Conditional cash transfers to alleviate poverty also reduced deforestation in Indonesia

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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

Q: Are we protecting the environment on the backs of the poor?
Two Great Challenges of the 21st Century

- Raise the cost of behaviors that lead to environmental damage
  - Raise the cost of using energy
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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.
• 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?
• 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

Phase-in Design

Design restricted to villages with primary forest
- Primary forest only

Design impacted over a range of villages with different reductions:
- 30% Reduction: 7,468 Villages
- 40% Reduction: 1,704 Villages
- 49% Reduction: 1,704 Villages

Impact on deforestation (ha/year/village):
- -1.7
- -9.2
- -12.4
- -33.4
- -4
- -16.3
Robustness

![Graph showing the impact of PKH on deforestation](image-url)

- **PKH Impact on Deforestation (ha/year/village)**
- **Year(s) Prior**: 4, 3, 2, 1
- **Year of Implementation**: 1
- **Year(s) After**: 1, 2, 3, 4

- **7,468 Villages**
Assessing Rival Explanations

Flexible Time Trend

Matched Design: Early to Late Cohort

Lagged Forest Cover Loss Design

Sensitivity Test to Hidden Bias

PKH impact on deforestation (ha/year/village)

-24% Reduction for 7,468 Villages

-31% Reduction for 4,382 Villages

-29% Reduction for 7,468 Villages

-15% Reduction for 7,468 Villages
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 CO2 emissions avoided via the PKH is between $3.01 and $4.02 (2010 USD), depending on the proportion of stored, above-ground CO2 that is assumed emitted after deforestation (100% vs. 75%)
- Social Cost of Carbon is 31 USD
• 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 incude 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
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Two Decades of Conditional Cash Transfers
DD Decomposition

Later Group Treatment vs. Earlier Group Control
Weight = 0.143; DD = -2.775

Earlier Group Treatment vs. Later Group Control
Weight = 0.857; DD = -5.583

DD Estimate = -5.18
Benefit Formula

\[ Value = SCC \times \left( \frac{1}{(1 + r)^s} \right) \left( 1 - \frac{1}{(1 + r)^D} \right) \]  \hspace{1cm} (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