Paying smallholders not to cut the Amazon forest: impact evaluation of a REDD+ pilot project.

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1. Introduction
1. Introduction: context

- Deforestation = 7-14% of global GHG emissions.
- Slow integration of tropical forests in carbon economics.
- REDD+ = Reduction of Emissions from Deforestation and forest Degradation, plus the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

Source: Simonet et al., 2015
1. Introduction: REDD+ in Brazil

- More than 300 REDD+ projects around the world.

Source: Simonet et al., 2014

- Brazil:
  First country in terms of REDD+ projects and REDD+ financings.
  45% of GHG emissions generated by land use change and forestry (2012).
1. Introduction: REDD+ in Brazil

• Deforestation fell from 1.9Mha before 2005 to 0.48Mha in 2014:
  • Intervention of the private sector
  • Role of the government, notably through the federal « Plan for the Protection and Control of Deforestation in the Amazon » based on 3 pillars:
    1. Tenure regularization (+)
    2. Monitoring and control (+++)
    3. Promotion of sustainable agricultural practices (-)

• Need to combine command-and-control and positive incentives to integrate smallholders, whose participation in the avoided deforestation has been low (financial, technical and ethical reasons).

• Incentives through REDD+ projects, notably financed by the Amazon Fund (775 millions USD in 2013).
1. Introduction: research questions

- Lack of hindsight on REDD+ projects, nearly no impact evaluation (Jindal et al., 2012; Jagger et al., 2009).

- Case study: the *Projeto Assentamentos Sustentaveis* (PAS) in Brazil, a REDD+ pilot project with a PES component.

- Assessment of PES in Costa-Rica (e.g. Robalino and Pfaff, 2013) and Mexico (Alix-Garcia et al., 2012 and 2015) → what about Brazil?

What is the impact of the PAS project on the forest cover?
What are the consequences of forest preservation for participants?
What can we learn from a preliminary cost-benefit analysis?
2. Case study
2. The REDD+ pilot project *Projeto Assentamentos Sustentáveis* (PAS)

- Location: State of Pará, Transamazon highway = arc of deforestation.

- Settlers arrived in the 70s (National Integration Plan). Rapidly abandoned by government.

- Swidden agriculture and extensive cattle ranching.

- 2003: First federal program of PES promoting agroecological practices (*Proambiente*). Rapidly abandoned.

- 2009: Same NGO (IPAM) transforms the project into a REDD+ project to receive funding from the Amazon Fund.

2. The REDD+ pilot project *Projeto Assentamentos Sustentáveis* (PAS)

- **Objective:** support the ecological intensification of agricultural systems for rural smallholders + comply with Forest Code.
- **Voluntary** project.

- **Three axes:**
  1. **Cash payments**, conditional on conserving forests and on adopting alternative practices;
  2. **Technical assistance and investments:** promotion of sustainable agricultural systems;
  3. Helping people comply with the environmental legislation (use of fire regulated, forest clearing forbidden under 50%, land regularization): **administrative support + sensitization and information meetings.**

- First payment in 2014, maximum 626 USD/year.

- Evaluation at **preliminary** stage.
3. Methods
3.1 Sampling: BACI

**LOCATION**

- **COMPARISON** (4 communities)
  - Comparison before
  - Comparison after

- **INTERVENTION** (4 communities)
  - Intervention before
  - Intervention after

**TIME**

- BEFORE = 2010
  - PAS project
- AFTER = 2014

**Total sample = 181 households**
( random selection)

- 106 intervention households
  - 54 NP
  - 52 P
- 75 comparison households
  - 0 Proambiente
Location of the communities

Sources: G. Simonet, N. Fauvet, September 2015
3.2 Descriptive statistics (1)

• «Small» landowners:
  - 93ha < 100ha of total area;
  - ~67% forest in 2010,
  - ~25% pasture
  - the rest is cropland.
  - Annual deforestation rate > 3% per year -> representative of Brazilian smallholders (Godar et al. 2014).
  - Agriculture and livestock: main sources of revenue and main deforestation drivers.

• Due to the selection process, voluntary participants differ from non-participants → We control for the following covariates (selection bias):
  - Total land area;
  - Share of different land uses;
  - Different revenues (agriculture, livestock, wage labor, government social programs, business);
  - Family size, and age and education level of the head of household.
3.3 Identification strategy

- Project’s impact on the forest cover answers the following question: What is the land area covered by forest in participating farms, in 2014, compared to what we would have observed in these farms, had they not been involved in the project?

*Average Treatment on the Treated*:  
\[
\text{ATT} = E(\Delta Y_1 | D=1) - E(\Delta Y_0 | D=1)
\]

\( \Delta Y \) = forest cover change between 2010 and 2014.

D = 1 for participants.

D = 0 for comparison households.

- DID-matching used to create the counterfactual level: we use comparison households who have the same observable variables X than participants to constitute an appropriate **control group**.
4. Results
4.1 Forest conservation impact on participants (1)

- Direct impact of project on forest cover ranges between 5% and 8%.

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Significance: ***: pvalue < 1%, **: pvalue < 5%, *: pvalue < 10%, °: pvalue < 15%

Control group: hh with same characteristics than participants

106 intervention households

54 NP

52 P

75 comparison households

Matching estimators

Linear regressions

4.1 Forest conservation impact on participants (2)

Forest cover as the share of the total area (2008, 2010 and 2014)

Successful matching procedure

Participants
Control group
Comparison communities

-50% deforestation rate
4.2 Other impacts of the project

- Same total area in 2010 and 2014: what impact of the project on non-forest categories (cropland and pastures)?
  - No significant impact on cropland.
  - **Significant** impact on pastures (ranging between -5.8% and -11.3%)
    → The project resulted in a lower conversion of forest to pastures.

- Lower value of livestock owned, but not statistically significant.

- Impact on other revenues not significant.
4.3 Spillover effects

- No significant effect of the project on the forest cover of non-participants.

- Forest conservation impact on the whole intervention communities (=non-participants+participants) significantly diff. from zero (ATT = 4.56).

- No impact of the project on the decision to work as agricultural labor.

→ Risk of leakage limited
### 4.4 Impact on *ex-Proambiente*

**106 intervention households**
- **54 NP** (Ex-Proambiente)**
- **52 P** (Control group)

**75 comparison households**

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**Impact of the project on participants who also participated in Proambiente**

****: pvalue<1%,  
* : pvalue<5%,  
° : pvalue<10%.

- **Greater impact** on the forest cover and better balancing tests.
- Same results on other land uses and revenues.

→ Suggests **time cumulative effect**.
4.4 Impact on *ex-Proambiente*

Forest cover as the share of the total area (2008, 2010 and 2014)
4.5 Cost benefit analysis

- Each participant saved in average **4ha** of forest in 2 years.

- Using 126 tC/ha (IPCC 2003; IPAM 2009) as the average carbon content of Brazilian tropical forest, and extrapolating to the 350 participants, we estimate the **environmental impact** of the project at around **650,000 tCO2**.

- **Net surplus** depends on the price given to one ton of CO2 and on the scenario used to estimate project’s cost.

<table>
<thead>
<tr>
<th>Cost (USD)</th>
<th>Benefit (USD)</th>
<th>Scenario 1 (only PES): 219,100</th>
<th>Scenario 2 (PES + other costs, based on Sills et al. 2014): 538,300</th>
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</thead>
<tbody>
<tr>
<td>5.2$/tCO2:</td>
<td>3,366,418</td>
<td>3,147,318</td>
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<td>20$/tCO2:</td>
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<td>65$/tCO2:</td>
<td>42,080,220</td>
<td>41,861,120</td>
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</table>

Positive net surplus
5. Conclusion

• Encouraging results at preliminary stage on the possibility to stem deforestation among Brazilian smallholders by using positive incentives (cash payments + technical assistance + land regularization).

• Forest area has been preserved at the expense of pastures.

• However:
  • Previous participation in Proambiente created pro-environmental motivation. → we probably measure the cumulative effect of both programmes.
  • Participants are those who have « the least to lose ».
  • External pressure due to command-and-control:
    “people will have to apply the law sooner or later, so any help to reach this goal is welcome” (key informant in Canoé community).
6. Conclusion

- What about the long term impact of the project?
  - New practices required to maintain and increase the impact.
  - 5 years enough to achieve a transition toward sustainable agriculture?
  - Risk of rebound effect if the command-and-control is not applied at the end of the project (likely situation).
Thanks for your attention!