School, Work or Marriage?
Agricultural Shocks and Gender Gaps in Child Development

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Child Labor, Education and Early Marriage

- In most developing countries, children's education is thwarted when their work is needed to contribute to family income or when girls are married off because the family has no means of supporting them
- How are these outcomes determined jointly and what are the substitution patterns?
  - Evidence suggests child labor can also enable schooling (Vasey, WP)
  - Marriage shown to decrease girl's education (Field and Ambrus, 2008) but bride price customs can also increase education for girls (Ashraf et al., 2020)
  - Chores are important: girls often perform domestic work instead of agricultural work (Keane et al., 2022)

What We Do

- Analyze the effect of agricultural shocks on children's schooling, work activities and marriage in Uganda
  - Income from agriculture as primary source of income, children work primarily on family farm - how do shocks to agr. productivity affect household decision patterns?
  - Agricultural shocks affect both household income and also returns to work for children, overall effect on education, farm work etc. not obvious
  - Compare two shocks: rainfall and commodity prices
  - Examine differential effects on boys vs girls, do parents shift work load towards daughters?
- Next: Estimate dynamic model of child investments and agricultural production

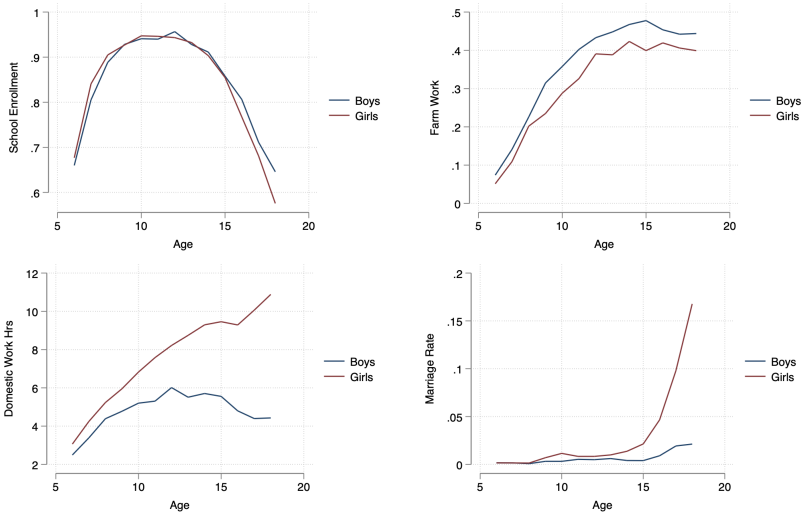
Literature

- Agricultural shocks and child outcomes:
  - Child labor: Bau et al. (WP), Shah and Bryce (2017), Beegle et al. (2006)
  - Child Marriage: Corno et al. (2020), Ashraf et al. (2020)
  - Education: Bau et al. (WP), Ashraf et al. (2020), Shah and Bryce (2017), Björkmann-Nyqvist (2013), Sharon and Yang (2009)
- Dynamic models of child investments:
  - Keane et al. (2022), Todd and Wolpin (2006)

Data

- 8 waves of Living Standards Measurements Survey (LSMS) from Uganda spanning years 2005-2020
  - Panel of 13,100 children from 3,088 rural households aged 6-18
  - observe school enrolment, farm work incl. hours, domestic work hours and marital status
  - household composition, crop-portfolio and other agricultural info (farm land, value harvested etc.)
- High resolution precipitation data from Climate Hazards Group InfraRed Precipitation with Station (CHIRPS)
- International commodity prices (Agricultural Producer Prices, FAO)

School Enrolment, Farm Work, Domestic Work Hours and Marriage Rate by Age and Gender



Methodology

Construction of agricultural shocks:

- Rainfall:
  - Measured for last 12 months before interview date constructed at the subcounty level
  - Use absolute precipitation and standard deviations from local mean
- International prices (Imbert et al., 2022):
  - Innovations in international prices lagged by one year (clean from serial correlation)
  - Tailored to each district (subcounty/household) using crop-portfolio in baseline wave (shift-share instrument), e.g. impact of changes in price of maize increases in quantity of maize grown

Methodology

- Regress agricultural shocks on key outcome variables:

$$Outcome_{ist} = \beta_0 + \beta_1 Shock_{st-1} + \alpha X_{it} + \gamma_s + \epsilon_{ist}$$

  - γ_s Household fixed effect: compare children in same household across waves. Control for time-invarying differences, e.g. location of household (rural, urban), education of household head
  - X_{it}: child's age and gender, number of children and adults in hh, month and year of interview
  - Errors clustered at the subcounty level for rainfall shocks and at the district level for price shocks

Results by Gender

Regressions using both shocks find same sign. One standard deviation increase in precipitation decreases girls' schooling by 2%, for price shocks it is .6%.

	Boys				Girls			
	School	Farm Work	Farm Hrs	Domestic Hrs	School	Farm Work	Farm Hrs	Domestic Hrs
Precipitation	0.030	-0.125	1.537	-0.639	-0.079**	0.007	3.592***	-2.587
	(0.034)	(0.082)	(1.344)	(1.306)	(0.035)	(0.083)	(1.231)	(2.137)
Observations	7427	7046	6143	3989	7086	6698	5770	3764
Price Shock	0.000	-0.048	0.347	-4.158***	-0.045**	0.089	1.118	-5.259***
	(0.026)	(0.057)	(1.035)	(0.965)	(0.022)	(0.059)	(0.720)	(1.301)
Observations	7428	7047	6144	3990	7088	6700	5772	3766

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Standard errors in parentheses. Precipitation measured in 1000 mm for past 12 months at the sub-county level. Price shock measured in standard deviations from mean. Sample covers all children aged 6-18 in all waves. Controls for age in years, number of children and adults, year and month fixed effects.

Results by Gender - Young Children Aged 6-11

Young girls spend less time on domestic work and are less likely to attend school when precipitation is high. Additional time is possibly spend on farm work although effects are insignificant.

	Boys				Girls			
	School	Farm Work	Farm Hrs	Domestic Hrs	School	Farm Work	Farm Hrs	Domestic Hrs
Precipitation	-0.053	-0.171	0.587	-1.040	-0.103*	0.051	1.777	-6.481**
	(0.061)	(0.111)	(1.260)	(2.475)	(0.053)	(0.111)	(1.329)	(3.008)
Observations	3082	2767	2573	1569	3059	2738	2549	1550

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Standard errors in parentheses. Precipitation measured in 1000 mm for past 12 months at the sub-county level. Price shock measured in standard deviations from mean. Sample covers all children aged 6-11 in all waves. Controls for age in years, number of children and adults, year and month fixed effects.

Results by Gender - Older Children Aged 12-18

Older boys' education benefits from positive rainfall shocks but not girls'. Higher productivity leads to more hours of farm work for girls. Girls' marriage rate decreases.

	Boys				Girls				
	School	Farm Work	Farm Hrs	Domestic Hrs	School	Farm Work	Farm Hrs	Domestic Hrs	Marriage
Precipitation	0.136***	-0.135	2.169	-0.585	-0.050	0.029	5.628***	-2.866	-0.099***
	(0.051)	(0.113)	(1.864)	(1.720)	(0.047)	(0.105)	(1.734)	(2.623)	(0.037)
Observations	4345	4279	3570	2420	4027	3960	3221	2214	2839

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Standard errors in parentheses. Precipitation measured in 1000 mm for past 12 months at the sub-county level. Price shock measured in standard deviations from mean. Sample covers all children aged 12-18 in all waves. Controls for age in years, number of children and adults, year and month fixed effects.

Results - Dynamic Effects

Shocks during younger ages can have long lasting effects. High precipitation during ages 6-8 leads to an increases in schooling, decrease in farm hours and marriage (for girls) at ages 11-18.

	School	Farm Work	Farm Work Hrs	Domestic Hrs	Marriage
Precipitation Ages 6-8	0.198***	-0.167	-3.310*	-1.136	-0.148*
	(0.070)	(0.101)	(1.958)	(2.310)	(0.079)
Observations	8372	8239	6791	4634	2839

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Standard errors in parentheses. Precipitation measured in 1000 mm for average yearly rainfall ages 6-8 at the sub-county level. Sample covers all children aged 11-18 in all waves. Controls for age in years, gender, number of children and adults, year and month fixed effects.

Conclusion

- Use panel data to examine effects of agricultural shocks on children in rural Uganda
- Employ rainfall shocks and international price shocks
- Find that positive shocks
  - Increase children's agricultural work at the expense of domestic work
  - Differences across gender: girls decrease schooling while boys do not, girls increase farm work more than boys
  - Reduce marriage among girls
- Effects could accumulate dynamically, favorable rainfall during primary school age can lead to increases in secondary schooling

Shocks to agricultural returns (z_t)

International prices: yearly prices "at the farm gate", r_{jct}, for country j, commodity c and year t (APP, FAO, 1991–2016),

$$r_{ct} = \sum_{j \in \Theta \setminus \{V\}} \alpha_{jc} r_{jct}$$

Pass-through from international shocks to domestic prices:

Innovation and a decomposition: We consider two models,

– an AR(n),

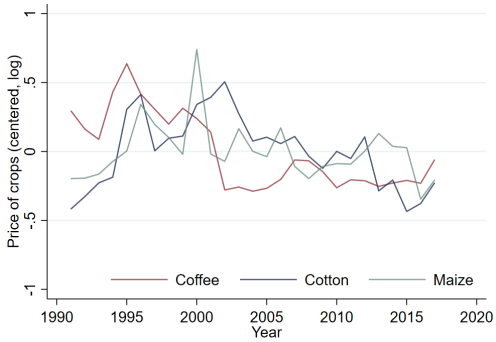
$$p_{ct} = \log(r_{ct}) = \sum_{i=1}^{n} \theta_c^i p_{ct-i} + \eta_t + \nu_c + \varepsilon_{ct} \tag{1}$$

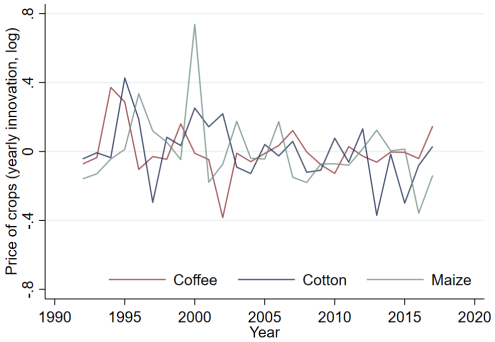
– a permanent/transitory decomposition

$$\begin{aligned} p_{ct} &= \mu_{ct} + \varepsilon_{ct}^t \\ \mu_{ct} &= \mu_{ct-1} + \varepsilon_{ct}^p \end{aligned} \tag{2}$$

Shocks to agricultural returns—variance and persistence

Prices and innovations:





We can define for each crop:

- the variance of the price σ_c,
- its persistence θ_c in an AR(1),
- the signal to noise ratio $s_c = \sigma_c^p / \sigma_c^t$.