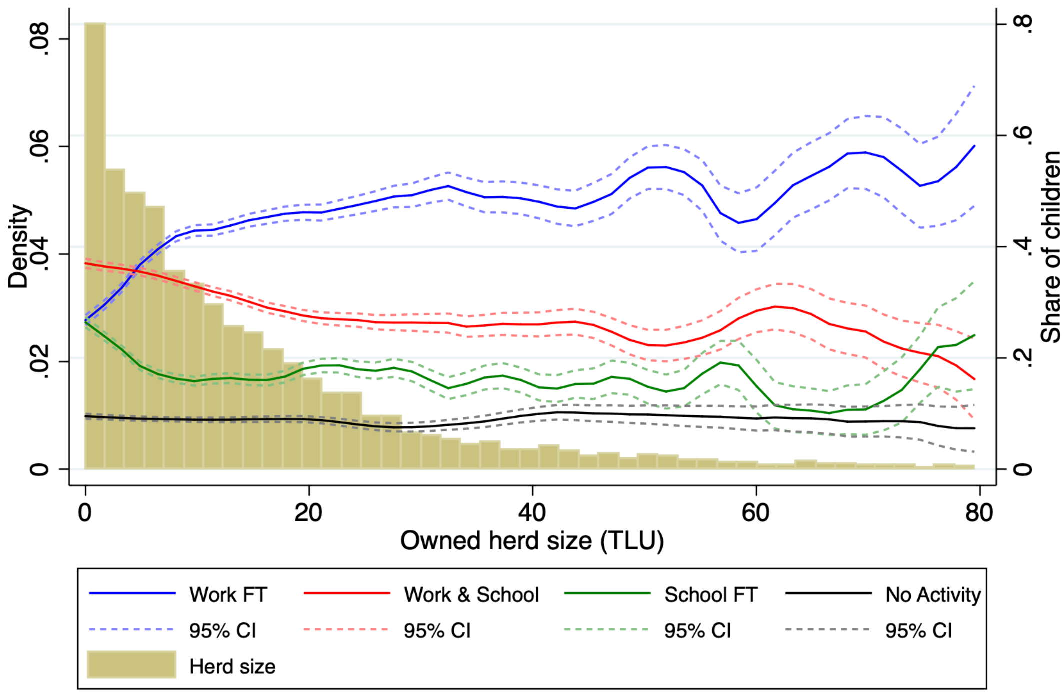
Figure 1: Children's activity by herd size

(a) Participation



(b) Hours, equals to zero if not participating

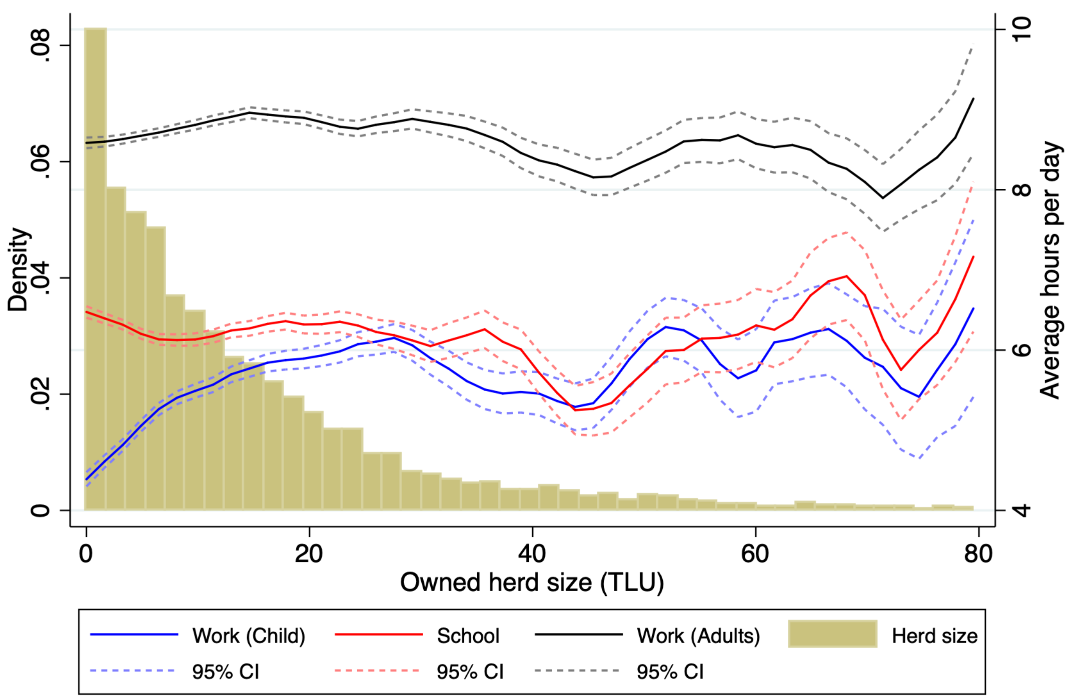


Figure 2: Map of project areas

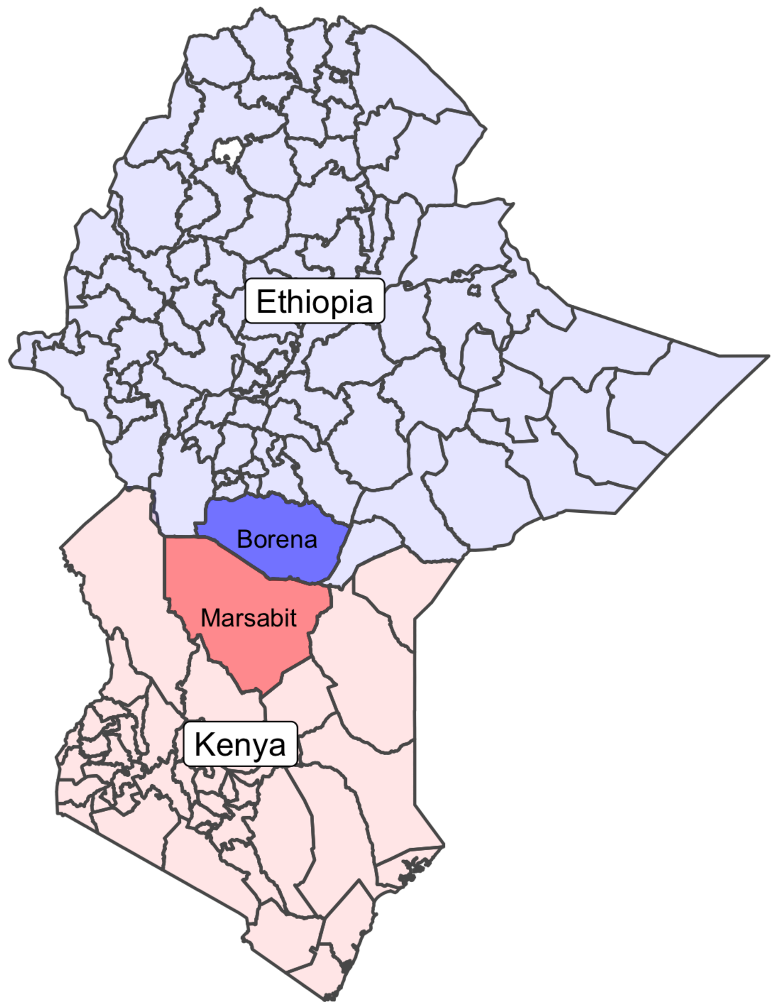
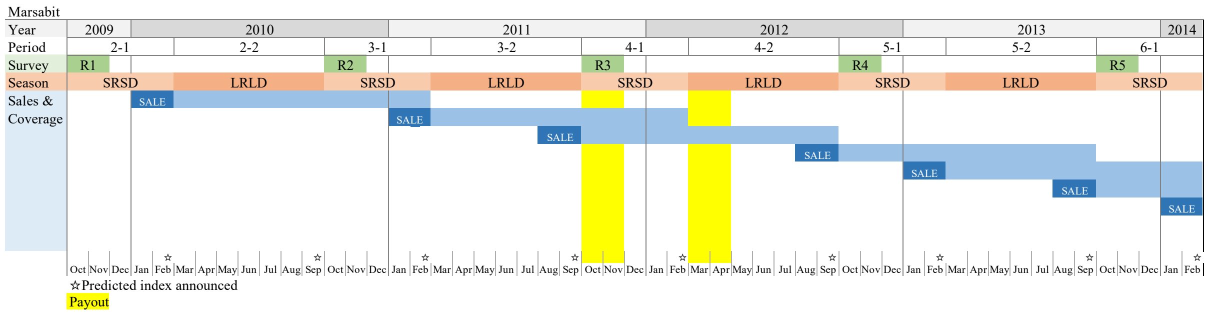


Figure 3: Timeline of the projects

(a) Marsabit District, Kenya



(b) Borena Zone, Ethiopia

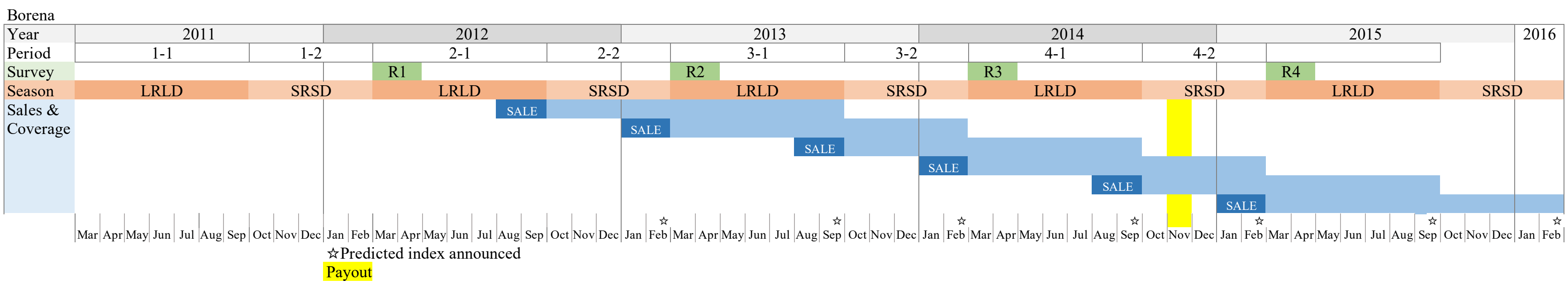
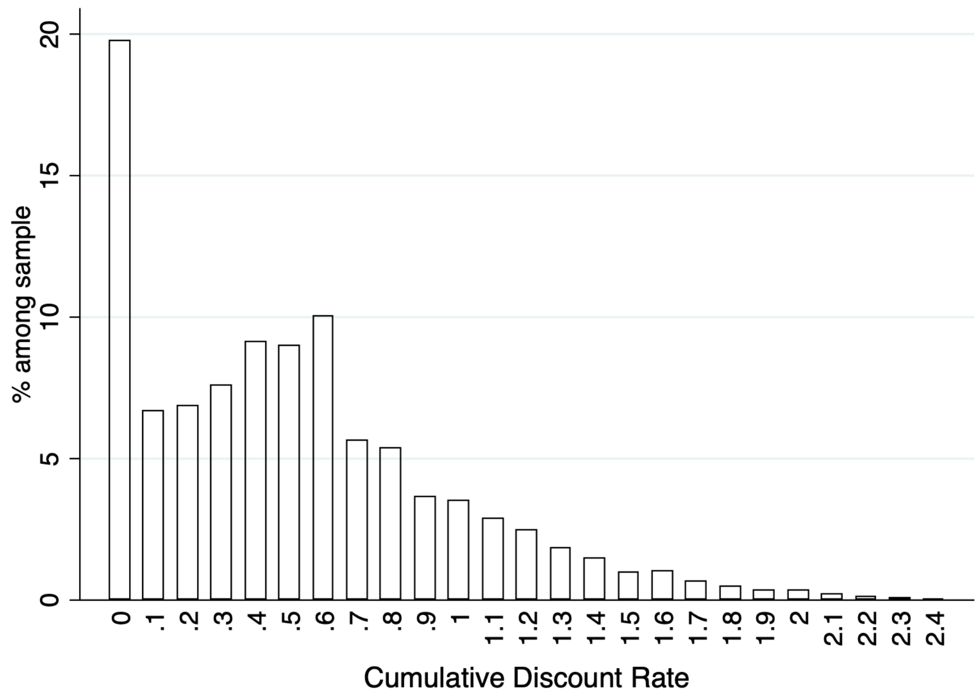


Figure 4: Cumulative discount rate and Insurance uptake

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



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

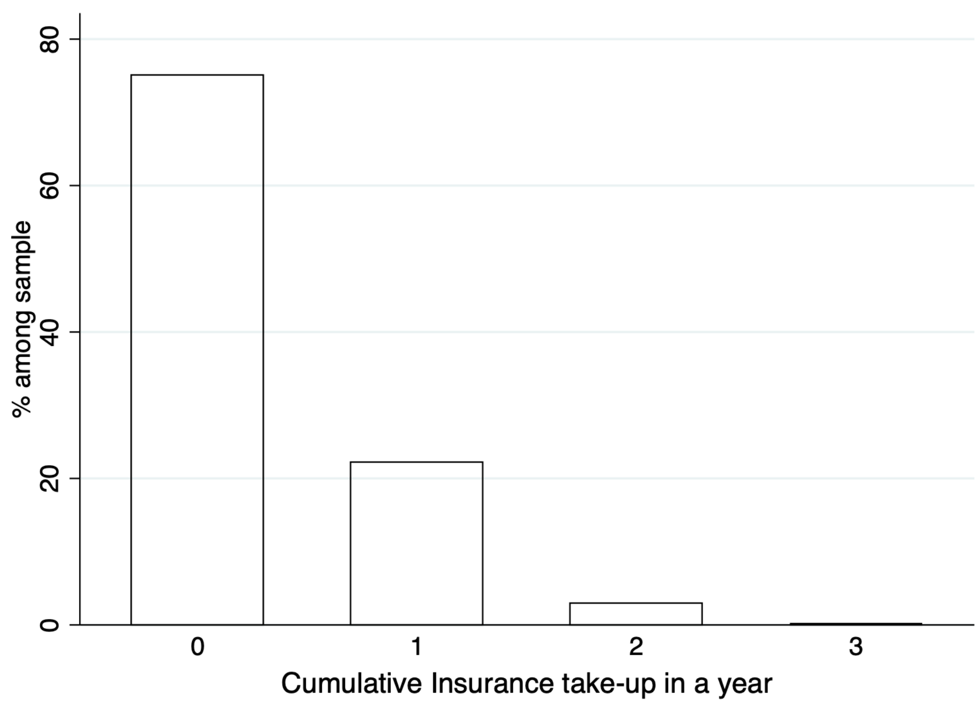
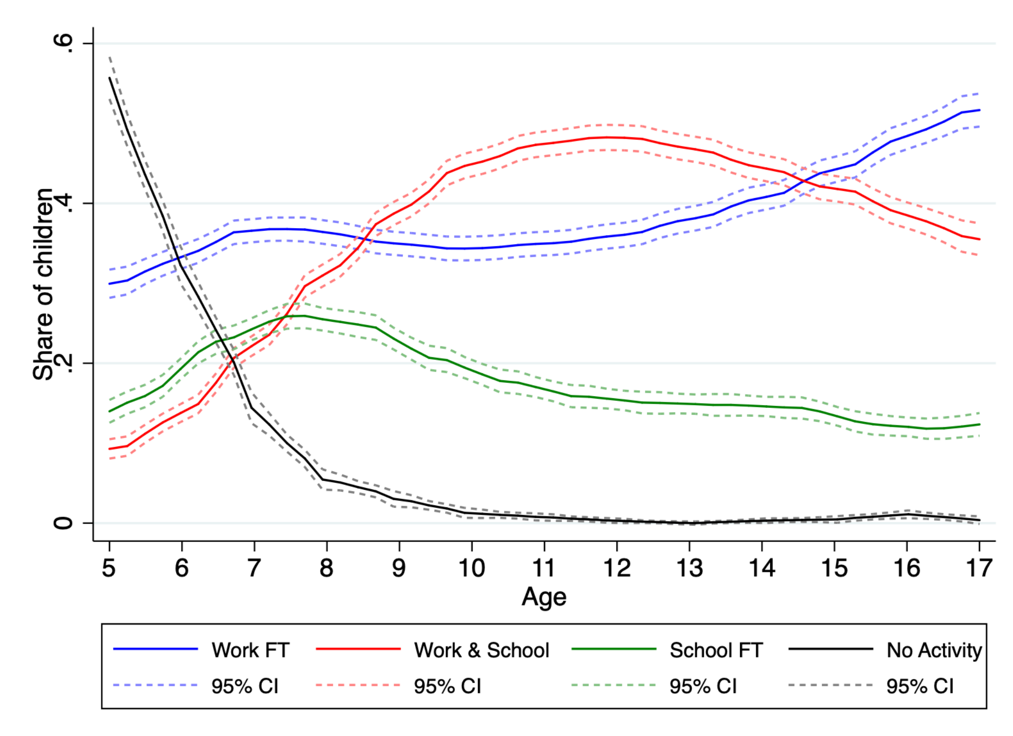


Figure 5: Children's activity by age and gender

(a) Girls



(b) Boys

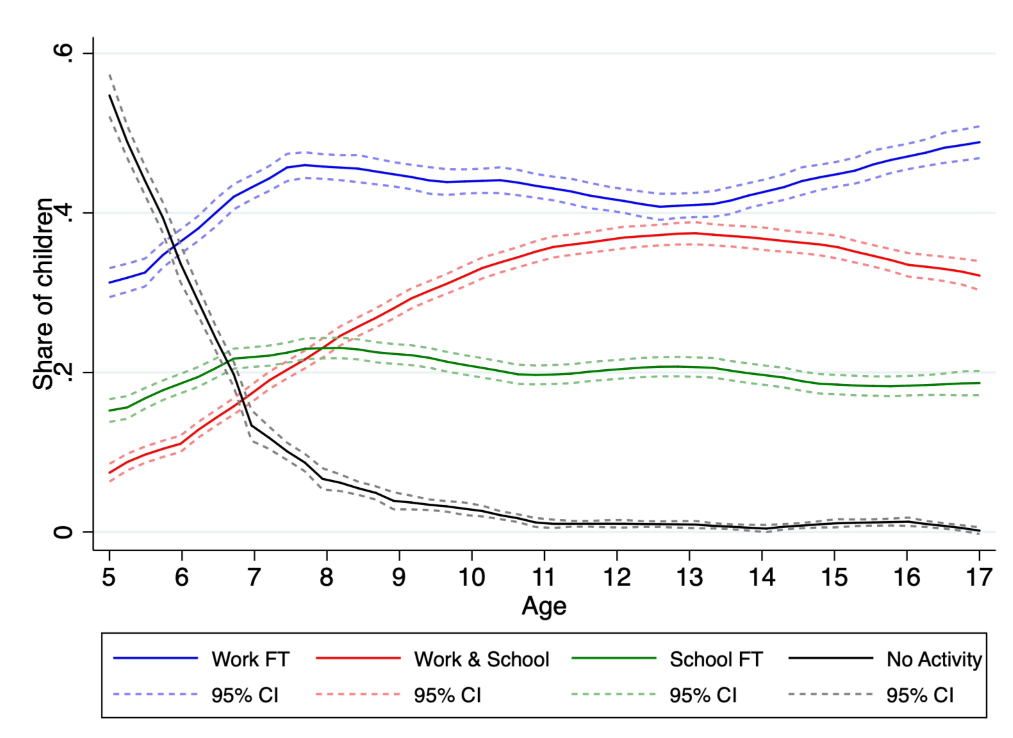


Table 1: Balance between recipients and non-recipients of coupon

	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.)	0.359***	0.329***	0.046***
	(0.030)	(0.031)	(0.011)
Shock $\times$ Discount rate (Cum.)		0.001	0.003***
		(0.001)	(0.001)
N	11296	11296	11296

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 Children's Work and Schooling

	Child labor	Work	Schooling	
			Activity: School	Enrollment
	(1)	(2)	(3)	(4)
Panel A: Average Effects				
Insurance Uptake (Cum.)	-0.089**	-0.121***	0.022	0.017
	(0.042)	(0.041)	(0.028)	(0.021)
N	12216	12216	12216	11177
F_{eff}	53.690	53.690	53.690	48.632
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.	0.033	0.003	0.431	0.410
Mean of Dep. Var.	0.427	0.645	0.434	0.390
Panel B: Disaggregated Effects				
Shock	0.091**	0.051	0.009	0.005
	(0.039)	(0.037)	(0.021)	(0.013)
Insurance Uptake (Cum.)	-0.038	-0.104**	0.023	0.018
	(0.054)	(0.052)	(0.037)	(0.028)
Shock $\times$ Insurance Uptake (Cum.)	-0.197*	-0.082	-0.008	-0.007
	(0.101)	(0.097)	(0.060)	(0.041)
Shock+Uptake $\times$ Shock (coef.)	-0.106	-0.031	0.001	-0.002
Shock+Uptake $\times$ Shock (p-val.)	0.145	0.654	0.982	0.938
N	11296	11296	11296	10354
K-P F-stat	24.379	24.379	24.379	18.891
AR test p-val.	0.006	0.007	0.792	0.756
Mean of Dep. Var.	0.535	0.720	0.495	0.421

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 Child Activities

	Work FT	Work and School	School FT	No activity
	(1)	(2)	(3)	(4)
Panel A: Average Effects				
Insurance Uptake (Cum.)	-0.024	-0.096**	0.118***	0.003
	(0.032)	(0.038)	(0.035)	(0.025)
N	12216	12216	12216	12223
F_{eff}	53.690	53.690	53.690	53.688
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.	0.446	0.010	0.000	0.912
Mean of Dep. Var.	0.374	0.271	0.163	0.193
Panel B: Disaggregated Effects				
Shock	0.014	0.037	-0.028	-0.022
	(0.022)	(0.035)	(0.035)	(0.018)
Insurance Uptake (Cum.)	-0.017	-0.087*	0.110***	-0.006
	(0.044)	(0.047)	(0.042)	(0.035)
Shock $\times$ Insurance Uptake (Cum.)	-0.031	-0.051	0.044	0.039
	(0.066)	(0.089)	(0.089)	(0.053)
Shock+Uptake $\times$ Shock (coef.)	-0.017	-0.015	0.016	0.017
Shock+Uptake $\times$ Shock (p-val.)	0.742	0.818	0.804	0.683
N	11296	11296	11296	11303
K-P F-stat	24.379	24.379	24.379	24.354
AR test p-val.	0.592	0.030	0.002	0.696
Mean of Dep. Var.	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 5: Impact on Hours Children Spent on Each Activity

	Work	School	Leisure
	(1)	(2)	(3)
Panel A: Average Effects			
Insurance Uptake (Cum.)	-0.491*	-0.018	0.630**
	(0.284)	(0.192)	(0.316)
N	12243	12243	12437
F_{eff}	54.577	54.577	53.615
5% Critical Value	37.418	37.418	37.418
10% Critical Value	23.109	23.109	23.109
AR test p-val.	0.078	0.927	0.041
Mean of Dep. Var.	3.811	3.111	17.371
Panel B: Disaggregated Effects			
Shock	0.361	0.039	-0.356
	(0.228)	(0.172)	(0.256)
Insurance Uptake (Cum.)	-0.676*	0.005	0.778*
	(0.375)	(0.249)	(0.407)
Shock $\times$ Insurance Uptake (Cum.)	0.151	-0.055	-0.084
	(0.640)	(0.435)	(0.696)
Shock+Uptake $\times$ Shock (coef.)	0.512	-0.016	-0.440
Shock+Uptake $\times$ Shock (p-val.)	0.286	0.960	0.391
N	11276	11276	11466
K-P F-stat	24.642	24.642	24.361
AR test p-val.	0.102	0.990	0.068
Mean of Dep. Var.	3.956	3.980	16.205

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 6: 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.)	0.011	0.011	0.007	-0.006	-0.192***	-0.064*	-0.088**	0.031**
	(0.033)	(0.031)	(0.028)	(0.029)	(0.053)	(0.038)	(0.045)	(0.013)
N	12215	12215	12215	12215	12216	12216	12216	12216
F_{eff}	53.621	53.621	53.621	53.621	53.690	53.690	53.690	53.690
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.	0.743	0.723	0.802	0.830	0.000	0.093	0.042	0.016
Mean of Dep. Var.	0.376	0.253	0.105	0.430	0.398	0.121	0.249	0.005
Panel B: Disaggregated Effects								
Shock	0.026	0.056***	-0.026	-0.004	0.045	-0.037	0.060	0.031***
	(0.021)	(0.022)	(0.020)	(0.022)	(0.046)	(0.028)	(0.043)	(0.009)
Insurance Uptake (Cum.)	0.027	0.034	0.001	-0.012	-0.192***	-0.063	-0.097*	0.041**
	(0.044)	(0.042)	(0.036)	(0.038)	(0.067)	(0.050)	(0.053)	(0.018)
Shock × Insurance Uptake (Cum.)	-0.061	-0.100	0.036	0.018	-0.034	0.026	-0.024	-0.048
	(0.063)	(0.066)	(0.056)	(0.061)	(0.124)	(0.071)	(0.110)	(0.032)
Shock+Uptake × Shock (coef.)	-0.035	-0.044	0.010	0.014	0.011	-0.011	0.036	-0.017
Shock+Uptake × Shock (p-val.)	0.475	0.398	0.813	0.762	0.904	0.839	0.643	0.491
N	11295	11295	11295	11295	11296	11296	11296	11296
K-P F-stat	24.415	24.415	24.415	24.415	24.379	24.379	24.379	24.379
AR test p-val.	0.616	0.281	0.713	0.941	0.001	0.400	0.071	0.059
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 7: Impact on Household Income and Expenditures in Response to Shock

	Annual income (Total)	Annual income per capita	Food expenditure	Non-food expenditure
	(1)	(2)	(3)	(4)
Shock	186.433	44.278*	-1.827**	-1.199
	(137.480)	(24.050)	(0.859)	(1.405)
Insurance Uptake (Cum.)	-225.122	-37.145	-1.312	0.133
	(147.915)	(25.511)	(1.194)	(1.151)
Shock $\times$ Insurance Uptake (Cum.)	-25.730	-14.352	1.328	-0.500
	(320.173)	(57.058)	(2.244)	(2.767)
Shock+Uptake $\times$ Shock (coef.)	160.704	29.926	-0.499	-1.699
Shock+Uptake $\times$ Shock (p-val.)	0.454	0.439	0.755	0.316
N	5085	5085	5082	5074
K-P F-stat	29.302	29.302	29.317	29.260
AR test p-val.	0.131	0.168	0.539	0.981
Mean of Dep. Var.	678.358	136.733	15.844	8.182

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

	Herd size (own)	Herd size (herding)	Adult animals	Lactating animals
	(1)	(2)	(3)	(4)
Panel A: Winsorized at 99 percent				
Shock	1.569**	3.232***	1.742**	0.350
	(0.800)	(0.928)	(0.695)	(0.254)
Insurance Uptake (Cum.)	1.431	-0.179	0.288	-0.893
	(1.375)	(1.712)	(1.156)	(0.560)
Shock × Insurance Uptake (Cum.)	-1.715	-3.011	-2.012	0.177
	(2.144)	(2.360)	(1.728)	(0.684)
Shock+Uptake × Shock (coef.)	-0.146	0.222	-0.270	0.527
Shock+Uptake × Shock (p-val.)	0.925	0.896	0.826	0.308
N	5085	5085	5085	5085
K-P F-stat	29.302	29.302	29.302	29.302
AR test p-val.	0.565	0.269	0.475	0.208
Mean of Dep. Var.	14.288	16.032	10.631	3.859
Panel B: Winsorized at 95 percent				
Shock	1.084	2.117***	1.108*	0.120
	(0.663)	(0.790)	(0.583)	(0.206)
Insurance Uptake (Cum.)	0.486	-1.627	-1.030	-1.172**
	(1.150)	(1.435)	(0.978)	(0.489)
Shock × Insurance Uptake (Cum.)	-0.229	-0.222	-0.041	0.771
	(1.735)	(1.971)	(1.417)	(0.581)
Shock+Uptake × Shock (coef.)	0.855	1.895	1.067	0.891
Shock+Uptake × Shock (p-val.)	0.489	0.176	0.276	0.044
N	5085	5085	5085	5085
K-P F-stat	29.302	29.302	29.302	29.302
AR test p-val.	0.906	0.329	0.442	0.045
Mean of Dep. Var.	13.283	14.967	9.848	3.621
Panel C: Winsorized at 90 percent				
Shock	0.458	0.933	0.522	0.024
	(0.570)	(0.686)	(0.491)	(0.189)
Insurance Uptake (Cum.)	-1.559	-3.573***	-2.317***	-1.556***
	(1.017)	(1.243)	(0.850)	(0.464)
Shock × Insurance Uptake (Cum.)	1.280	2.288	1.366	1.047**
	(1.477)	(1.698)	(1.186)	(0.533)
Shock+Uptake × Shock (coef.)	1.738	3.221	1.888	1.071
Shock+Uptake × Shock (p-val.)	0.099	0.008	0.024	0.008
N	5085	5085	5085	5085
K-P F-stat	29.302	29.302	29.302	29.302
AR test p-val.	0.306	0.012	0.020	0.001
Mean of Dep. Var.	12.419	13.930	9.089	3.419

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 Production Stratgeies

	Mobile	Share of livestock kept away	Livestock expenditure (Total)	Livestock food	Livestock Veterinary	Income Diversity Index
	(1)	(2)	(3)	(4)	(5)	(6)
Shock	-0.045	0.033	0.088	-0.015	0.045**	-0.003
	(0.043)	(0.034)	(0.076)	(0.053)	(0.019)	(0.029)
Insurance Uptake (Cum.)	0.223***	0.219***	-0.012	0.089	-0.044	0.038
	(0.072)	(0.055)	(0.109)	(0.058)	(0.031)	(0.040)
Shock $\times$ Insurance Uptake (Cum.)	-0.176	-0.197**	-0.200	-0.129	-0.007	-0.020
	(0.117)	(0.090)	(0.222)	(0.151)	(0.053)	(0.073)
Shock+Uptake $\times$ Shock (coef.)	-0.221	-0.163	-0.112	-0.144	0.037	-0.023
Shock+Uptake $\times$ Shock (p-val.)	0.012	0.016	0.495	0.178	0.337	0.668
N	5085	4832	5072	5072	5072	5085
K-P F-stat	29.302	28.005	29.200	29.200	29.200	29.302
AR test p-val.	0.004	0.000	0.594	0.281	0.175	0.611
Mean of Dep. Var.	0.600	0.633	0.517	0.246	0.163	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 10: 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.)	-0.145**	-0.029	-0.071	0.099**	-0.003	-0.194***
	(0.057)	(0.046)	(0.046)	(0.041)	(0.047)	(0.063)
Age 13-17 × Insurance Uptake (Cum.)	-0.053	-0.002	-0.194***	0.177***	0.054	-0.260***
	(0.070)	(0.045)	(0.073)	(0.066)	(0.045)	(0.100)
Difference	-0.092	-0.027	0.123	-0.078	-0.058	0.067
	(0.089)	(0.064)	(0.082)	(0.072)	(0.065)	(0.110)
N	12216	12216	12216	12216	12215	12216
Panel B: Disaggreagted Effects, Children of Age 5-12						
Shock	0.106**	0.011	0.005	0.020	0.020	0.011
	(0.053)	(0.031)	(0.041)	(0.043)	(0.032)	(0.053)
Insurance Uptake (Cum.)	-0.084	-0.018	-0.050	0.085*	0.002	-0.168**
	(0.071)	(0.062)	(0.056)	(0.050)	(0.063)	(0.078)
Shock × Insurance Uptake (Cum.)	-0.244*	-0.036	-0.054	0.018	-0.030	-0.072
	(0.139)	(0.091)	(0.103)	(0.108)	(0.093)	(0.142)
Shock+Uptake × Shock (coef.)	-0.139	-0.025	-0.049	0.038	-0.010	-0.061
Shock+Uptake × Shock (p-val.)	0.167	0.720	0.517	0.626	0.892	0.554
N	6872	6872	6872	6872	6872	6872
K-P F-stat	0.535	0.406	0.314	0.180	0.412	0.446
Panel C: Disaggreagted Effects, Children of Age 13-17						
Shock	0.125**	0.045*	0.077	-0.120**	0.062**	0.089
	(0.056)	(0.025)	(0.061)	(0.061)	(0.026)	(0.074)
Insurance Uptake (Cum.)	-0.022	0.017	-0.218**	0.175**	0.100*	-0.301**
	(0.085)	(0.059)	(0.089)	(0.075)	(0.059)	(0.121)
Shock × Insurance Uptake (Cum.)	-0.181	-0.088	0.010	0.096	-0.174**	0.048
	(0.137)	(0.072)	(0.154)	(0.150)	(0.075)	(0.198)
Shock+Uptake × Shock (coef.)	-0.056	-0.042	0.087	-0.024	-0.113	0.138
Shock+Uptake × Shock (p-val.)	0.567	0.452	0.428	0.817	0.060	0.342
N	3859	3859	3859	3859	3859	3859
K-P F-stat	0.535	0.406	0.314	0.180	0.412	0.446

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 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.)	-0.050	0.076	-0.225***	0.147**	0.133**	-0.339***
	(0.078)	(0.060)	(0.069)	(0.058)	(0.061)	(0.099)
Others × Insurance Uptake (Cum.)	-0.122**	-0.088**	-0.032	0.111***	-0.061	-0.139**
	(0.051)	(0.040)	(0.039)	(0.039)	(0.040)	(0.056)
Difference	0.072	0.164**	-0.193**	0.035	0.194***	-0.200*
	(0.092)	(0.072)	(0.076)	(0.065)	(0.072)	(0.107)
N	12216	12216	12216	12216	12215	12216
Panel B: Disaggreagted Effects, Oldest siblings						
Shock	0.128**	0.044*	0.004	-0.019	0.068**	-0.023
	(0.053)	(0.027)	(0.048)	(0.048)	(0.027)	(0.058)
Insurance Uptake (Cum.)	0.082	0.122	-0.221**	0.129*	0.212**	-0.413***
	(0.104)	(0.088)	(0.090)	(0.075)	(0.088)	(0.134)
Shock × Insurance Uptake (Cum.)	-0.369**	-0.129	-0.012	0.051	-0.214**	0.173
	(0.150)	(0.100)	(0.136)	(0.137)	(0.093)	(0.181)
Shock+Uptake × Shock (coef.)	-0.242	-0.084	-0.008	0.032	-0.146	0.150
Shock+Uptake × Shock (p-val.)	0.039	0.330	0.937	0.760	0.071	0.297
N	3676	3676	3676	3676	3676	3676
K-P F-stat	0.535	0.406	0.314	0.180	0.412	0.446
Panel C: Disaggreagted Effects, Younger siblings						
Shock	0.045	-0.010	0.030	-0.003	-0.011	0.050
	(0.050)	(0.036)	(0.043)	(0.042)	(0.036)	(0.055)
Insurance Uptake (Cum.)	-0.123*	-0.095*	-0.048	0.125***	-0.080	-0.151**
	(0.066)	(0.056)	(0.049)	(0.048)	(0.056)	(0.073)
Shock × Insurance Uptake (Cum.)	-0.034	0.025	0.017	-0.034	0.058	-0.009
	(0.124)	(0.092)	(0.100)	(0.097)	(0.096)	(0.134)
Shock+Uptake × Shock (coef.)	0.011	0.015	0.047	-0.038	0.047	0.040
Shock+Uptake × Shock (p-val.)	0.898	0.819	0.499	0.578	0.500	0.666
N	6984	6984	6984	6984	6983	6984
K-P F-stat	0.535	0.406	0.314	0.180	0.412	0.446

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 12: Impact on Child Activities, by Gender

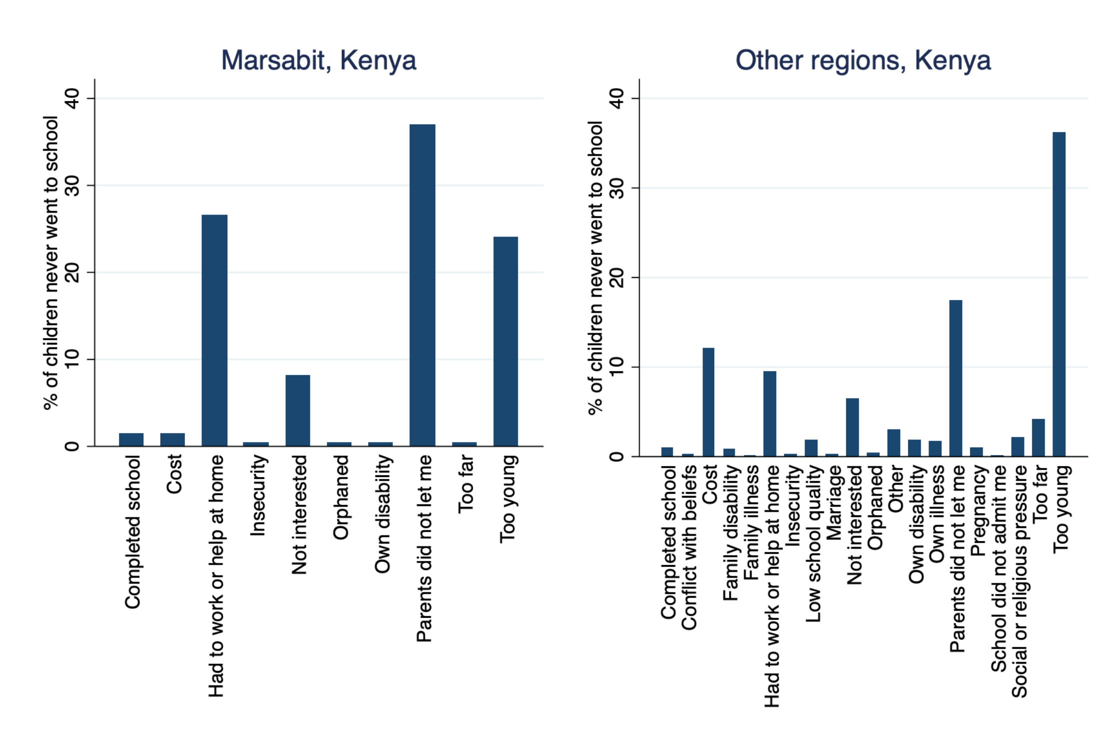
	Child Labor	Work FT	Work and School	School FT	Work as Primary	Work as Secondary
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Heterogeneity of Average Effects						
Female × Insurance Uptake (Cum.)	-0.126**	-0.041	-0.096*	0.103**	0.018	-0.176**
	(0.058)	(0.046)	(0.051)	(0.041)	(0.047)	(0.069)
Male × Insurance Uptake (Cum.)	-0.048	-0.010	-0.093*	0.134***	0.002	-0.205***
	(0.058)	(0.043)	(0.050)	(0.051)	(0.043)	(0.071)
Difference	-0.078	-0.031	-0.003	-0.031	0.016	0.028
	(0.080)	(0.063)	(0.067)	(0.060)	(0.063)	(0.091)
N	12216	12216	12216	12216	12215	12216
Panel B: Disaggreagted Effects, Girls						
Shock	0.191***	0.000	0.110**	-0.114**	0.018	0.099
	(0.067)	(0.033)	(0.054)	(0.054)	(0.032)	(0.075)
Insurance Uptake (Cum.)	-0.025	-0.013	-0.035	0.032	0.050	-0.078
	(0.076)	(0.065)	(0.065)	(0.054)	(0.067)	(0.090)
Shock × Insurance Uptake (Cum.)	-0.396**	-0.066	-0.233*	0.262*	-0.092	-0.316
	(0.180)	(0.095)	(0.141)	(0.147)	(0.096)	(0.208)
Shock+Uptake × Shock (coef.)	-0.205	-0.066	-0.124	0.147	-0.074	-0.217
Shock+Uptake × Shock (p-val.)	0.103	0.360	0.215	0.156	0.315	0.139
N	5402	5402	5402	5402	5402	5402
K-P F-stat	0.535	0.406	0.314	0.180	0.412	0.446
Panel C: Disaggreagted Effects, Boys						
Shock	0.010	0.028	-0.025	0.047	0.034	0.008
	(0.045)	(0.028)	(0.042)	(0.044)	(0.028)	(0.055)
Insurance Uptake (Cum.)	-0.048	-0.022	-0.133**	0.186***	0.003	-0.294***
	(0.073)	(0.057)	(0.062)	(0.062)	(0.056)	(0.094)
Shock × Insurance Uptake (Cum.)	-0.007	0.010	0.119	-0.167	-0.028	0.221
	(0.119)	(0.086)	(0.106)	(0.106)	(0.082)	(0.150)
Shock+Uptake × Shock (coef.)	0.002	0.037	0.094	-0.120	0.007	0.228
Shock+Uptake × Shock (p-val.)	0.979	0.586	0.230	0.114	0.919	0.042
N	5852	5852	5852	5852	5851	5852
K-P F-stat	0.535	0.406	0.314	0.180	0.412	0.446

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

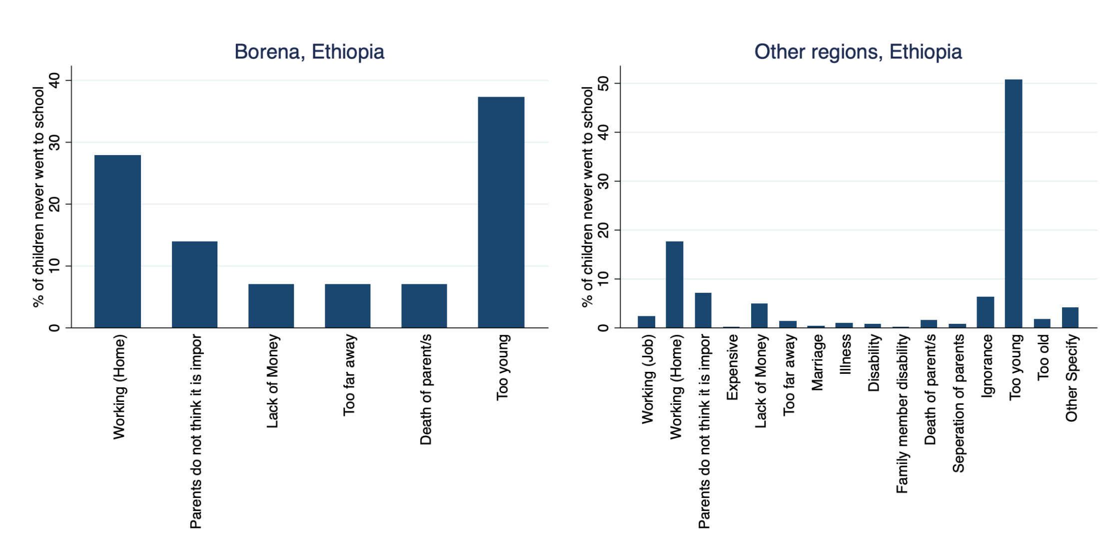
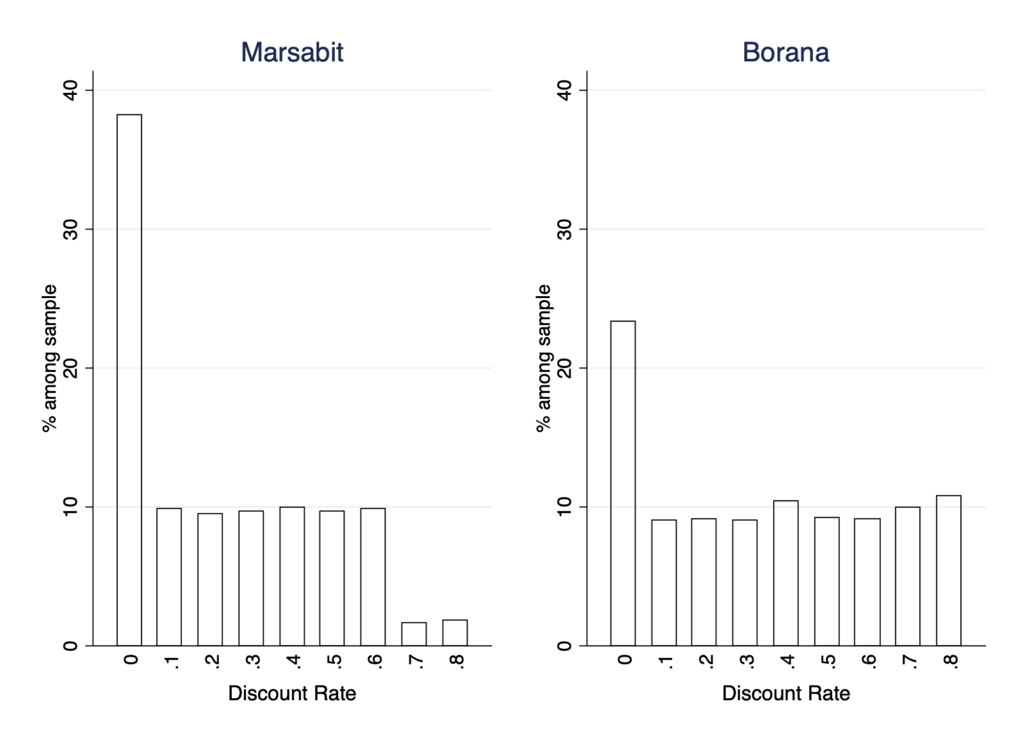


Figure A2: Discount Rate and Insured Livestock

(a) Discount Rates



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

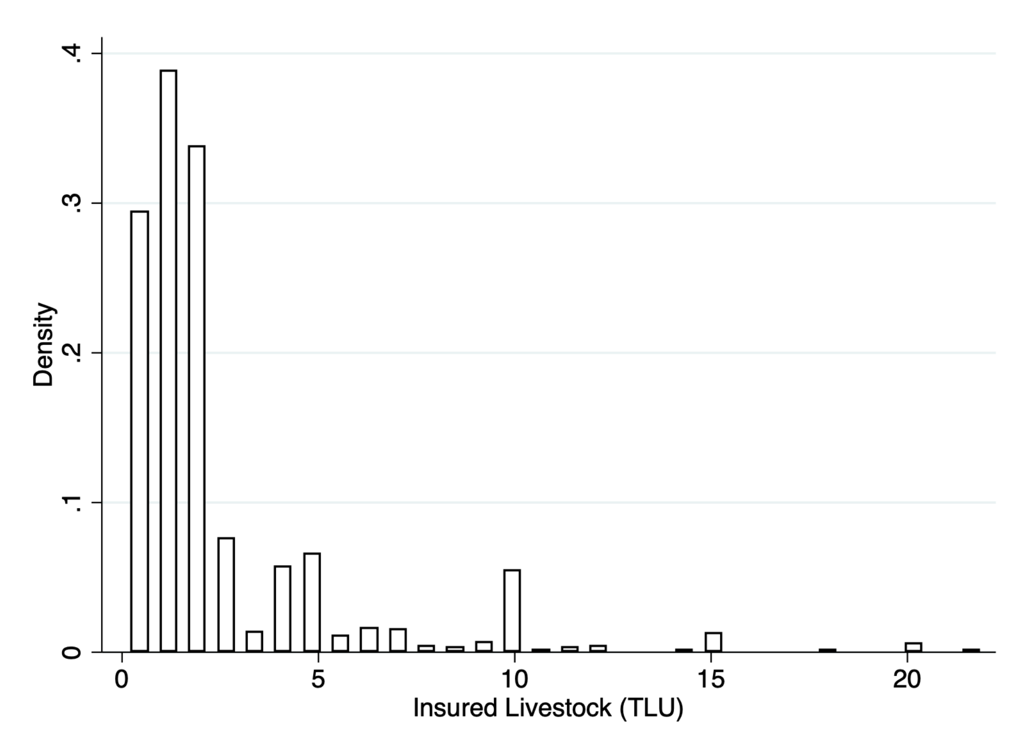


Table A1: Relationship between premium discounts and insurance uptake among neighbors

	Peers' IBLI uptake		Own IBLI uptake	
	(1)	(2)	(3)	(4)
Own Discount Rate	0.510***	-0.092		0.357***
	(0.148)	(0.118)		(0.030)
Peers' Average Discount Rate		0.556***	0.003*	0.001
		(0.044)	(0.002)	(0.002)
N	12027	12027	12027	12027
Mean of Dep. Var.	1.121	1.121	0.140	0.140

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 A2: First-stage predictive power of Table 4, 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 A3: Impact on Child Activities (ITT)

	Child Labor	Work	Schooling	Work FT	Work and School	School FT
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Average Effects						
Discount rate (Current + Cum.)	-0.031**	-0.046***	-0.003	-0.005	-0.041***	0.038***
	(0.015)	(0.014)	(0.011)	(0.012)	(0.013)	(0.012)
N	12136	12136	12136	12136	12136	12136
Mean of Dep. Var.	0.489	0.694	0.547	0.368	0.326	0.221
Panel B: Disaggregated Effects						
Shock	0.041	0.027	0.016	-0.0048	0.032	-0.016
	(0.026)	(0.025)	(0.017)	(0.017)	(0.025)	(0.024)
Discount rate (Current + Cum.)	-0.025	-0.042***	-0.0024	-0.0053	-0.036***	0.034***
	(0.015)	(0.015)	(0.011)	(0.013)	(0.013)	(0.012)
Shock × Discount rate (Cum.)	-0.00049*	-0.00031	-0.000096	0.000040	-0.00035	0.00025
	(0.00029)	(0.00029)	(0.00020)	(0.00022)	(0.00027)	(0.00027)
N	12136	12136	12136	12136	12136	12136
Mean of Dep. Var.	0.548	0.728	0.466	0.426	0.302	0.164

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 Child Activities (OLS using insurance uptake)

	Child Labor	Work	Schooling	Work FT	Work and School	School FT
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Average Effects						
Insurance Uptake (Cum.)	0.003	-0.013	-0.006	0.006	-0.019*	0.013
	(0.012)	(0.012)	(0.008)	(0.009)	(0.011)	(0.010)
N	12136	12136	12136	12136	12136	12136
Mean of Dep. Var.	0.535	0.720	0.495	0.406	0.314	0.180
Panel B: Disaggregated Effects						
Shock	0.015	-0.003	0.008	-0.005	0.002	0.006
	(0.020)	(0.020)	(0.014)	(0.014)	(0.020)	(0.019)
Insurance Uptake (Cum.)	0.012	-0.022	-0.011	0.007	-0.029**	0.018
	(0.014)	(0.014)	(0.010)	(0.011)	(0.014)	(0.012)
Shock × Insurance Uptake (Cum.)	-0.026	0.023	0.012	-0.000	0.024	-0.012
	(0.022)	(0.023)	(0.013)	(0.014)	(0.022)	(0.021)
N	12136	12136	12136	12136	12136	12136
Mean of Dep. Var.	0.548	0.728	0.466	0.426	0.302	0.164

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 Child Activities with lapsed insurance

	Child Labor	Work FT	Work and School	School FT	No activity
	(1)	(2)	(3)	(4)	(5)
Insurance Uptake (Cum.)	-0.138*	-0.042	-0.181**	0.226***	-0.002
	(0.083)	(0.057)	(0.078)	(0.076)	(0.045)
Insurance Updatke (Lapsed)	-0.115	-0.034	-0.189	0.237*	-0.014
	(0.150)	(0.094)	(0.142)	(0.143)	(0.079)
N	11276	11276	11276	11276	11283
K-P F-stat	28.239	28.239	28.239	28.239	28.261
AR test p-val.	0.090	0.688	0.017	0.000	0.967
Mean of Dep. Var.	0.489	0.368	0.326	0.221	0.086

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 insurance uptake incidences over the latest three seasons. Relevant periods for discount rate are the same as those of the insurance uptake. Insurance uptake (Lapsed) is the insurance uptake prior to the latest three seasons, that is lapsed during the survey periods. 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: 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)
Panel A: Average Effects					
Insurance coverage (TLU)	-0.017**	-0.005	-0.019**	0.023***	0.001
	(0.009)	(0.006)	(0.008)	(0.008)	(0.005)
N	12173	12173	12173	12173	12180
F_{eff}	9.150	9.150	9.150	9.150	9.152
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.	0.031	0.404	0.008	0.000	0.892
Mean of Dep. Var.	0.427	0.374	0.272	0.161	0.193
Panel B: Disaggregated Effects					
Shock	0.037	0.004	0.003	0.007	-0.014
	(0.026)	(0.015)	(0.023)	(0.023)	(0.012)
Insurance coverage (TLU)	-0.009	-0.004	-0.017*	0.022**	-0.001
	(0.010)	(0.008)	(0.009)	(0.009)	(0.006)
Shock × Insurance coverage (TLU)	-0.029	-0.004	-0.006	0.004	0.006
	(0.020)	(0.011)	(0.016)	(0.016)	(0.009)
Shock+Uptake × Shock (coef.)	0.007	0.000	-0.003	0.011	-0.007
Shock+Uptake × Shock (p-val.)	0.744	0.997	0.877	0.575	0.517
N	11249	11249	11249	11249	11256
K-P F-stat	8.758	8.758	8.758	8.758	8.756
AR test p-val.	0.005	0.546	0.023	0.001	0.676
Mean of Dep. Var.	0.489	0.368	0.326	0.221	0.086

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. An observation corresponds to an individual. The sample includes children of age 5-17. Insurance uptake (TLU) is the sum of insured animals in Tropical Livestock Unit (TLU) over the latest three seasons. Relevant periods for discount rate are the same as those of the insurance uptake. Shock is an indicator equals to one if the insurance payout was triggered for the season in the index unit. All columns include insurance area- and survey year- fixed effects, adult equivalent, age and age-squared, female dummy, age, sex, and education of the household head, whether or not a household is participating in a school feeding or supplementary feeding program.

Table A7: 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.)	-0.094*	-0.015	-0.073	0.051	0.038
	(0.056)	(0.044)	(0.051)	(0.046)	(0.034)
N	12197	12197	12197	12197	12204
F_{eff}	29.608	29.608	29.608	29.608	29.610
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.	0.083	0.735	0.157	0.262	0.260
Mean of Dep. Var.	0.426	0.374	0.271	0.163	0.193
Panel B: Disaggregated Effects					
Shock	0.105**	0.026	0.059	-0.080**	-0.005
	(0.044)	(0.025)	(0.039)	(0.040)	(0.021)
Insurance Uptake (Cum.)	-0.002	0.008	-0.028	-0.016	0.038
	(0.074)	(0.061)	(0.068)	(0.059)	(0.049)
Shock × Insurance Uptake (Cum.)	-0.231**	-0.056	-0.110	0.167*	-0.002
	(0.113)	(0.076)	(0.100)	(0.098)	(0.062)
Shock+Uptake × Shock (coef.)	-0.127	-0.030	-0.051	0.087	-0.006
Shock+Uptake × Shock (p-val.)	0.109	0.599	0.460	0.190	0.894
N	11276	11276	11276	11276	11283
K-P F-stat	26.141	26.141	26.141	26.141	26.165
AR test p-val.	0.008	0.601	0.151	0.103	0.482
Mean of Dep. Var.	0.489	0.368	0.326	0.221	0.086

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. An observation corresponds to an individual. The sample includes children of age 5-17. Insurance uptake (Cum.) is the sum of insurance uptake incidences over the latest three seasons. Relevant periods for discount rate are the same as those of the insurance uptake. Shock is an indicator equals to one if the insurance payout was triggered for the season in the index unit. All columns include insurance area-, survey year-, and country × year fixed effects, adult equivalent, age and age-squared, female dummy, age, sex, and education of the household head, whether or not a household is participating in a school feeding or supplementary feeding program.

Table A8: Impact on Child Activities, by country

	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						
Ethopia × Insurance Uptake (Cum.)	-0.003	0.046	-0.072	0.005	0.061	-0.115
	(0.057)	(0.058)	(0.050)	(0.030)	(0.061)	(0.075)
Kenya × Insurance Uptake (Cum.)	-0.246**	-0.114*	-0.079	0.126	-0.096	-0.102
	(0.115)	(0.069)	(0.107)	(0.110)	(0.066)	(0.134)
Difference	0.242*	0.160*	0.007	-0.121	0.157*	-0.013
	(0.129)	(0.090)	(0.118)	(0.114)	(0.090)	(0.154)
N	12197	12197	12197	12197	12196	12197
Panel B: Disaggreagted Effects, Ethiopia						
Shock	0.108**	0.011	0.007	0.018	0.020	0.012
	(0.054)	(0.032)	(0.042)	(0.043)	(0.033)	(0.054)
Insurance Uptake (Cum.)	-0.083	-0.021	-0.050	0.085*	-0.001	-0.169**
	(0.072)	(0.062)	(0.056)	(0.050)	(0.064)	(0.078)
Shock × Insurance Uptake (Cum.)	-0.247*	-0.035	-0.057	0.022	-0.029	-0.074
	(0.141)	(0.092)	(0.104)	(0.110)	(0.095)	(0.144)
Shock+Uptake × Shock (coef.)	-0.140	-0.025	-0.050	0.039	-0.009	-0.062
Shock+Uptake × Shock (p-val.)	0.167	0.729	0.507	0.616	0.902	0.551
N	6862	6862	6862	6862	6862	6862
K-P F-stat	0.535	0.406	0.314	0.180	0.412	0.446
Panel C: Disaggreagted Effects, Kenya						
Shock	0.126**	0.047*	0.078	-0.124**	0.064**	0.092
	(0.057)	(0.025)	(0.062)	(0.062)	(0.026)	(0.075)
Insurance Uptake (Cum.)	-0.009	0.018	-0.216**	0.173**	0.100*	-0.303**
	(0.084)	(0.059)	(0.089)	(0.075)	(0.059)	(0.121)
Shock × Insurance Uptake (Cum.)	-0.186	-0.093	0.005	0.106	-0.182**	0.041
	(0.139)	(0.074)	(0.157)	(0.153)	(0.077)	(0.201)
Shock+Uptake × Shock (coef.)	-0.060	-0.045	0.083	-0.018	-0.117	0.133
Shock+Uptake × Shock (p-val.)	0.545	0.427	0.451	0.868	0.054	0.363
N	3846	3846	3846	3846	3846	3846
K-P F-stat	0.535	0.406	0.314	0.180	0.412	0.446

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 A9: Impact on Child Activities using Balanced Panel

	Child Labor	Work FT	Work and School	School FT	No activity
	(1)	(2)	(3)	(4)	(5)
Panel A: Average Effects					
Insurance Uptake (Cum.)	-0.086**	-0.030	-0.101***	0.120***	0.012
	(0.043)	(0.033)	(0.039)	(0.035)	(0.025)
N	10587	10587	10587	10587	10594
F_{eff}	48.186	48.186	48.186	48.186	48.192
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.	0.041	0.355	0.008	0.000	0.638
Mean of Dep. Var.	0.412	0.380	0.248	0.161	0.214
Panel B: Disaggregated Effects					
Shock	0.094**	0.000	0.038	-0.027	-0.011
	(0.043)	(0.024)	(0.038)	(0.038)	(0.019)
Insurance Uptake (Cum.)	-0.034	-0.024	-0.099**	0.114***	0.010
	(0.054)	(0.044)	(0.047)	(0.043)	(0.034)
Shock $\times$ Insurance Uptake (Cum.)	-0.204*	-0.013	-0.037	0.037	0.014
	(0.108)	(0.069)	(0.094)	(0.093)	(0.055)
Shock+Uptake $\times$ Shock (coef.)	-0.111	-0.013	0.002	0.009	0.003
Shock+Uptake $\times$ Shock (p-val.)	0.144	0.805	0.980	0.886	0.942
N	9936	9936	9936	9936	9943
K-P F-stat	19.001	19.001	19.001	19.001	18.999
AR test p-val.	0.008	0.657	0.025	0.002	0.812
Mean of Dep. Var.	0.501	0.372	0.329	0.222	0.077

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. An observation corresponds to an individual. The sample includes children of age 5-17, restricted to individuals who were interviewed in all survey rounds. Insurance uptake (Cum.) is the sum of insurance uptake incidences over the latest three seasons. Relevant periods for discount rate are the same as those of the insurance uptake. Shock is an indicator equals to one if the insurance payout was triggered for the season in the index unit. All columns include insurance area- and survey year- fixed effects, adult equivalent, age and age-squared, female dummy, age, sex, and education of the household head, whether or not a household is participating in a school feeding or supplementary feeding program.

Table A10: 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)
Panel A: Average Effects					
Insurance Uptake (Cum.)	-0.080*	0.001	-0.105**	0.142***	-0.036
	(0.046)	(0.034)	(0.045)	(0.040)	(0.023)
N	8486	8486	8486	8486	8491
F_{eff}	48.807	48.807	48.807	48.807	48.794
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.	0.074	0.980	0.016	0.000	0.111
Mean of Dep. Var.	0.489	0.453	0.332	0.191	0.026
Panel B: Disaggregated Effects					
Shock	0.058	0.013	0.013	-0.015	-0.010
	(0.044)	(0.023)	(0.043)	(0.042)	(0.014)
Insurance Uptake (Cum.)	-0.045	0.024	-0.129**	0.157***	-0.052*
	(0.057)	(0.045)	(0.055)	(0.047)	(0.030)
Shock × Insurance Uptake (Cum.)	-0.152	-0.079	0.057	-0.033	0.053
	(0.117)	(0.073)	(0.113)	(0.105)	(0.044)
Shock+Uptake × Shock (coef.)	-0.094	-0.066	0.070	-0.048	0.043
Shock+Uptake × Shock (p-val.)	0.263	0.245	0.393	0.514	0.208
N	8172	8172	8172	8172	8178
K-P F-stat	17.123	17.123	17.123	17.123	17.135
AR test p-val.	0.065	0.535	0.042	0.001	0.225
Mean of Dep. Var.	0.529	0.394	0.348	0.227	0.031

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. An observation corresponds to an individual. The sample includes children who were 5 to 17 years old at baseline. Insurance uptake (Cum.) is the sum of insurance uptake incidences over the latest three seasons. Relevant periods for discount rate are the same as those of the insurance uptake. Shock is an indicator equals to one if the insurance payout was triggered for the season in the index unit. All columns include insurance area- and survey year- fixed effects, adult equivalent, age and age-squared, female dummy, age, sex, and education of the household head, whether or not a household is participating in a school feeding or supplementary feeding program.

Table A11: Impact on Production Stratgeies

	Mobile	Share of livestock kept away	Livestock expenditure (Total)	Livestock food	Livestock Veterinary	Income Diversity Index
	(1)	(2)	(3)	(4)	(5)	(6)
Insurance Uptake (Cum.)	0.179***	0.149***	-0.053	0.038	-0.023	0.033
	(0.058)	(0.044)	(0.116)	(0.063)	(0.025)	(0.033)
N	4426	4254	4415	4415	4415	4426
F_{eff}	146.391	141.329	146.251	146.251	146.251	146.391
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.	0.001	0.000	0.648	0.544	0.357	0.323
Mean of Dep. Var.	0.562	0.564	0.413	0.183	0.147	0.208

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. An observation corresponds to a household. The sample includes the households that have children of age 5-17. Insurance uptake (Cum.) is the sum of insurance uptake incidences over the latest three seasons. Relevant periods for discount rate are the same as those of the insurance uptake. All specifications include insurance area- and survey year- fixed effects, adult equivalent, age, sex and education of the household head, the number of children in the household, whether a household received food aid, participated in a school feeding or supplementary feeding program, and share of female members and members older than 65 years old in the household.

Table A12: Impact on Household Income and Expenditures

	Annual income (Total)	Annual income per capita	Food expenditure	Non-food expenditure
	(1)	(2)	(3)	(4)
Insurance Uptake (Cum.)	-113.403	-7.480	-1.992**	-0.220
	(75.040)	(13.405)	(0.864)	(0.792)
N	4426	4426	4423	4417
F_{eff}	146.391	146.391	145.163	145.976
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.	0.128	0.576	0.018	0.781
Mean of Dep. Var.	628.147	127.565	15.324	6.634

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. An observation corresponds to a household. The sample includes the households that have children of age 5-17. Insurance uptake (Cum.) is the sum of insurance uptake incidences over the latest three seasons. Relevant periods for discount rate are the same as those of the insurance uptake. All specifications include insurance area- and survey year- fixed effects, adult equivalent, age, sex and education of the household head, the number of children in the household, whether a household received food aid, participated in a school feeding or supplementary feeding program, and share of female members and members older than 65 years old in the household.

Table A13: Impact on Herd Size

	Herd size (own)	Herd size (herding)	Adult animals	Lactating animals
	(1)	(2)	(3)	(4)
Insurance Uptake (Cum.)	1.363	-0.358	-1.399	-1.168*
	(1.475)	(1.864)	(1.426)	(0.630)
N	4426	4426	4426	4426
F_{eff}	146.391	146.391	146.391	146.391
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.	0.361	0.847	0.331	0.064
Mean of Dep. Var.	12.442	13.312	8.513	3.109

Notes: Standard errors, clustered at household level, are in parentheses. * denotes significance at 0.10; ** at 0.05; and *** at 0.01. An observation corresponds to a household. The sample includes the households that have children of age 5-17. Insurance uptake (Cum.) is the sum of insurance uptake incidences over the latest three seasons. Relevant periods for discount rate are the same as those of the insurance uptake. All specifications include insurance area- and survey year- fixed effects, adult equivalent, age, sex and education of the household head, the number of children in the household, whether a household received food aid, participated in a school feeding or supplementary feeding program, and share of female members and members older than 65 years old in the household.