Climate change

What have we learned from development economics research and what are the open questions?

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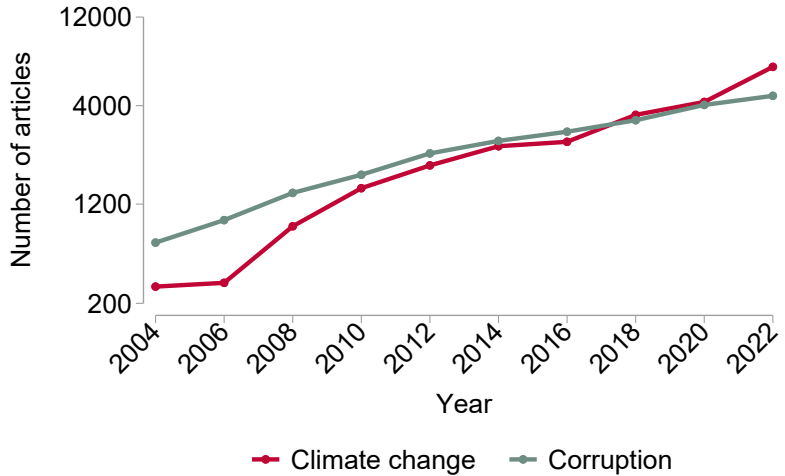
Expansion of research on climate change within development econ

Google Scholar search of “climate change” + “developing countries’ + “JEL”



Outline

Impacts

Many reasons to expect climate change to be especially harmful for the global poor

- Geography (e.g., hotter to start with)
- Greater reliance on agriculture, which is especially sensitive to weather
- People's health is more fragile to begin with
- Less technical capacity and money for adaptation (e.g., use a/c, build levees)

Development economics research on climate change impacts

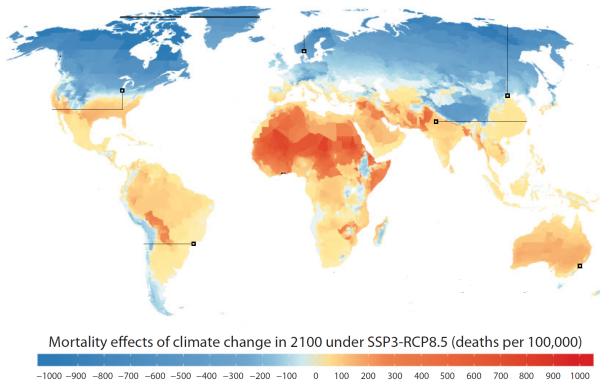
- Causal evidence that has refined views on the nature and magnitude of effects
- Establishes the case for mitigating climate change and need for assistance to LMICs
- Understanding the specific damages informs the design of adaptation policies

Larger and broader negative effects on the economy than realized

- Example: Dell, Jones, and Olken (2012)
- High temperature anomalies have large negative effects on income per capita, but only in poor countries
- High temp reduces rate of economic growth, not just level of output
- High temp affects a broad and surprising set of outcomes, including industrial output, investment, and political stability

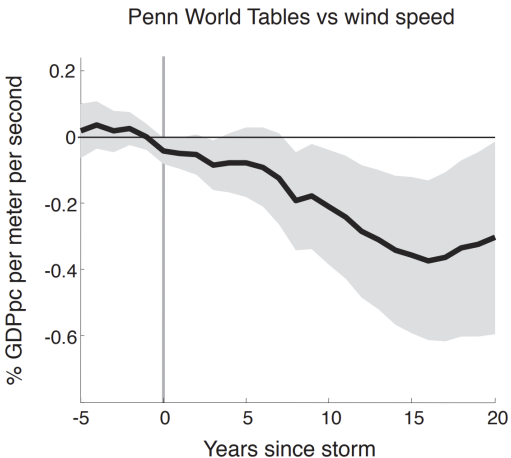
Mortality effects of climate change will be enormous

Carleton et al. (2022)



Mortality costs alone have a social cost of carbon of $37, suggesting total SCC is much larger than current level used

Long-run effects of natural disasters



- Conventional wisdom: Places rebound after physical destruction
- Hsiang and Jina (2014): Limited recovery from tropical storms

Adaptation

Well failure → persistent reduction in water access (Blakeslee et al., 2020)

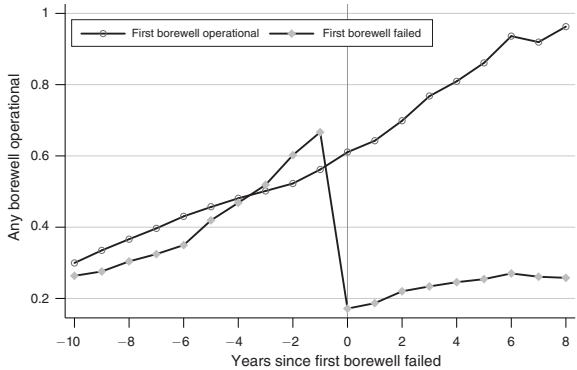


FIGURE 4. BOREWELL FAILURE AND ACCESS TO WATER OVER TIME

Developed areas better able to adapt

	Impact of BW failure	
	Development	
	Low (1)	High (2)
Fraction of HH members (dry season)		
Working on own farm	−0.105	−0.105
	[0.037]	[0.035]
Working off-farm, agriculture	0.055	0.075
	[0.036]	[0.025]
Working off-farm, non-agriculture	0.034	0.062
	[0.018]	[0.019]
Not working	0.054	0.001
	[0.017]	[0.023]
Non-migrant working outside village	0.026	0.043
	[0.018]	[0.022]
Semi-permanent migrant (annual)	0.026	0.008
	[0.013]	[0.005]
Income (1,000 Rs)		
On-farm	−24.083	−5.502
	[8.480]	[10.903]
Off-farm	3.428	27.462
	[8.244]	[10.732]
Total	−20.655	21.960
	[12.118]	[15.926]

Government policy influences private adaptation

- Labor market flexibility influences how much the manufacturing sector absorbs agricultural labor during high-temperature episodes in India (Colmer, 2019)
- Decentralized planning leads to road investment being too tilted toward coastal areas in Vietnam (Balboni, 2019)
- Government adaptation can crowd out private adaptation, e.g., planned sea wall in Jakarta inhibits inland migration (Hsaio, 2023)

Many non-climate studies are relevant for climate change

- Bazzi et al. (2016) study resettlement in Indonesia – economic success depends on agro-climactic similarity destination and origin
- Bryan et al (2014) on barriers to temporary migration
- Casaburi and Willis (2018) insight on timing of insurance premia is being applied to livestock insurance for pastoralists in Nigeria
- BRAC's graduation program as a cushion against climate shocks

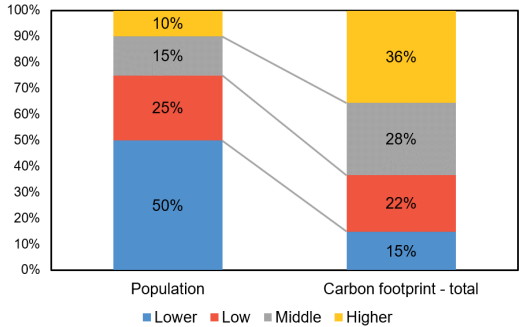
Many pressing topics to research

- Spurring technology development and adoption (e.g., heat, drought, salinity tolerant crops)
- Facilitating and coordinating migration
- Designing and deploying insurance and other financial services
- Strengthening the social safety net
- Building state capacity to deliver on these needs

Mitigation

Rich countries are the biggest contributors to climate change

Rich countries (10% of population) are responsible for over 1/3 of current CO_2 emissions...



...and more of historical emissions and, hence, the stock of atmospheric CO_2

Sources: Hubacek et al. (2017)

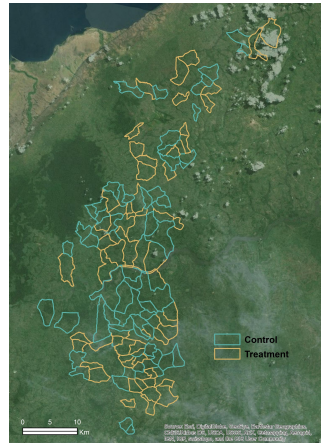
Many of the low-cost ways to reduce CO_2 emissions are in LMICs

- Rich countries can fund mitigation projects wherever in the world the most cost-effective opportunities are
- Many of the lowest-cost options are likely in LMICs
  - Low-hanging fruit because not on technological frontier
  - Lower factor prices (e.g., labor, land)
  - More infrastructure growth and cheaper to build green than retrofit

Payments for Ecosystem Services to protect forests

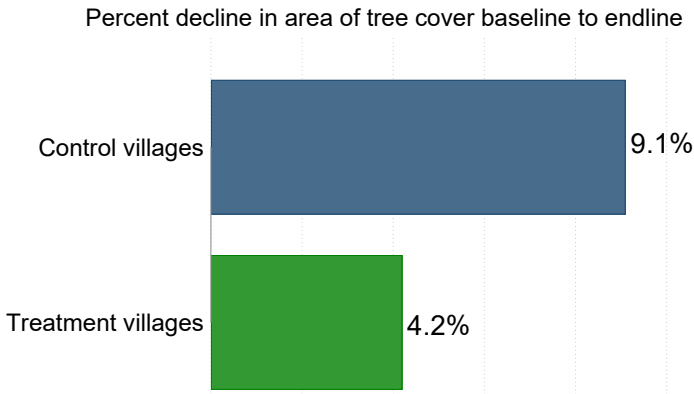
- Forests are being cut down for local economic gains that are small relative to the global climate costs
- Banning deforestation is undesirable and often ineffective
  - A ban would make very poor people even poorer
  - Weak enforcement of regulations
- Payments for Ecosystem Services (PES): Pay forest owners an amount each year if they do not clear their forest (conditional cash transfer)

Randomized trial in 121 villages in western Uganda



Jayachandran, S., J. de Laat, E.F. Lambin, C.Y. Stanton, R. Audy, & N.E. Thomas (2017): "Cash for Carbon: A Randomized Trial of Payments for Ecosystem Services to Reduce Deforestation," *Science*.

PES cut deforestation by more than half



Equivalent to 5.5 additional hectares of tree cover per treatment village

Valuing the CO_2 benefits of the program

Benefit-cost ratio = 14.8

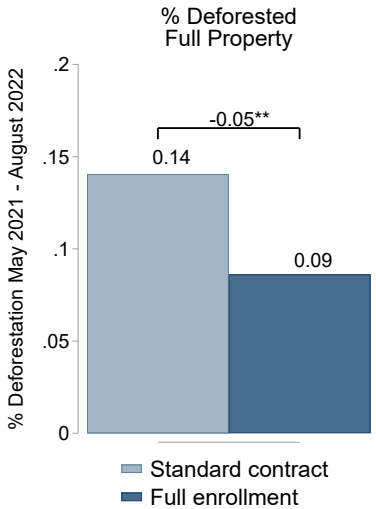
Open area: Making these approaches more cost-effective and scalable

- Example #1: Jack (2013) on using auctions to elicit willingness to accept
- Example #2: Prioritizing conservation in the most carbon-intensive and ecologically sensitive places (Burgess et al., in progress)
- Example #3: Improving contract design to reduce inframarginal payments (Izquierdo Tort et al., 2024)

Requiring landowners to enroll all or none of their forest

- Most PES programs allow people to enroll a subset of their forest
- Includes Mexico's national program, Pago por Servicios Ambientales (PSA)
- Izquierdo-Tort, Jayachandran, & Saavedra (2024) ran a pilot study in Chiapas that enrolled HHs that applied to PSA but were rejected due to budget cut
- We have polygon they submitted to PSA
- Randomly offered 1-year **standard** contract (polygon submitted to PSA) or **full enrollment** contract (all of forest)
- Full enrollment contract is 4x as cost-effective

Much less inframarginality when enrollees must enroll their full forest



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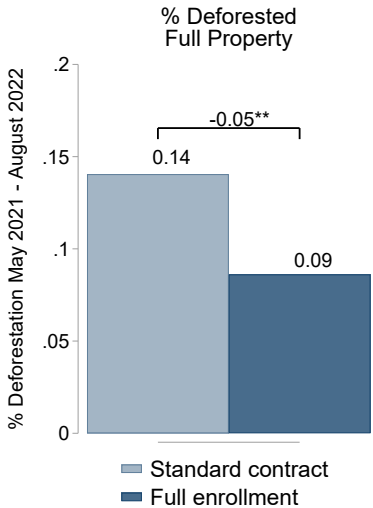

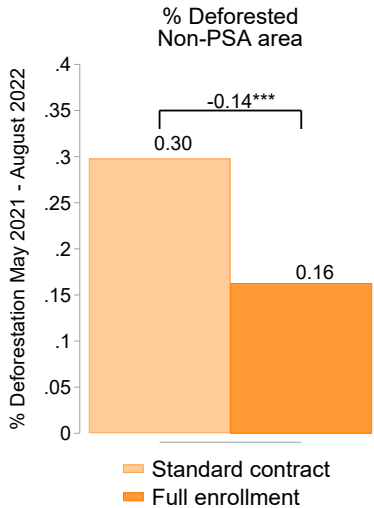

Funding mitigation projects $\neq$ development aid

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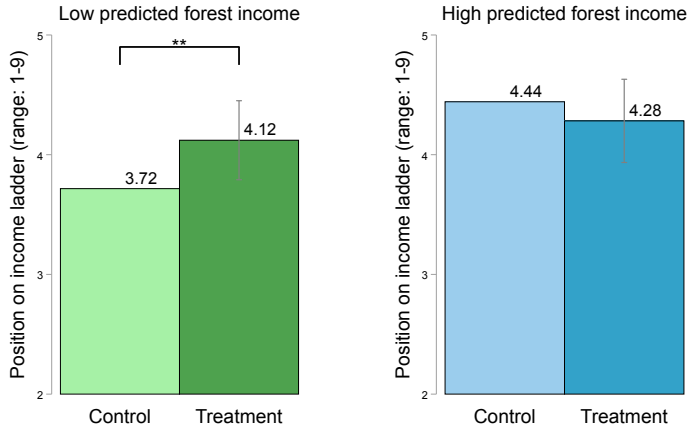
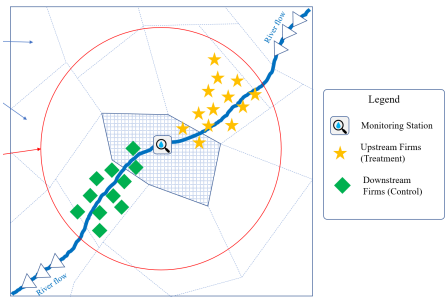
Economic benefits of PES only for those with low costs to conserve



Open research areas

- Measuring co-benefits (e.g., particulate matter reduction from transition from coal to renewable energy sources) – identify actual win-wins
- Improving monitoring capability/credibility so that LMICs can capture these opportunities
- Spurring innovation for appropriate technology (e.g., cheap clean cooling)
- Improving regulatory capacity
  - Technology (Assuncao et al, 2020)
  - Bureaucrat incentives (Duflo et al, 2013)
- Quantifying economic trade-offs from greening the economy

Often a tradeoff between economic output & enviro. protection



- He et al. (2018) show tradeoff between economic output and enviro quality in China
- Firms downriver of pollution monitoring stations, with less environmental enforcement, have 24% higher TFP

Climate change will be a **huge challenge** for LMICs

Too little money is flowing to them for adaptation, and mitigation has been framed as their obligation too

$\Rightarrow$ Climate change will be a critical area for development econ research over the next 20 years