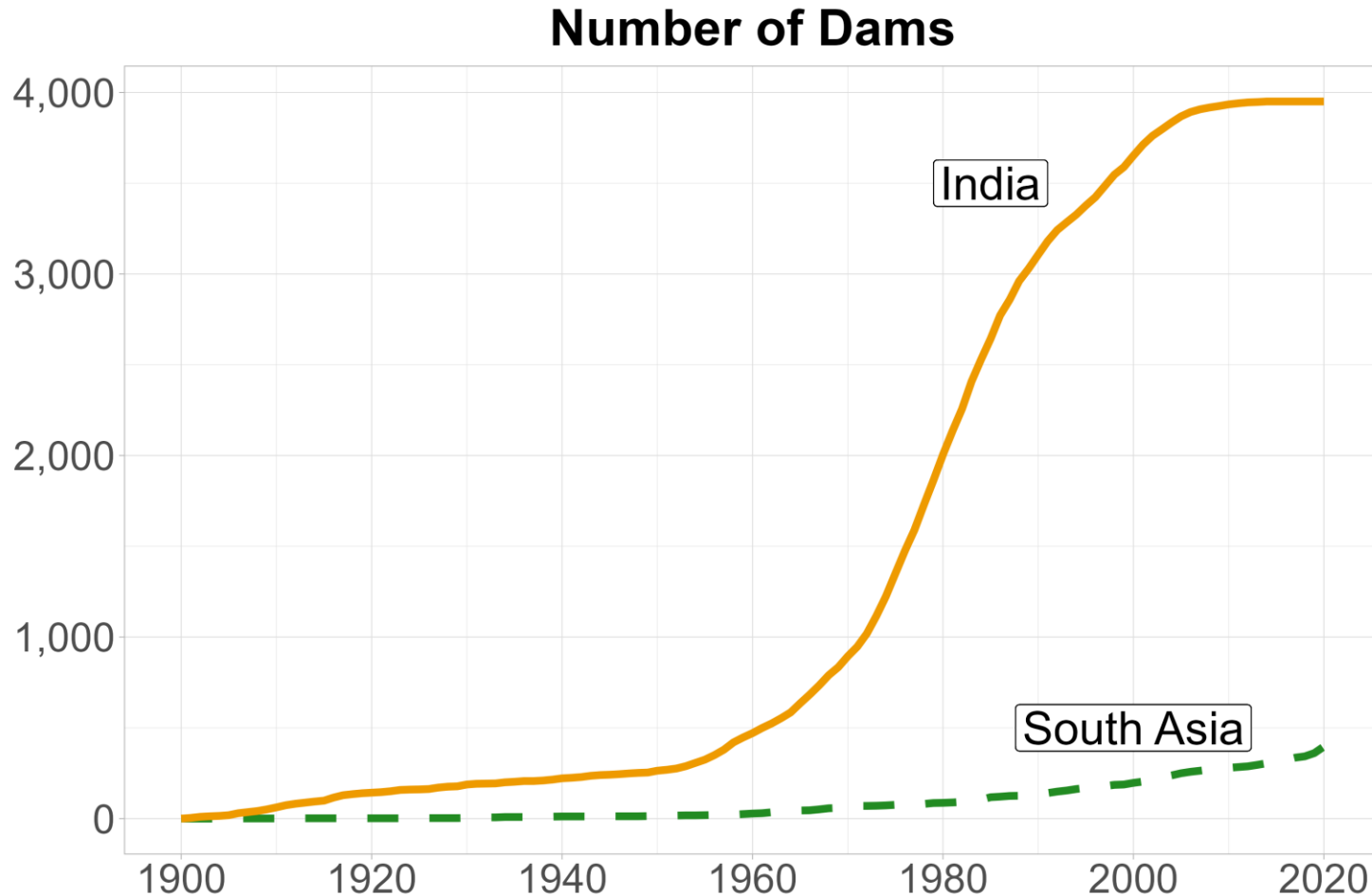# Children of the Dam: Evaluating Impacts of Irrigation Dams on Children in India

Karan S. Shakya

The Ohio State University

(*ASSA 2025*)

Irrigation Dams

Number of Dams

India

South Asia

Data source: GDAT. South Asia countries include Afghanistan, Bangladesh, Bhutan, Cambodia, Laos, Malaysia, Myanmar, Nepal, Pakistan, and Sri Lanka

- Among the most grandiose, expensive, and contentious of agricultural investments.

- Notable benefits for agricultural and economic growth, but at huge costs.

- Gap in understanding its effects on human health, especially on children (WCD 2001; Dillon and Fishman 2019).

Research Questions

1) Do irrigation dams affect **early childhood mortality** in India, and do these effects vary spatially?

2) What are the **key channels** that could explain the observed health effects?

Data (1990 - 2014)

|	
Survey	▪ National Family Health Survey (2 waves: 2015/16 and 2019/21) ▪ Global Dam Database ▪ ICRISAT Agricultural Panel Surveys ▪ CPCB Water Quality Monitoring Database
Remote	▪ HydroSHEDS Product: **River Basin** + Rivers ▪ Land Cover Indicators ▪ Malaria Atlas ▪ Agricultural Productivity (NDVI) ▪ Rainfall + Temperature

Empirical Strategy

- Identifying causal relationships through an **instrumental variable** strategy using river gradients to predict the construction of dams (Duflo et al. 2007).

- Generate time-varying predictions by interacting river gradients with dam construction trends over time and across states with varying shares of dam.

$$Y_{idt} = \beta_0 + \beta_1 \widehat{Dam}_{idt} + \beta_2 \widehat{LDam}_{idt}^{Up} + X_{idt} + \gamma_d + \phi_t + \epsilon_{idt}$$
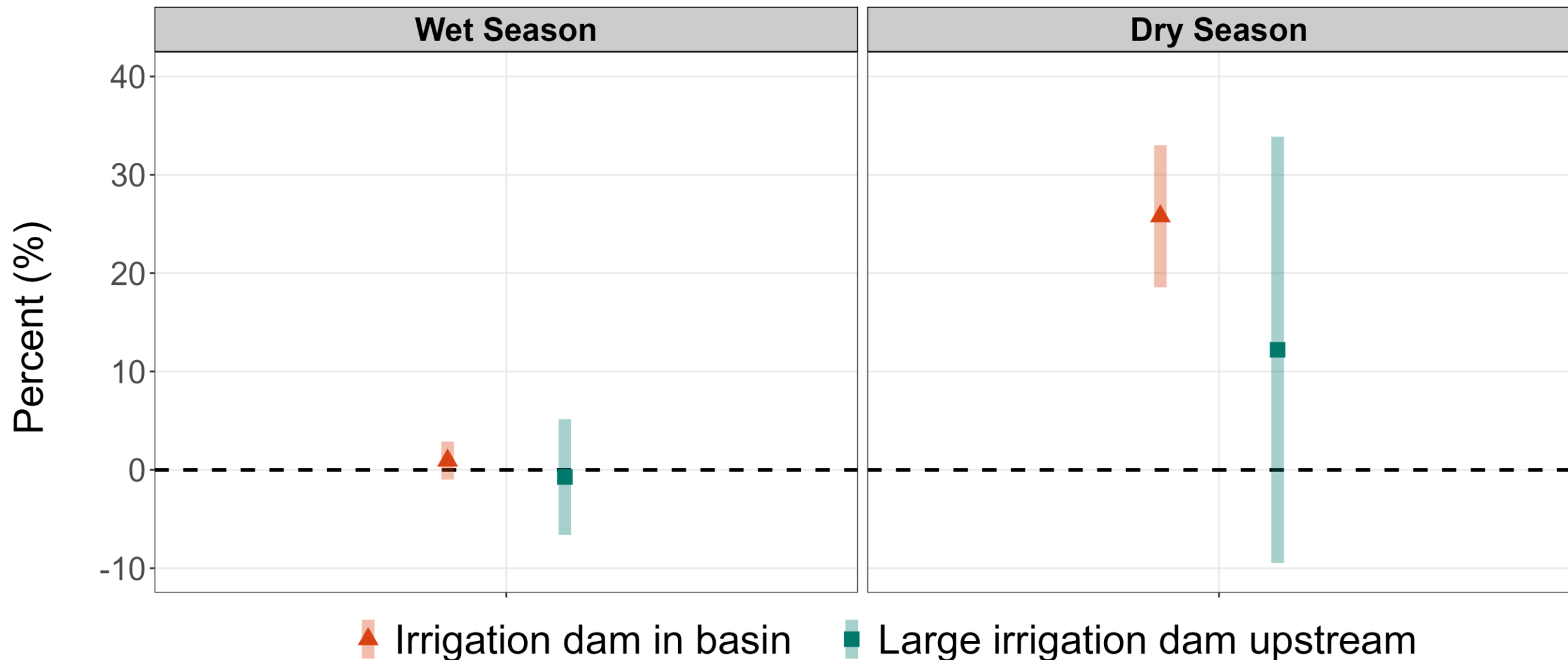
- Strong instruments.
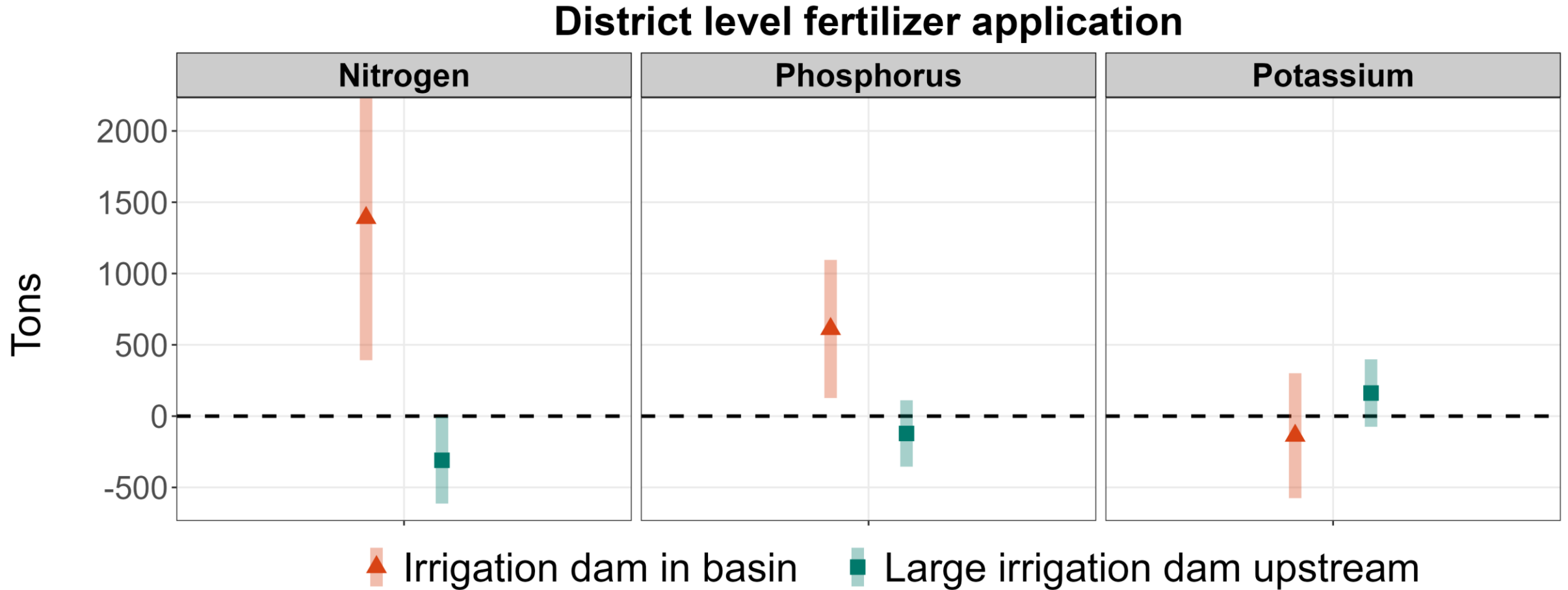- No pre-trends across different shares.

Early-Childhood Mortality
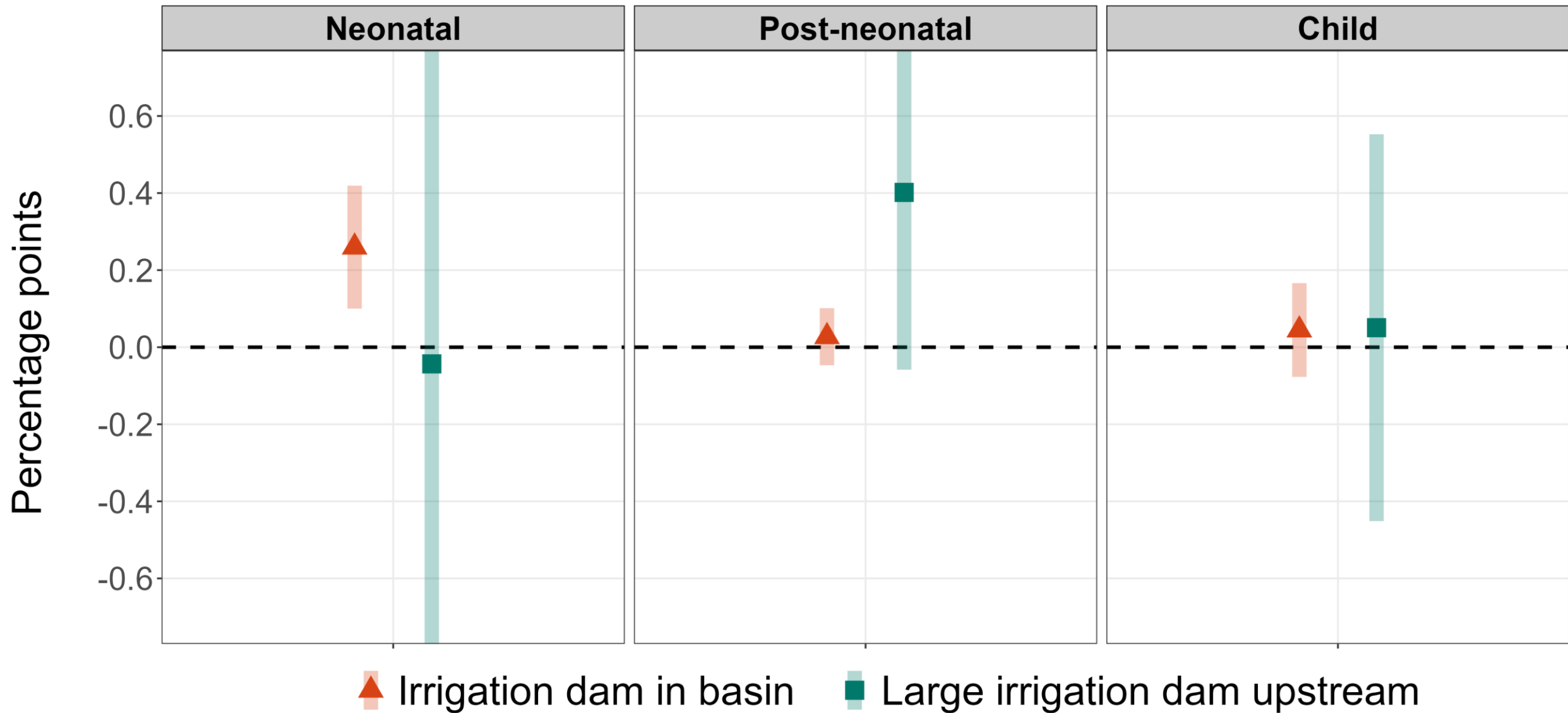
Agricultural Productivity

Adjusted NDVI

Agrichemical Exposure

District level fertilizer application

- **Water quality data**: local irrigation dams are associated with an increase of 'high nitrate levels' (>10 mg/L) by roughly 3.6%.

Sowing Season – Results

	Neonatal mortality incidence			
	(1) Wet Season	(2) Wet Season	(3) Dry Season	(4) Dry Season
Sowing period	0.0004	0.0004	-0.0039***	-0.0039***
	(0.0006)	(0.0006)	(0.0008)	(0.0008)
Sowing period × Moderate dam	0.0019*	0.0017	0.0044***	0.0045***
	(0.0011)	(0.0011)	(0.0015)	(0.0015)
Sowing period × High dam	0.0020**	0.0018*	0.0050*	0.0053*
	(0.0010)	(0.0010)	(0.0030)	(0.0030)
Constant	0.0342***	0.0466	0.0349***	0.0474
	(0.0001)	(0.0366)	(0.0001)	(0.0367)
Fixed effects	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes
Observations	1,217,373	1,217,373	1,217,373	1,217,373

Asterisks indicates significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are clustered at the district level. The omitted interaction is the low intensity of nitrogen fertilizer (columns 1 and 2) and low intensity of irrigation dams (columns 3 and 4). Fixed effects indicate district and year fixed effects. Controls include variables for household wealth index, rural residence, mother's height, mother's age, mother's education, average rainfall and temperature (with its squared terms).

Conclusion

- Irrigation dams in India increase neonatal mortality rates in river basins where they are constructed. One channel for this seems to be dam-induced increases in agrichemical exposure.

- Current cost-benefit assessments of irrigation do not account for these unintended consequences.

- In progress: Quantify the health costs incurred due to these irrigation dams.

Thank You
shakya.11@osu.edu