Mitigating the Health Impact of a Famine: Evidence from the 1985 Ethiopian Emergency Food Aid

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Humanitarian Crises & Emergency Aid

- Increase in the frequency of climate hazards
  - 39 incidents in 1960 $\Rightarrow$ 396 incidents in 2019
  - Long-term detrimental impacts on human capital
  - Exposure to negative events in childhood $\Rightarrow$ poorer health status in adulthood (Almond, 2006; Dinkelman, 2017; Adhvaryu et al., 2019)
- Long-term coping strategies are essential
- Emergency aid for low-income countries
  - Lack of domestic capacity to build coping mechanisms
  - Emergency aid from external parties
  - Play a long-term mitigating role?

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Research Questions

- How does emergency aid in early life affect physical health in adulthood?
  - Long-term negative impact of the 1984 Ethiopian drought on adult height (Dercon & Porter, 2014)
  - Mitigating effects of the 1985 relief operation?
- Is the health consequence associated with labor productivity?
  - Better physical health $\Rightarrow$ higher labor productivity?
- How to study?
  - Digitize a historical map of relief camps in 1985 in Ethiopia
  - Micro-level data: Adult height and labor productivity
  - Quantitative analysis

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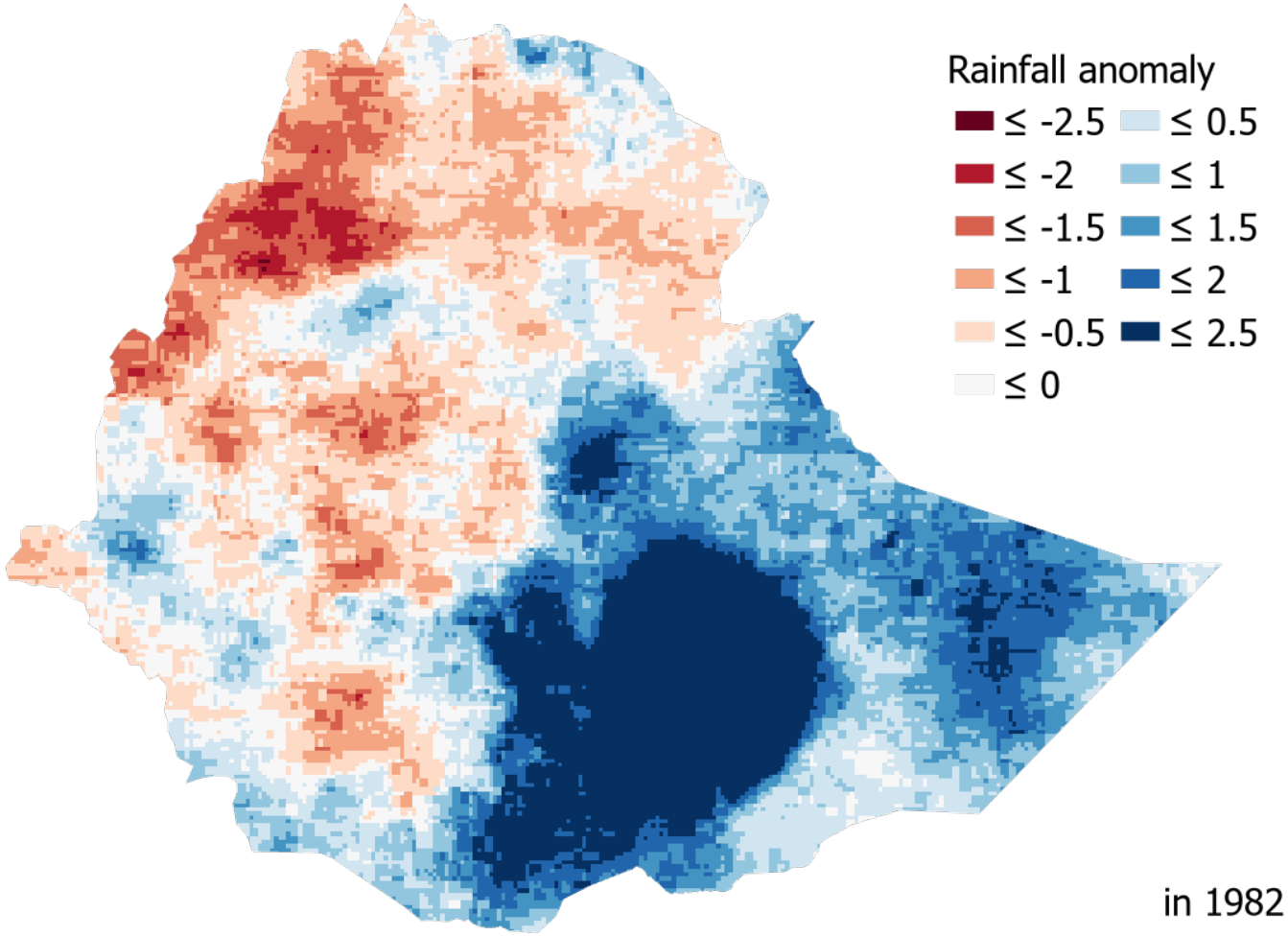
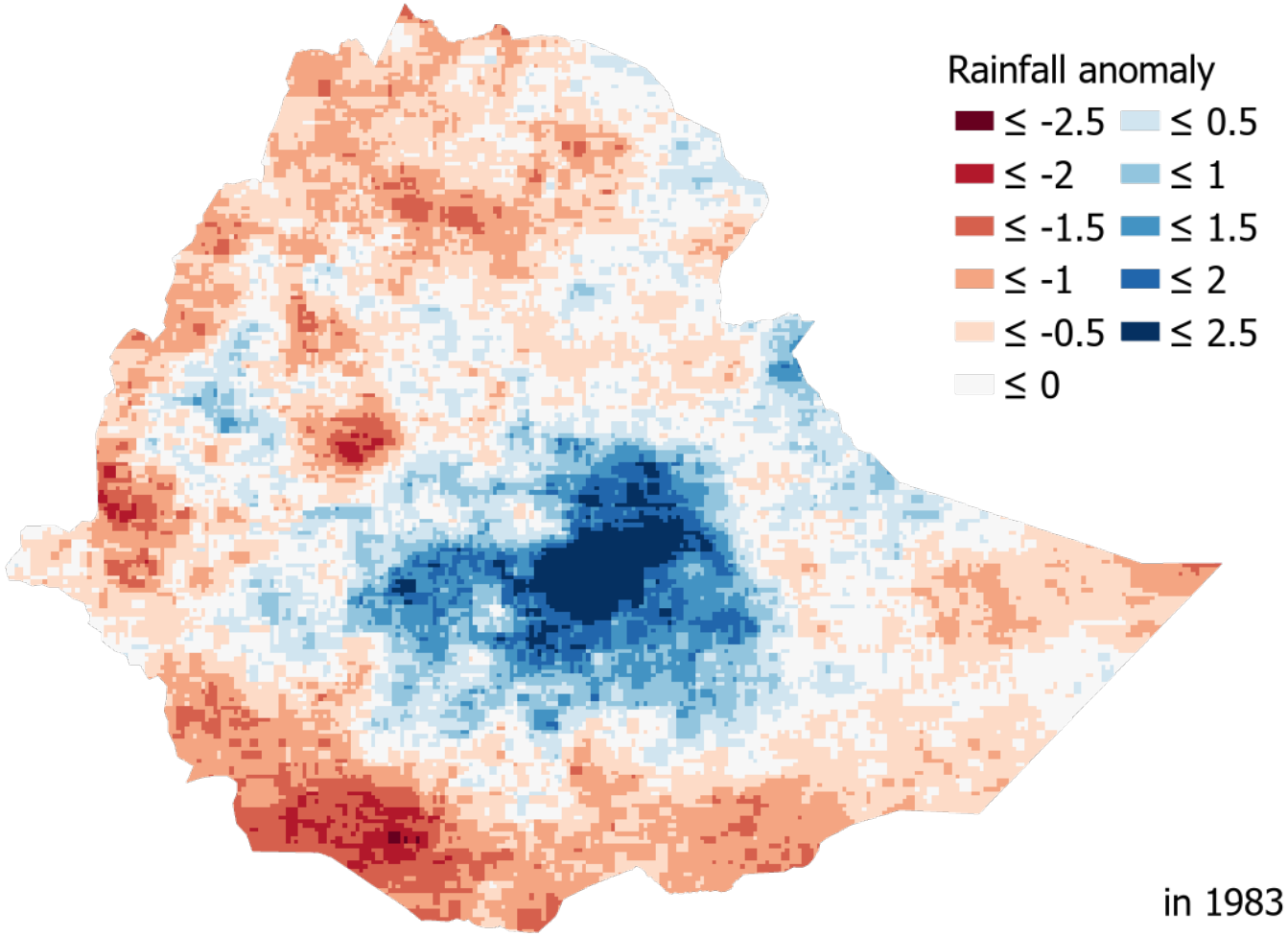


Figure 1: Rainfall Anomaly in Ethiopia 1982-85

- Darker red ⇒ More severe drought
- Extreme and countrywide drought shock in 1984



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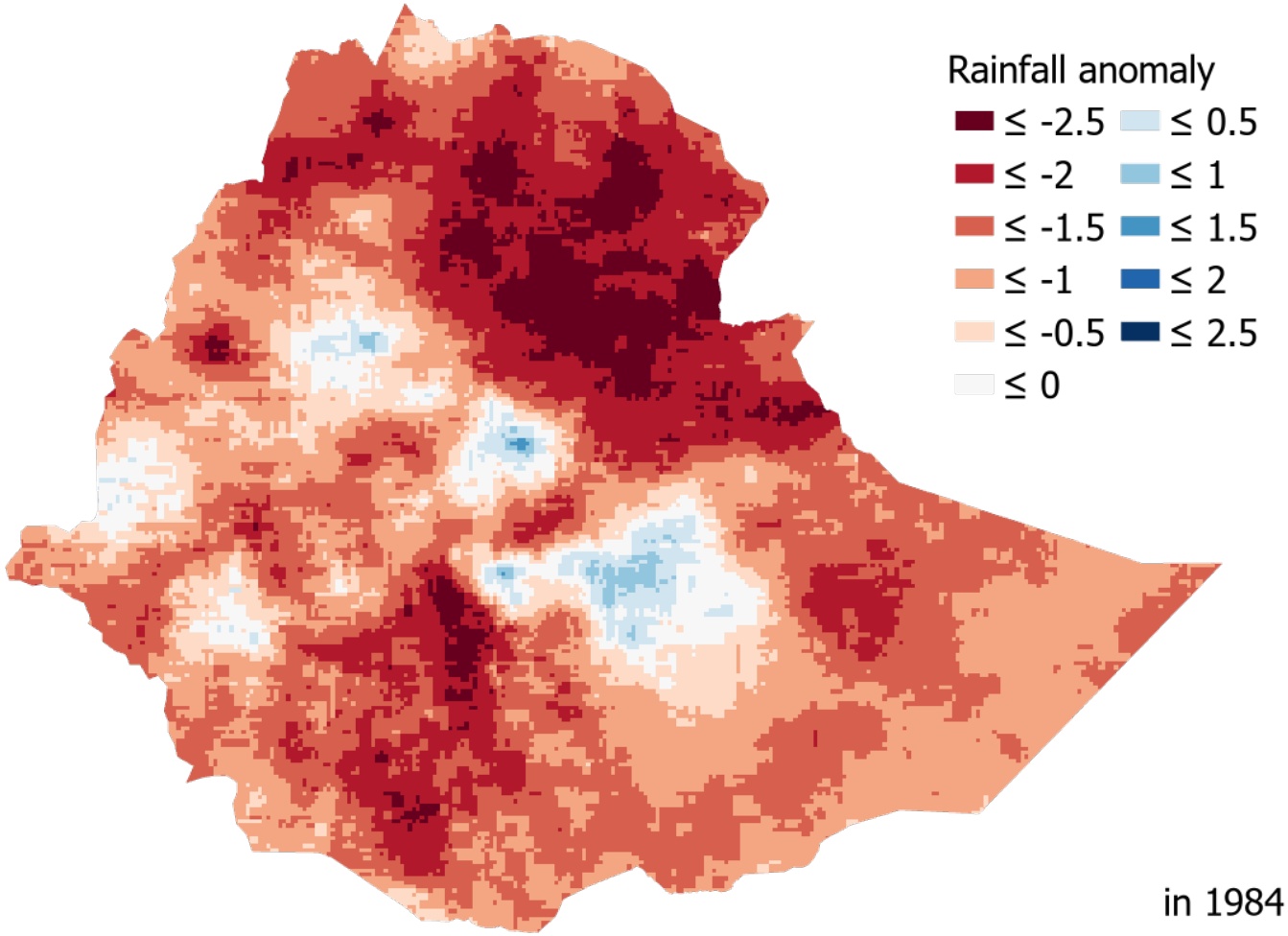

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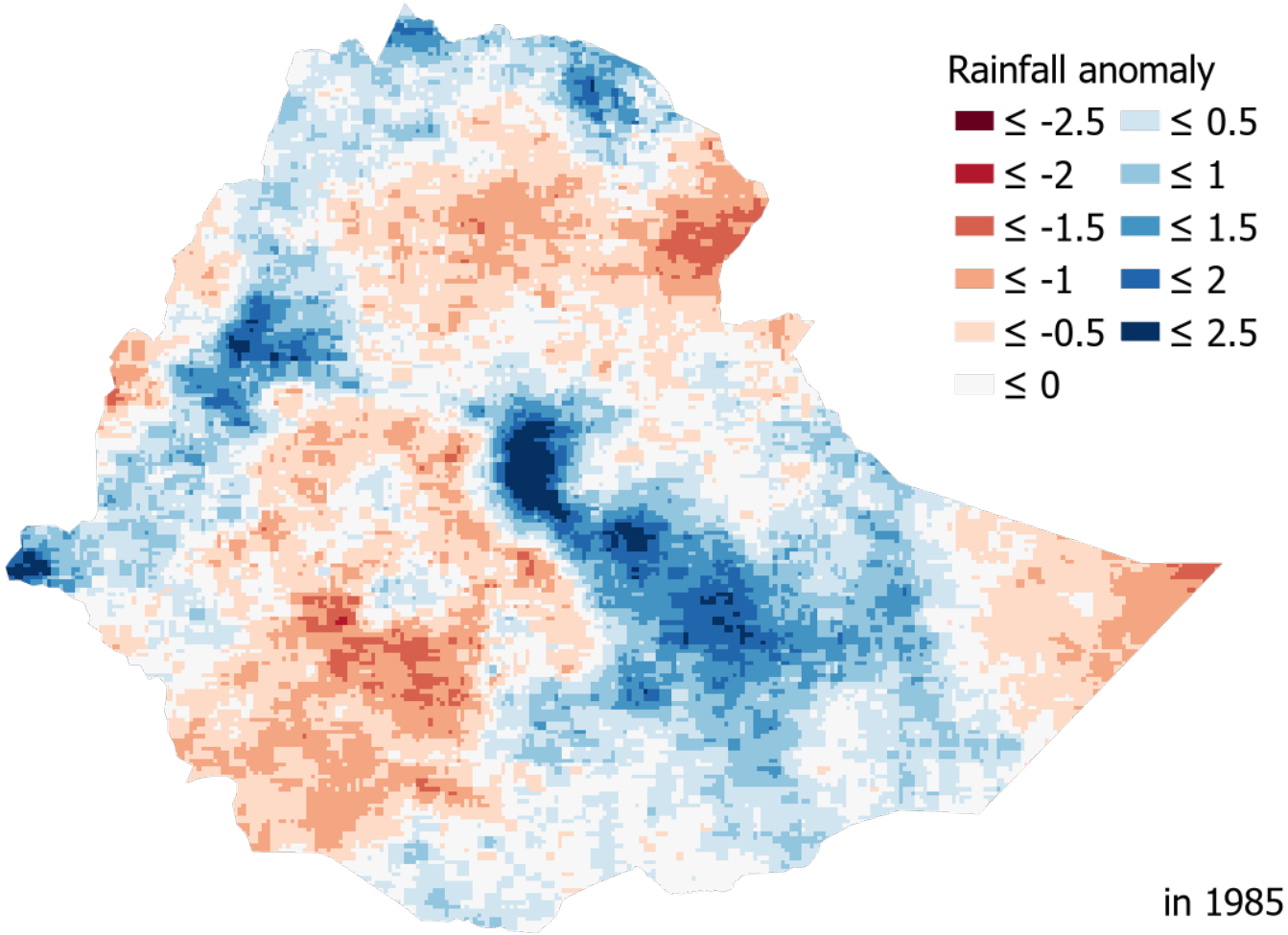

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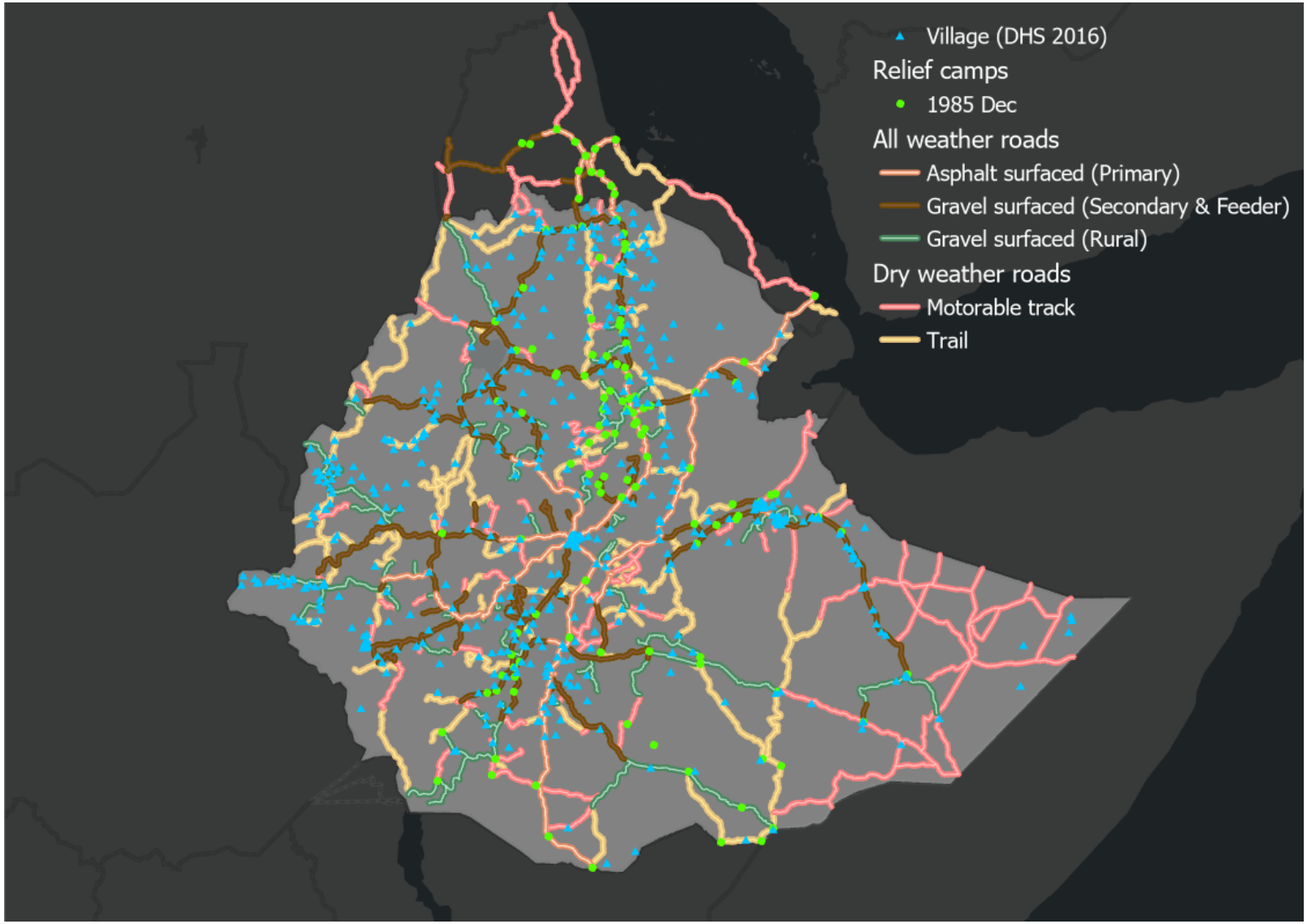
Figure 2: Relief Camps, Villages, and Roads



- Nearest distance to a camp (1985) from each village (2016): Accessibility to emergency aid

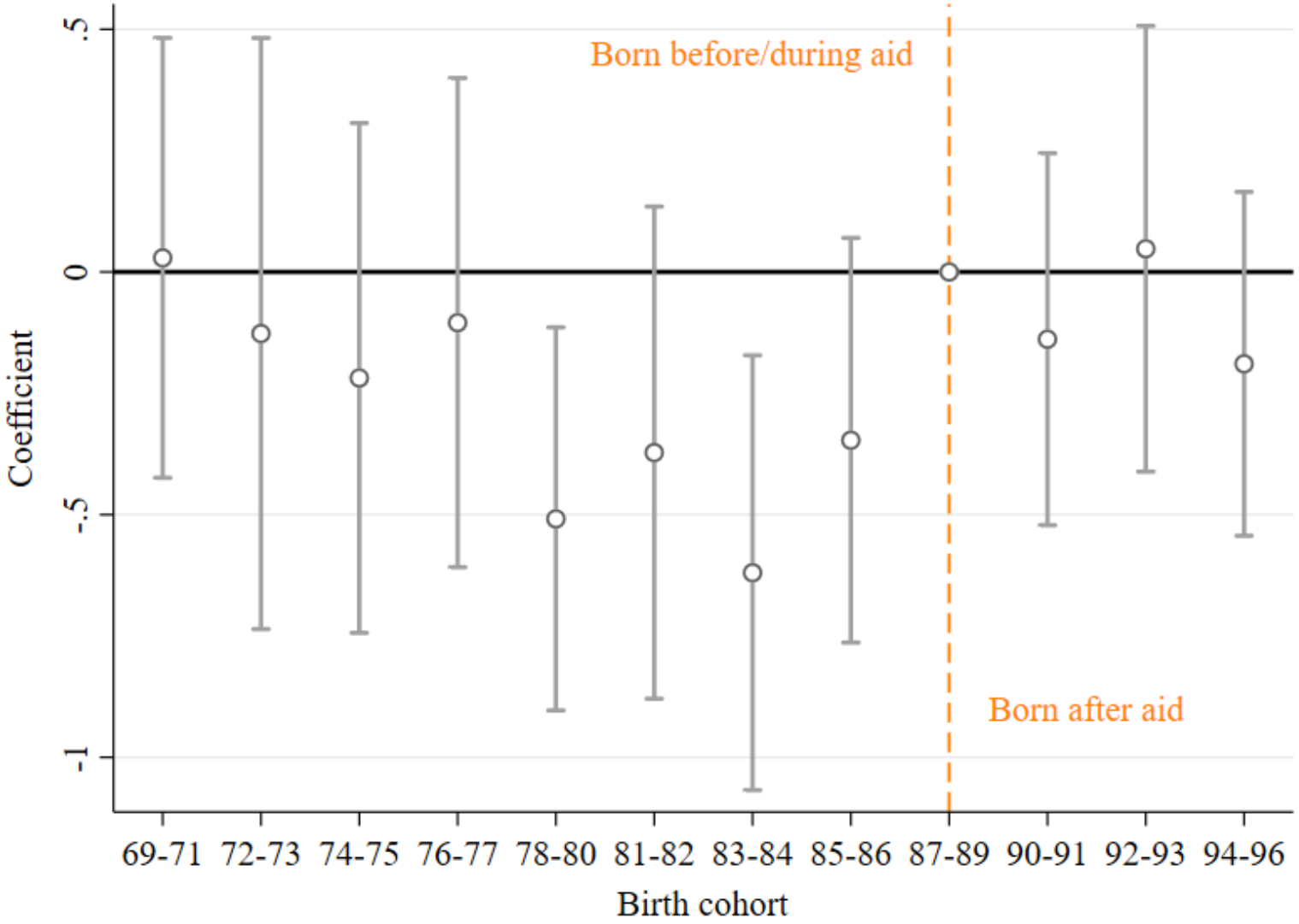


Figure 3: Effects of Emergency Aid on Adult Height

▸ Specification ▸ Baseline ▸ Regression

Conclusion

- Long-term mitigating impacts of emergency aid against a large-scale disaster
  - Born closer to a relief camp ⇒ higher stature in adulthood (health)
  - Born closer to a relief camp ⇒ higher labor productivity

- Emergency aid
  - Considered as a short-term intervention so far (vs development aid)
  - This study: **Long-term coping strategy** against disasters

Conclusion

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  - Born closer to a relief camp $\Rightarrow$ higher stature in adulthood (health)
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- Emergency aid
  - Considered as a short-term intervention so far (vs development aid)
  - This study: **Long-term coping strategy** against disasters

Thank you very much!

Height and Other Health Outcomes

- Mortality by coronary heart disease (CHD) and stroke (Smith et al., 2000)
  - 10cm $\downarrow$ height $\Rightarrow$ 14% (male) and 29% (female) $\uparrow$ probability of dying by CHD
  - 10cm $\downarrow$ height $\Rightarrow$ 32% (male) 23% (female) $\uparrow$ probability of dying by stroke
- Self-reported health conditions, grip strength, and lung function (McGovern, 2014)
  - 10cm $\uparrow$ height $\Rightarrow$ 3% $\uparrow$ probabilities of being in good health and no difficulties in daily activities.
  - 10cm $\uparrow$ height $\Rightarrow$ 0.2 sd and 0.25 sd $\uparrow$ grip strength and lung function
- Suicide risk (Magnusson et al., 2005)
  - 5cm $\uparrow$ height $\Rightarrow$ 9% $\downarrow$ suicide risk
- Offspring health (Subramanian et al., 2009; Addo et al. 2013; Perkins et al., 2016)

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Contributions & Literature Review

- **Welfare effects of emergency aid**
  - Allocation of aid: Clay et al. (1999), Jayne et al. (2002), Angelucci & De Giorgi (2009), Broussard et al. (2014)
  - Development aid: Duflo (2001), Schultz (2004), Bleakley (2007), Hoynes et al. (2016)
- **Long-term health impacts of emergency aid**
  - Early-life inputs and later-life health: Cunha & Heckman (2007), Currie & Almond (2011), Adhvaryu et al. (2019), Goodman-Bacon (2021)
  - Short-term impacts: Quisumbing (2003), Yamano et al. (2005)
- **Preventing the collapse of labor productivity**
  - Nutritional status & labor market outcomes: Strauss (1986), Sahn & Alderman (1988), Deolalikar (1998), Schultz (2002), Vogl (2014)

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Data

- 2016 Demographic and Health Survey (DHS)
  - Health outcome: Height (in cm) of grown-up adults
  - Control variables: FEs for village of birth and birth cohort, individual characteristics
- Jansson et al. (1987): Details on relief operation in Ethiopia
  - Accessibility to emergency aid: Nearest distance to a relief camp
- Two main determinants of camp placement
  - Road network: 1984-85 road map by Ethiopian Mapping Agency
  - Drought shock: Satellite rainfall data from CHIRPS
- 2018-19 Ethiopia Socioeconomic Survey
  - Labor productivity: Crop yield (kg) per working hour

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Table 1: Summary Statistics

Variables	Mean	Std dev	Min	Max	Obs
Health (DHS):					
Height (cm)	163.07	8.97	102.5	193.5	9,354
Relief operation (Digitized Map):					
Distance to camp 1985 (km)	68.91	77.35	0.19	377.66	9,354
Individual characteristics (DHS):					
Year of birth	1987.86	5.32	1978	1996	9,354
Female	0.56	0.50	0	1	9,354
Head	0.34	0.47	0	1	9,354
Female $\times$ Head	0.10	0.29	0	1	9,354
Age	28.14	5.32	20	38	9,354
Drought (CHIRPS):					
1984 drought shock	0.78	0.41	0	1	9,354

Notes: 1984 drought shock is an indicator for whether the annual rainfall in 1984 is lower than the long-term mean rainfall by more than 1 standard deviation.

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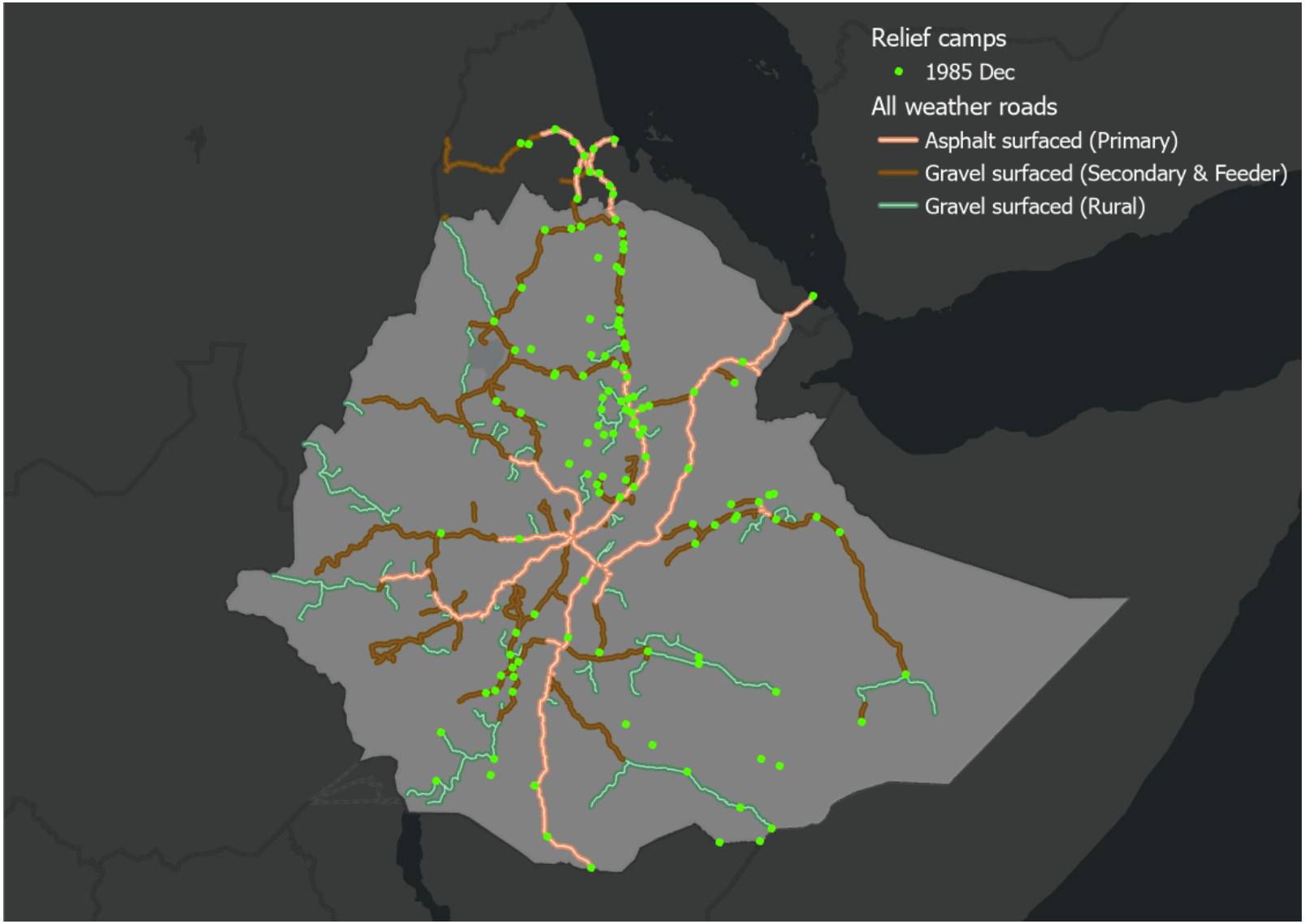

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Figure 4: Determinants of Camp Location - Road Network

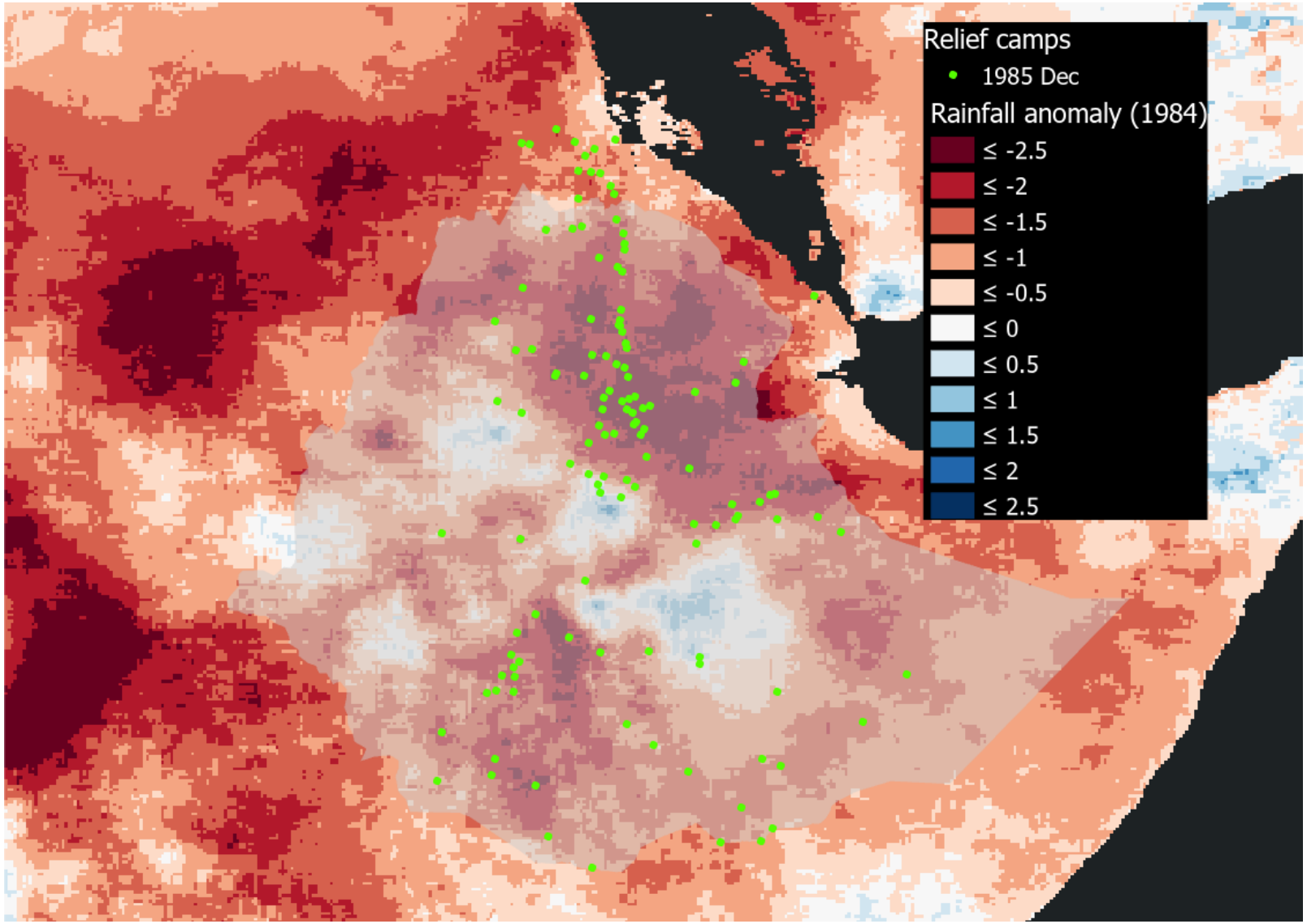

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Figure 5: Determinants of Camp Location - 1984 Drought

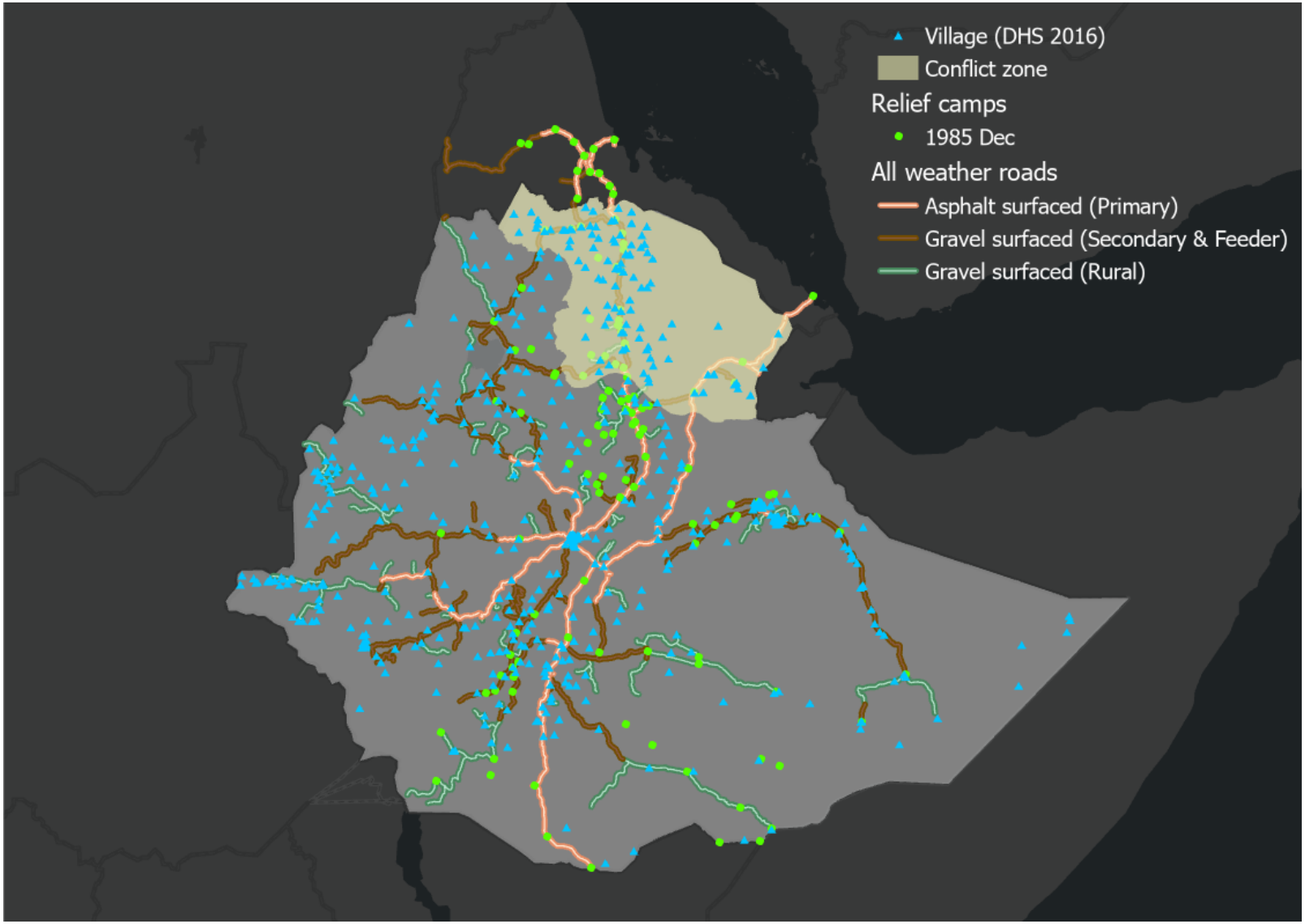

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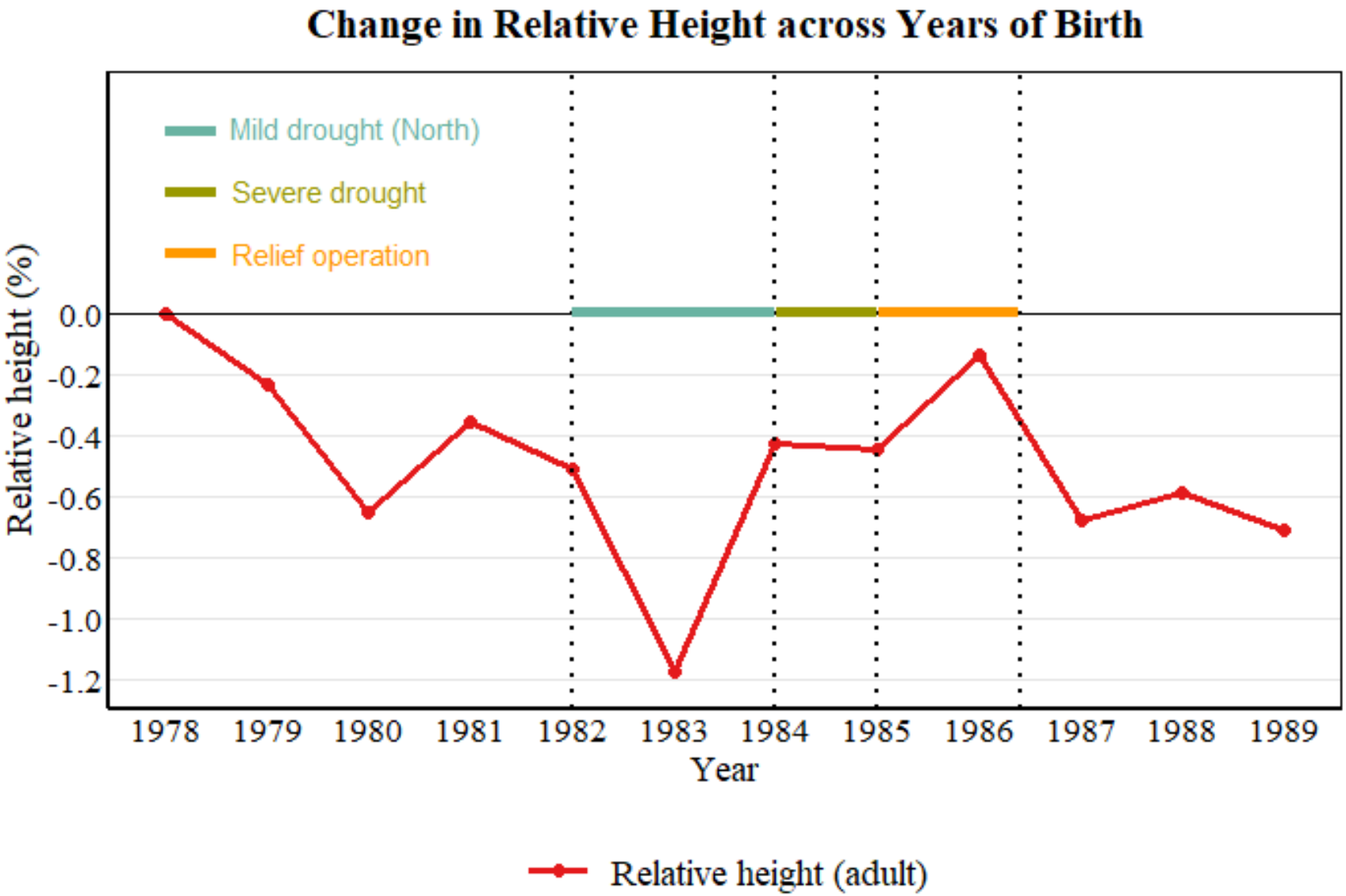
Figure 6: Determinants of Camp Location - 1984 Drought

Relative Height in Ethiopia



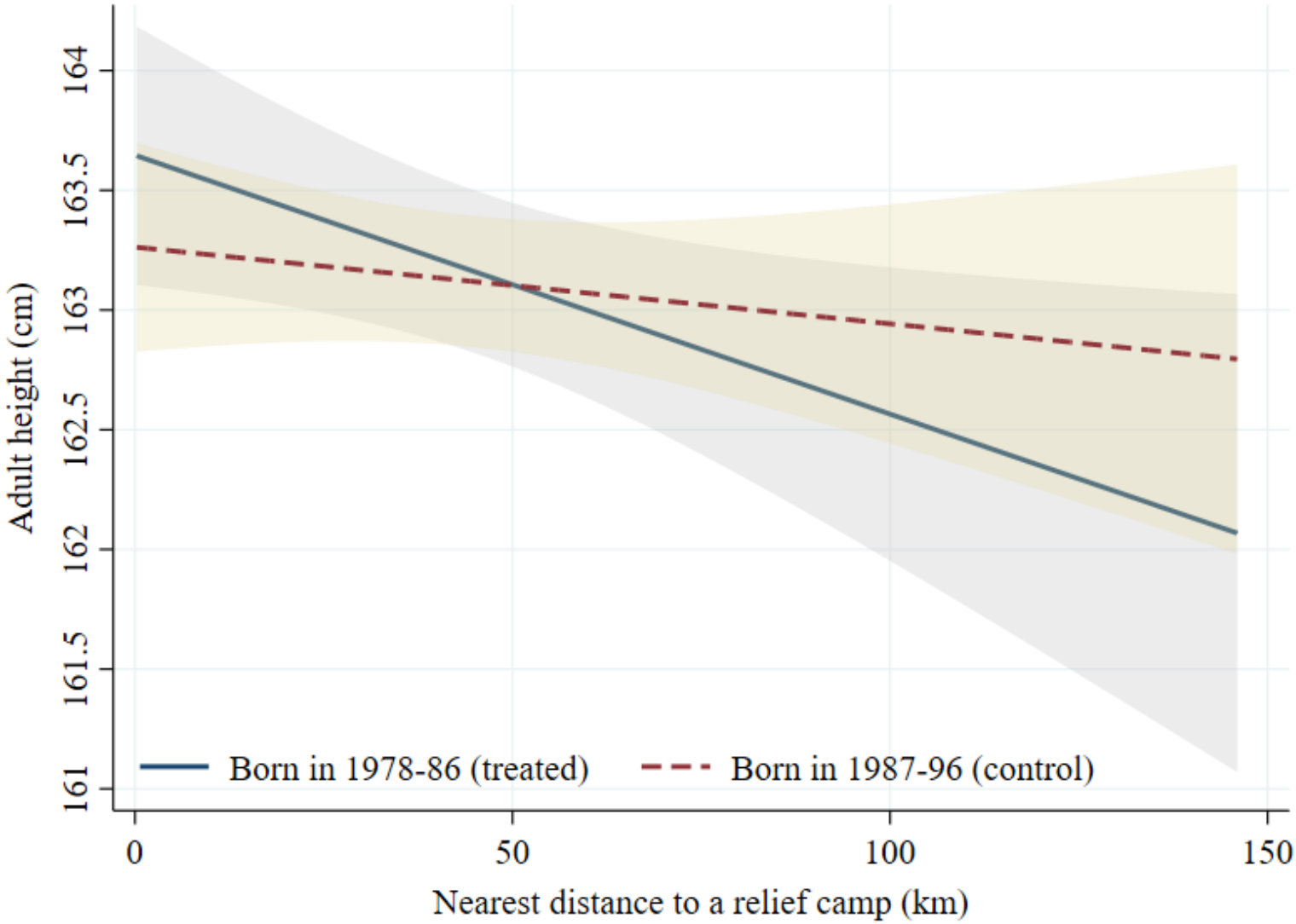


Figure 8: Linear fit between adult height and the nearest distance to a camp

Placebo Test

$$\text{Height}_{ivc} = \alpha + \sum_{c=1}^{8} \beta_c^{Pre} \ln(\text{Dist to Camp}_v) \times \text{BC}_c^{Pre} + \sum_{c=10}^{12} \beta_c^{Post} \ln(\text{Dist to Camp}_v) \times \text{BC}_c^{Post} + \text{BC}_c + \mu_v + z_{ivc}'\eta + \varepsilon_{ivc}$$

- Significant differences in adult height would not have existed across villages without the relief operation
  - Any strategic development of towns where relief camps were set up?
- Split the sample cohort into multiple ones
- Control cohort: Born in 1987-89
- β_c^{Pre} (born before or during the operation) vs β_c^{Post} (born after the end of the operation)

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Specification

$$\text{Height}_{ivc} = \alpha + \beta \ln(\text{Dist to Camp}_v) \times \text{BC}_c + \gamma \text{BC}_c + \mu_v + z'_{ivc}\eta + \varepsilon_{ivc}$$

- Height_{ivc}: Height in cm for individual i, born in village v in birth cohort c
- Dist to Camp_v: Nearest distance to a relief camp in 1985
- BC: Dummy for the cohort born before or during the relief operation
- Born in 78-86 (before or during) vs 87-96 (after)
- Control for the 1984 drought shock

- β: **How much the height in adulthood would change as the village of birth moves further away from the nearest relief camp**
  - Born further away $\Rightarrow$ Limited access to relief operation
  - Negative sign

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	Height (cm)		
	(1)	(2)	(3)
ln(Dist. to camp) × Cohort	-0.269***	-0.305***	-0.359***
	(0.100)	(0.108)	(0.117)
Observations	9,354	9,354	7,949
Fixed effects			
Birth cohort	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes
Controls			
Individual characteristics	Yes	Yes	Yes
1984 Drought × Cohort	No	Yes	Yes
Sample			
Conflict area	Yes	Yes	No
Percentiles of dist. to camp (km)			
10th-percentile		3.72	3.83
50th-percentile		41.66	51.03
90th-percentile		197.30	216.52

- Adults born in the 50th-percentile village are 0.93 cm shorter than the ones born in the 10th ($-0.359 \times \ln(51.03/3.83) = -0.93$)
- Schultz (2002): 1 cm increase in height $\Rightarrow$ 8-10% increase in wage

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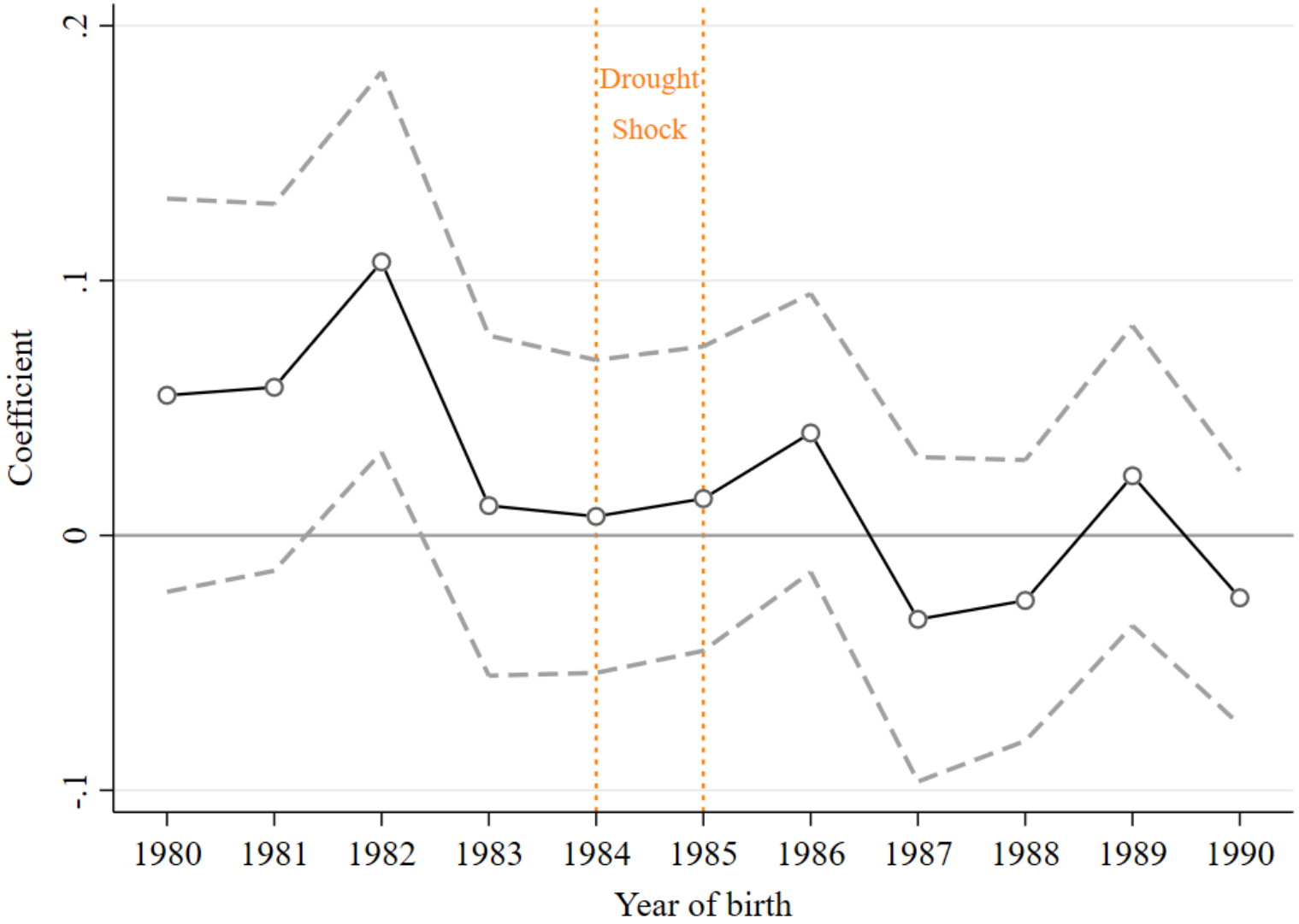

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Figure 9: Effects of 1984 Drought on 5-Year Mortality

Impact on Labor Productivity

$$\ln(\text{Prod}_{pivc}) = \alpha + \beta \ln(\text{Dist to Camp}_v) \times \text{BC}_c + \gamma \text{BC}_c + \mu_v + z'_{pivc}\eta + \varepsilon_{pivc}$$

- Do aid beneficiaries also display higher labor productivity?
- Prod_{pivc}: Crop yield (kg) divided by working hours invested for plot p by individual i born in village v in birth cohort c
- Highly skewed distribution
  - Log-transformation
  - Log-transformed OLS model: Inconsistent in the presence of heteroskedasticity (Silva & Tenreyro, 2006)
  - Poisson quasi-maximum likelihood estimation (QMLE) model is robust to this problem
  - Reporting both results

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$$\text{Mortality}_{ivc} = \alpha + \beta \text{Shock}_v \times \text{BC}_c + \gamma \text{BC}_c + \mu_v + z'_{ivc}\eta + \varepsilon_{ivc}$$

	5-year mortality			
	(1)	(2)	(3)	(4)
Panel A: Effect of 1984 Drought				
1984 Drought × Cohort	0.045***	0.041**		
	(0.017)	(0.017)		
Panel B: Effect of Aid				
ln(Dist. to camp) × Cohort			-0.002	0.000
			(0.006)	(0.006)
Observations	28,762	24,295	27,944	23,585
Fixed effects				
Birth cohort	Yes	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes	Yes
Controls				
Individual characteristics	Yes	Yes	Yes	Yes
1984 Drought × Cohort	·	·	Yes	Yes
Sample				
Conflict area	Yes	No	Yes	No

$$\text{Birth}_{ivat} = \alpha + \beta \text{Shock}_v \times \text{Year}_t^{Post} + \gamma \text{Year}_t^{Post} + \mu_i + \delta_a + z'_{ivat}\eta + \varepsilon_{ivat}$$

	Fertility			
	(1)	(2)	(3)	(4)
Panel A: Effect of 1984 Drought				
1984 Drought × Year 1985-90	-0.001	-0.004		
	(0.016)	(0.016)		
Panel B: Effect of Aid				
ln(Dist. to camp) × Year 1986-90			0.004	0.007
			(0.004)	(0.004)
Observations	70,933	60,025	70,933	60,025
Fixed effects				
Year	Yes	Yes	Yes	Yes
Mother	Yes	Yes	Yes	Yes
Mother's age	Yes	Yes	Yes	Yes
Controls				
Individual characteristics	Yes	Yes	Yes	Yes
1984 Drought × Year	·	·	Yes	Yes
Sample				
Conflict area	Yes	No	Yes	No

	Height (cm)				
	(1)	(2)	(3)	(4)	(5)
ln(Dist. to camp) × Cohort	-0.359***	-0.358***	-0.356***	-0.358***	-0.355***
	(0.117)	(0.113)	(0.113)	(0.113)	(0.113)
Observations	7,949	794,816	794,676	794,640	793,860
Fixed effects					
Birth cohort	Yes	Yes	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes	Yes	Yes
Controls					
Individual characteristics	Yes	Yes	Yes	Yes	Yes
1984 Drought × Cohort	Yes	Yes	Yes	Yes	Yes
Sample correction					
Selection by rainfall anomaly	Baseline	3%	9%	3%	9%
Weighted sample	Baseline	10% height & anomaly		30% height & anomaly	
Ratio to full sample	Baseline	0.35%		3.27%	
Ratio to 78-85 cohort	Baseline	0.99%		9.18%	

- Frequency weighting for sample selection
- Deflate the group of individuals born before the drought, exposed to extreme rainfall anomaly, and having a tall height in adulthood

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Table 2: Two-way Clustering Standard Errors

	Height (cm)		
	(1)	(2)	(3)
ln(Dist. to camp) × Cohort	-0.269**	-0.305**	-0.359***
	(0.121)	(0.129)	(0.139)
Observations	9,354	9,354	7,949
Fixed effects			
Birth cohort	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes
Controls			
Individual characteristics	Yes	Yes	Yes
1984 Drought × Cohort	No	Yes	Yes
Sample			
Conflict area	Yes	Yes	No

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Table 3: Spatial GMM Standard Errors

	Height (cm)		
	(1)	(2)	(3)
ln(Dist. to camp) × Cohort	-0.269***	-0.305***	-0.359***
	(0.089)	(0.094)	(0.101)
Observations	9,354	9,354	7,949
Fixed effects			
Birth cohort	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes
Controls			
Individual characteristics	Yes	Yes	Yes
1984 Drought × Cohort	No	Yes	Yes
Sample			
Conflict area	Yes	Yes	No

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	Height (cm)		
	(1)	(2)	(3)
ln(Dist. to camp) × Cohort	-0.239**	-0.270***	-0.311***
	(0.095)	(0.102)	(0.109)
Observations	9,354	9,354	7,949
Fixed effects			
Birth cohort	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes
Controls			
Individual characteristics	Yes	Yes	Yes
1984 Drought × Cohort	No	Yes	Yes
Sample			
Conflict area	Yes	Yes	No
Percentiles of dist. to camp (km)			
10th-percentile		4.49	4.69
50th-percentile		60.09	75.38
90th-percentile		332.43	345.06

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	Height (cm)		
	(1)	(2)	(3)
ln(Dist. to camp) × Cohort	-0.206	-0.313**	-0.417**
	(0.148)	(0.158)	(0.168)
Observations	5,288	5,288	4,537
Fixed effects			
Birth cohort	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes
Controls			
Individual characteristics	Yes	Yes	Yes
1984 Drought × Cohort	No	Yes	Yes
Sample			
Conflict area	Yes	Yes	No
Percentiles of dist. to camp (km)			
10th-percentile		3.92	3.83
50th-percentile		41.66	50.02
90th-percentile		196.64	216.52

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	Height (cm)
	(1)
Panel A: Exposed to Conflict	
ln(Dist. to camp) × BC + ln(Dist. to camp) × BC × Conflict	0.316
	(0.344)
Panel B: Unexposed to Conflict	
ln(Dist. to camp) × BC	-0.353**
	(0.154)
Panel C: Diff. between Unexpo. and Expo.	
ln(Dist. to camp) × BC × Conflict	0.668*
	(0.377)
Observations	6,012
Fixed effects	
Birth cohort	Yes
Village of birth	Yes
Controls	
Individual characteristics	Yes
1984 Drought × BC × Conflict	Yes
Percentiles of dist. to camp (km)	
10th-percentile	3.83
50th-percentile	41.54
90th-percentile	196.64

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	Height (cm)		
	(1)	(2)	(3)
Panel A: Female			
ln(Dist. to camp)×BC+ln(Dist. to camp)×BC×Female	-0.181	-0.198	-0.236
	(0.129)	(0.137)	(0.149)
Panel B: Male			
ln(Dist. to camp)×BC	-0.403**	-0.451**	-0.519***
	(0.166)	(0.181)	(0.195)
Panel C: Diff. between Female and Male			
ln(Dist. to camp)×BC×Female	0.221	0.252	0.284
	(0.214)	(0.231)	(0.251)
Observations	9,354	9,354	7,949
Fixed effects			
Birth cohort	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes
Controls			
Individual characteristics	Yes	Yes	Yes
1984 Drought × BC × Female	No	Yes	Yes
Sample			
Conflict area	Yes	Yes	No

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	Height (cm)		
	(1)	(2)	(3)
ln(Dist. to camp) × Cohort	-0.269***	-0.299***	-0.354***
	(0.100)	(0.107)	(0.116)
Observations	9,354	9,354	7,949
Fixed effects			
Birth cohort	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes
Controls			
Individual characteristics	Yes	Yes	Yes
1984 Drought × Cohort	No	Yes	Yes
Sample			
Conflict area	Yes	Yes	No
Percentiles of dist. to camp (km)			
10th-percentile		3.72	3.83
50th-percentile		41.66	51.03
90th-percentile		197.30	216.52

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	Outcomes				
	BMI	Anemia	Education	Work	Literacy
	(1)	(2)	(3)	(4)	(5)
ln(Dist. to camp) × Cohort	-0.204***	-0.009	-0.062***	0.007	0.002
	(0.063)	(0.006)	(0.019)	(0.008)	(0.008)
Observations	7,945	7,747	7,799	7,949	7,816
Fixed effects					
Birth cohort	Yes	Yes	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes	Yes	Yes
Controls					
Individual characteristics	Yes	Yes	Yes	Yes	Yes
1984 Drought × Cohort	Yes	Yes	Yes	Yes	Yes
Sample					
Conflict area	No	No	No	No	No
Percentiles of dist. to camp (km)					
10th-percentile	3.83	4.23	3.83	3.83	3.83
50th-percentile	51.01	51.74	51.02	51.03	51.01
90th-percentile	216.52	216.52	216.52	216.52	211.30

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	Height (cm)		
	(1)	(2)	(3)
Born within 0-10km × Cohort	0.996***	1.076***	1.205***
	(0.384)	(0.398)	(0.438)
Born within 10-20km × Cohort	-0.034	0.026	-0.167
	(0.410)	(0.419)	(0.497)
Born within 20-30km × Cohort	0.794	0.871	0.809
	(0.570)	(0.578)	(0.749)
Observations	9,354	9,354	7,949
Fixed effects			
Birth cohort	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes
Controls			
Individual characteristics	Yes	Yes	Yes
1984 Drought × Cohort	No	Yes	Yes
Sample			
Conflict area	Yes	Yes	No

	Yield per working hour			
	Log-transformation		Poisson QMLE	
	(1)	(2)	(3)	(4)
Born within 0-10km × Cohort	0.174**	0.188*	0.220**	0.340***
	(0.081)	(0.102)	(0.098)	(0.079)
Born within 10-20km × Cohort	0.045	0.067	0.037	0.105
	(0.100)	(0.113)	(0.112)	(0.116)
Born within 20-30km × Cohort	-0.035	-0.057	0.049	0.146
	(0.090)	(0.098)	(0.173)	(0.182)
Observations	7,293	6,290	7,293	6,290
Fixed effects				
Birth cohort	Yes	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes	Yes
Controls				
Individual characteristics	Yes	Yes	Yes	Yes
1984 Drought × Cohort	Yes	Yes	Yes	Yes
Land size & Crop	Yes	Yes	Yes	Yes
Agri. practices	Yes	Yes	Yes	Yes
Sample				
Conflict area	Yes	No	Yes	No

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	Height (cm)		
	(1)	(2)	(3)
ln(Dist. to camp) × Cohort	-0.204*	-0.231*	-0.301**
	(0.110)	(0.124)	(0.134)
ln(Dist. to road) × Cohort	-0.147	-0.133	-0.104
	(0.090)	(0.095)	(0.106)
Observations	9,354	9,354	7,949
Fixed effects			
Birth cohort	Yes	Yes	Yes
Village of birth	Yes	Yes	Yes
Controls			
Individual characteristics	Yes	Yes	Yes
1984 Drought × Cohort	No	Yes	Yes
Sample			
Conflict area included	Yes	Yes	No
Percentiles of dist. to camp (km)			
10th-percentile		3.72	3.83
50th-percentile		41.66	51.03
90th-percentile		197.30	216.52

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