

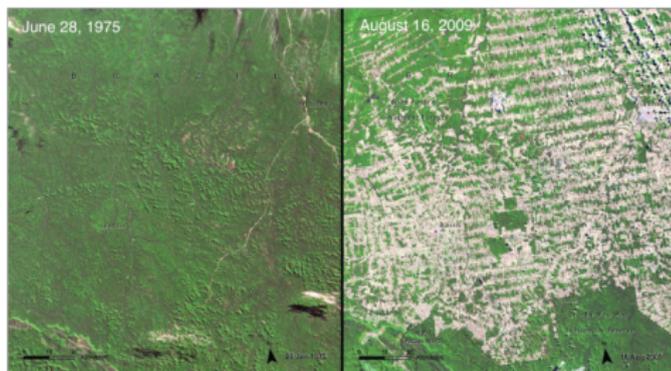
# Conditional cash transfers to alleviate poverty also reduced deforestation in Indonesia

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New Directions in Anti-Poverty Research Conference,  
December 6, 2022

# Two Great Challenges of the 21st Century



## Managing Environmental Change

Satellite Images of Rondonia in Western Brazil, taken in 1975 (left) and 2009 (right).  
Source: NASA, Images of Change, accessed through: vox.com



## Alleviating Poverty

Locals work to catch crabs from the mining operations site in Timika, Papua Province, Indonesia on Feb. 2, 2017  
Source: Ulet Ifansasti/Getty Images, accessed through: time.com

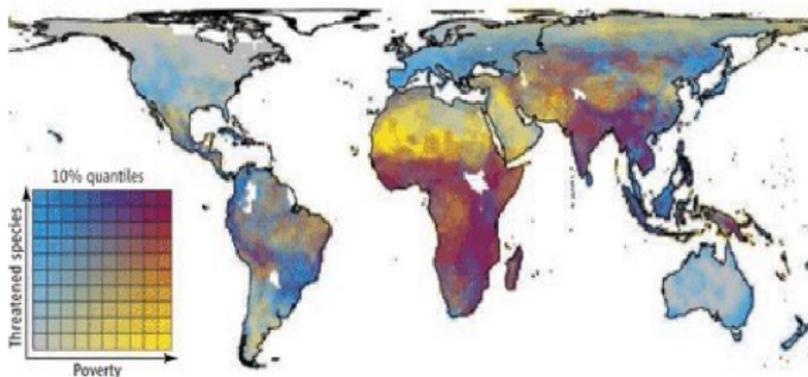
# Two Great Challenges of the 21st Century

- Raise the cost of behaviors that lead to environmental damage
  - Raise the cost of using energy
  - Raise the cost of using water
  - Raise the cost of developing land and housing
  - Raise the cost of consuming food
- Solution to alleviate poverty
  - Lowering the costs of consumption and raise incomes for the poor

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- Solution to alleviate poverty
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- **Q: Are we protecting the environment on the backs of the poor?**

# High overlap between poverty and biodiversity: Fisher and Christopher (2007)



Map of poverty and potential biodiversity loss (Sachs et al., 2009)

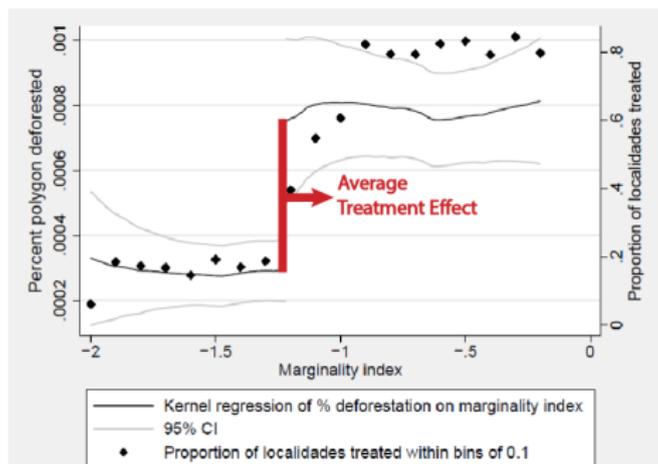
Map of tropical rainforest countries



# Correlation does not imply causation

- Effect of protecting environment on poverty?
  - Forest conservation programs can achieve their goals without exacerbating poverty: Alix-Garcia et al. (2015), Andam et al. (2010), Braber et al. (2018), Ferraro and Hanauer (2010), Jayachandran et al. (2017), Naidoo et al. (2019), Oldekop et al. (2019).
- Effect of alleviating poverty on the environment?
  - Mixed results from some attempts to identify a relation between development and biodiversity (Dasgupta et al., 2002).
  - Sachs et al. (2009): We need to do more to estimate effects of anti-poverty programs on the environment.

# Mexico's CCT: Oportunidades



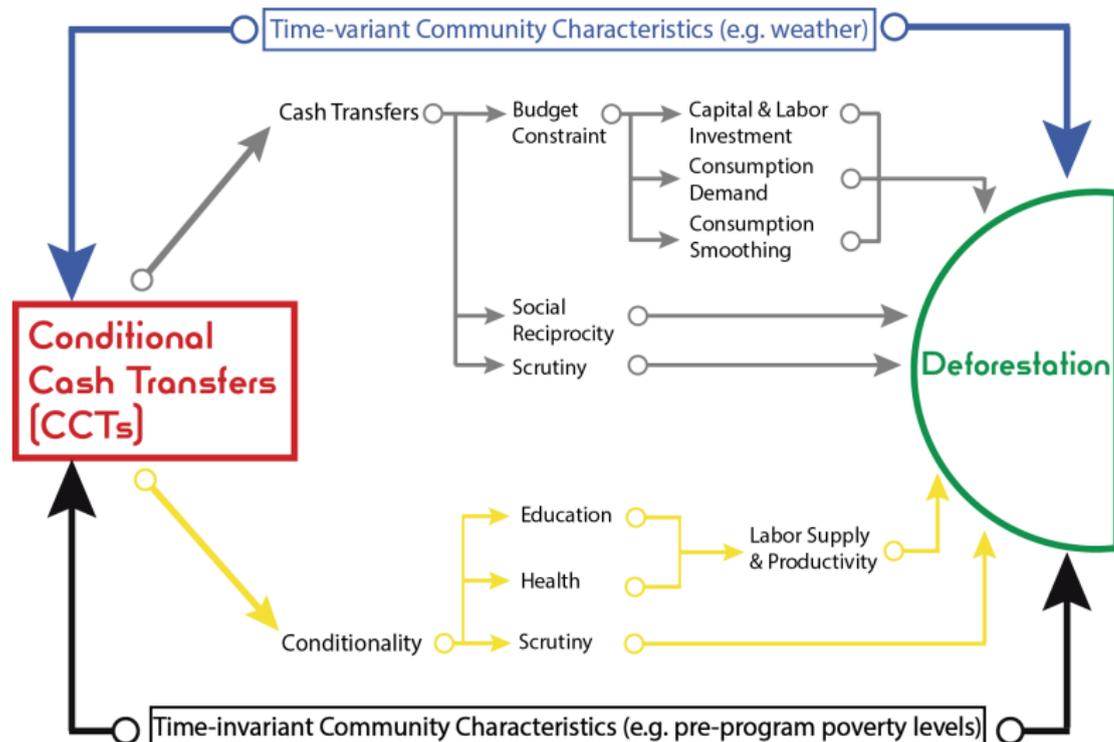
- The Mexican CCT program increases deforestation in villages that are at the eligibility cutoff (Alix-Garcia et al., 2013)
- Regression Discontinuity Design: compares villages barely eligible to those barely not eligible
- Only capable of measuring causal effect of CCT for villages near the eligibility cutoff ("least poor")

# Indonesia's CCT: Program Keluarga Harapan (PKH)

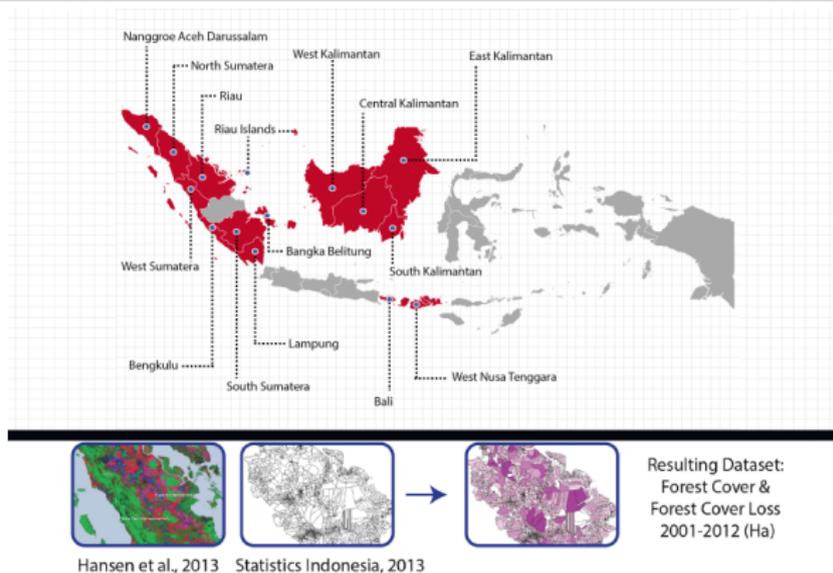


- A household conditional cash transfer program: transfer cash to mothers in poor households on a quarterly basis
- Piloted in 2007 and rolled out over time
- The cash transfers are approximately 15% to 20% of the estimated consumption of poor households in Indonesia (World Bank, 2017)

# How could PKH affect Village-level Deforestation?

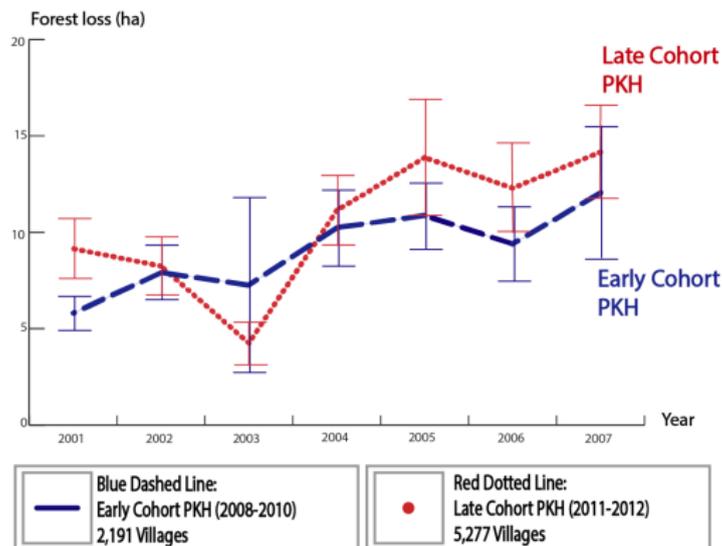


# Study Area



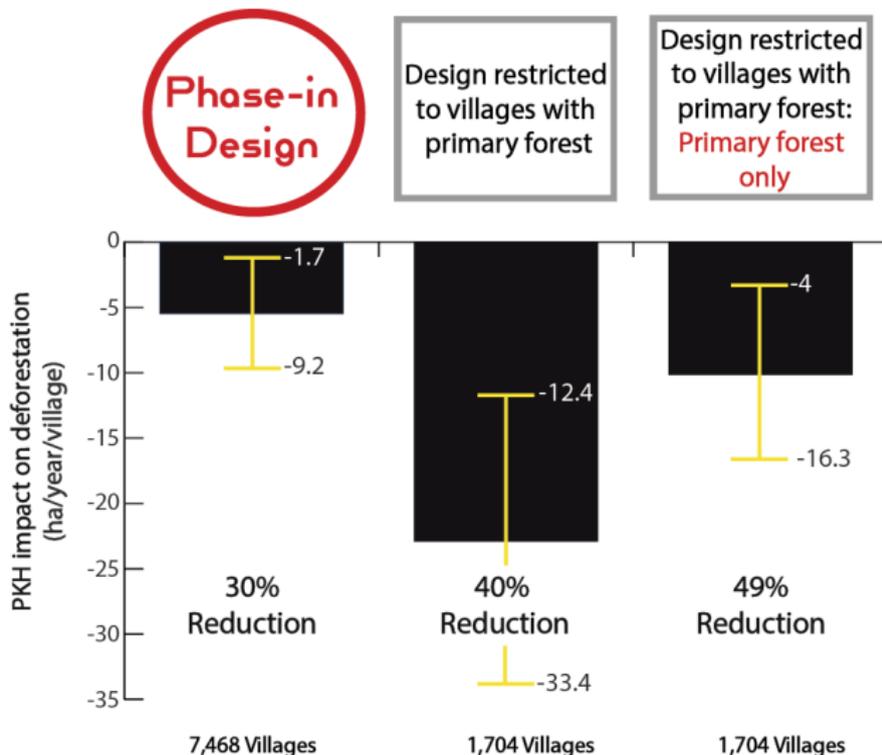
- 15 Provinces (red), representing 53% of Indonesia's forest cover in 2000 and accounting for over 80% of the forest cover loss between 2000 and 2012.
- PKH Villages 2008-2012: BAPPENAS

# Phase-in as a Natural Experiment

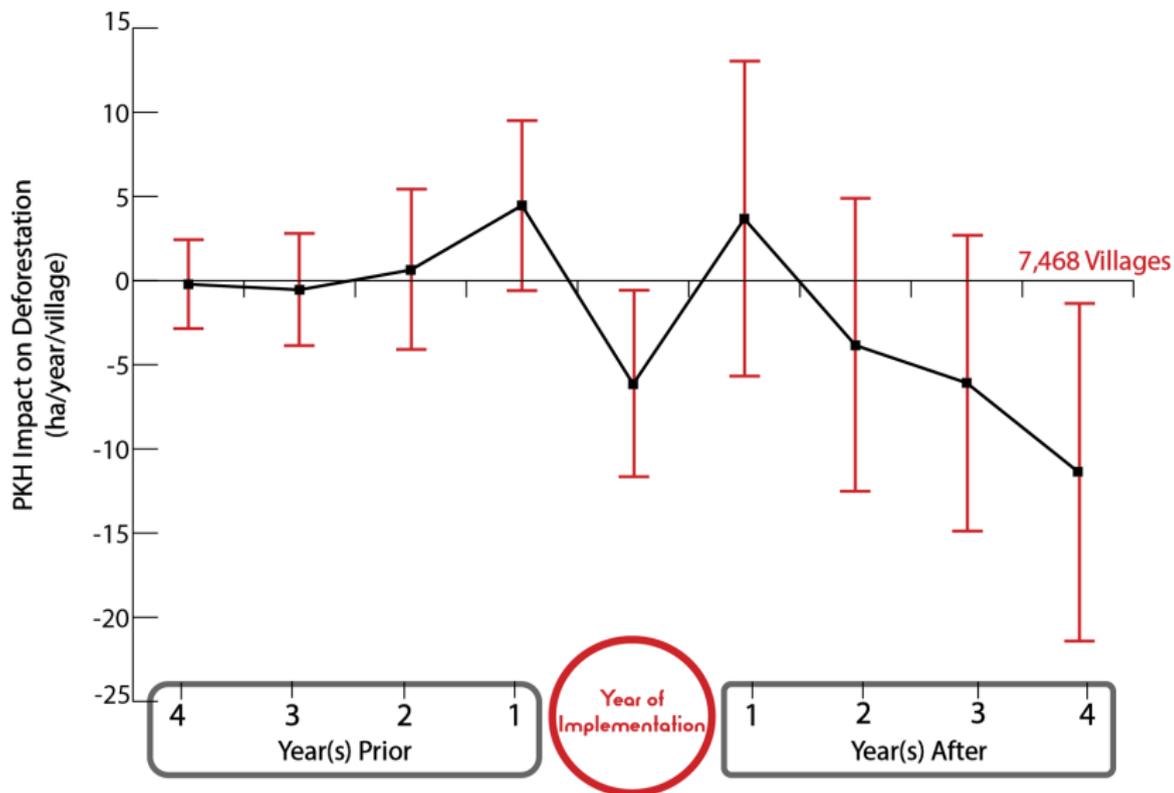


- Conditional on time-invariant (slowly-changing) village characteristics and weather, roll-out is "as if" randomly assigned
- Trend of untreated villages in a year serve as counterfactual trend for treated villages

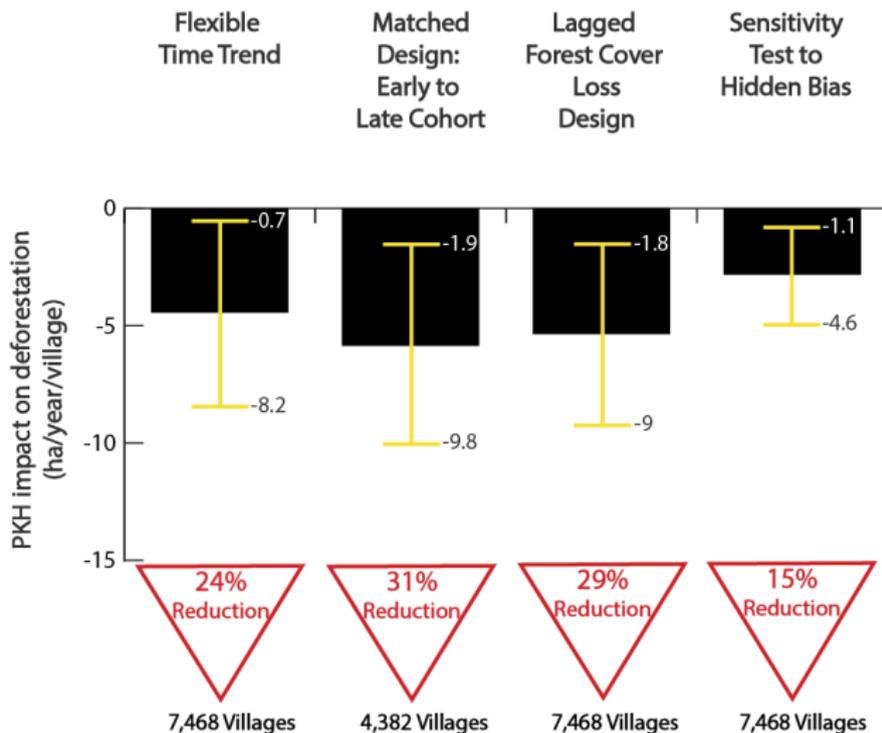
# Results



# Robustness



# Assessing Rival Explanations

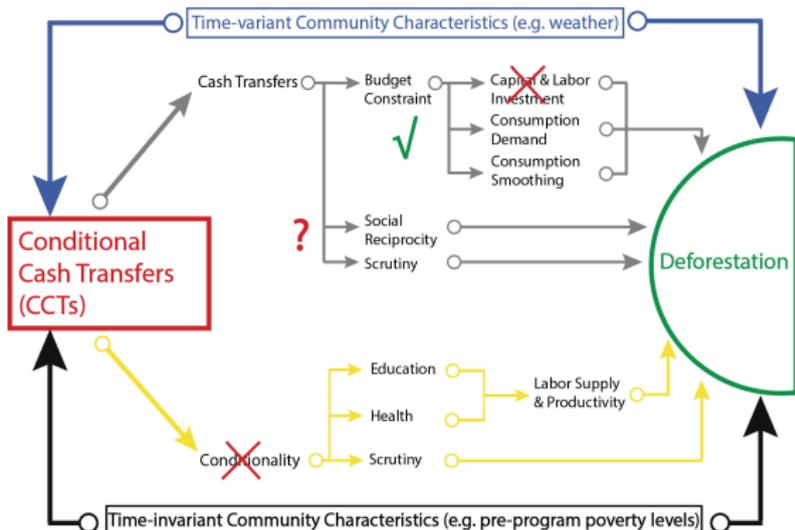


# Benefit-Cost Analysis

Scenario	How many years does PKH delay deforestation?	How many years after trees are cut is carbon released?	Benefit-Cost Ratio for Carbon Storage
1	Permanently	—	10.29
2	50 years	Immediately	4.27
3	9 years	Immediately	0.95
4	6 years	Immediately	0.64

- Cost per MT of CO<sub>2</sub> emissions avoided via the PKH is between \$3.01 and \$4.02 (2010 USD), depending on the proportion of stored, above-ground CO<sub>2</sub> that is assumed emitted after deforestation (100% vs. 75%)
- Social Cost of Carbon is 31 USD

# Mechanism



- Evidence consistent with cash substituting for deforestation as a form of insurance against delayed rains
- Evidence consistent with substitution of deforestation-derived products with market-derived products

# Conclusion

Does reducing poverty have unavoidable environmental costs?

In Indonesia, under certain conditions, the answer is "No"

- Although the PKH program was not designed as an environmental program, its estimated effect on deforestation was nearly one-tenth of a standard deviation.
- For comparison, PES studies reported a median effect size of 0.12 SD Ferraro (2017).

# Learning & Future Research

- Learnings for policymakers and program implementers
  - Our understanding of the effects of the CCT programmes on the environment & their mechanisms is incomplete
  - There needs to be a concerted effort from the policymakers to include the evaluation of poverty alleviation's environmental footprint in their rollout design
- Research question that remain to be investigated
  - Multi-country evaluation of CCT programs impact on deforestation

# Thank You

P.J. Ferraro, R. Simorangkir, Conditional cash transfers to alleviate poverty also reduced deforestation in Indonesia. *Sci.Adv.* **6**, eaaz1298 (2020).

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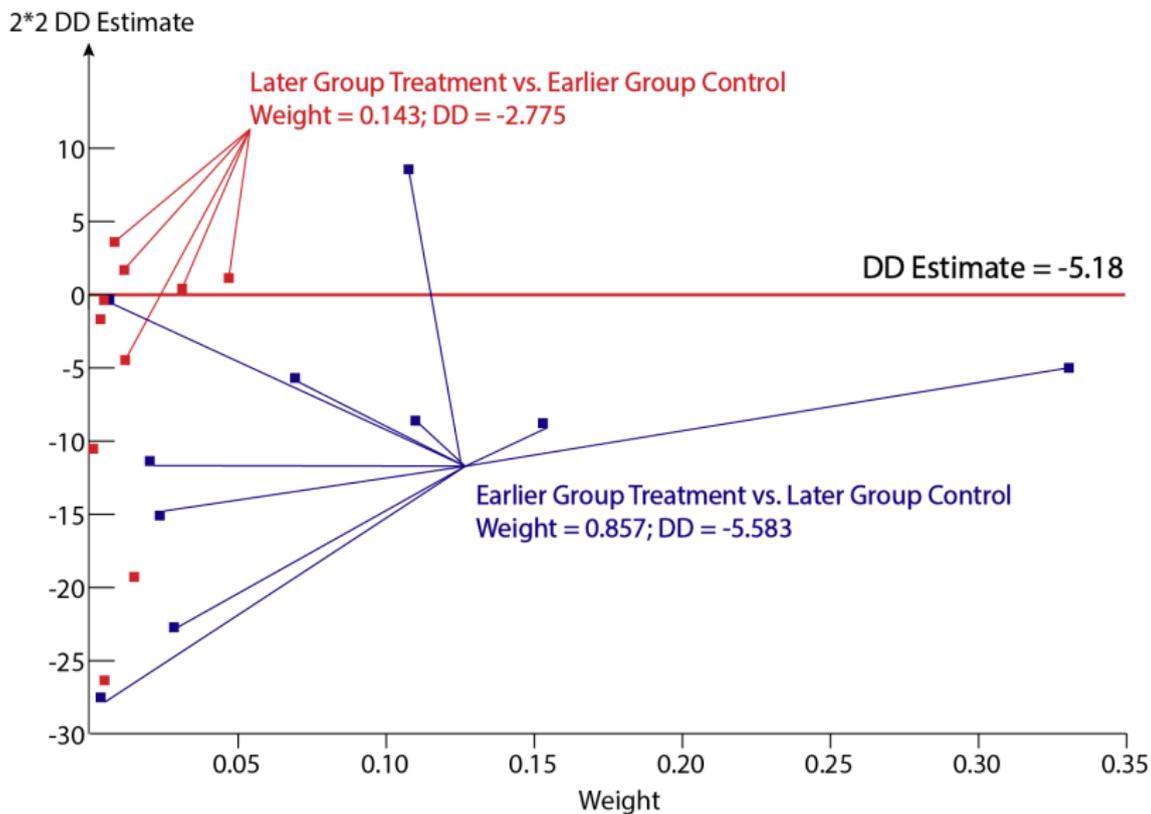
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# Two Decades of Conditional Cash Transfers



# DD Decomposition



# Benefit Formula

$$Value = SCC * \left(\frac{1}{(1+r)^s}\right) \left(1 - \frac{1}{(1+r)^D}\right) \quad (1)$$

- SCC is US EPA Social Cost of Carbon
- r is effective discount rate 1.08%
- s is storage or duration from deforestation to carbon emissions
- D is delay length in years