

# Do PA reductions impact forest cover in the Brazilian Amazon?

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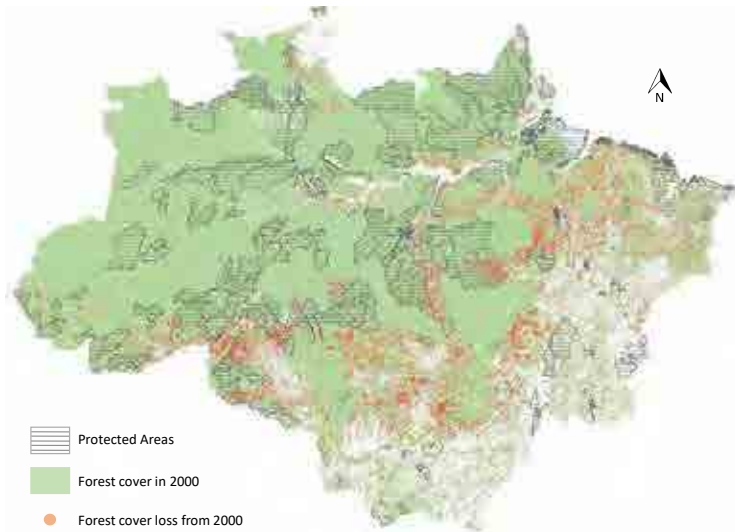
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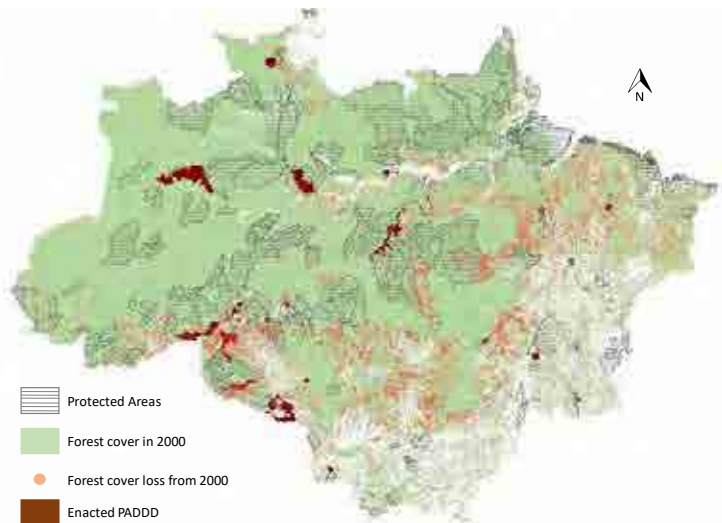
Ulvön, Sweden



# Protected Areas and Deforestation



# PA Downgradation, Degazettement and Downsizement





## Effectiveness of the PA Network?

- PAs questioned near economic pressures (Tesfaw et al., 2018, Keles et al., 2019, Mascia et al., 2011)
- PAs located far from economic pressure (Joppa and Pfaff, 2009)
  - ▷ Less effective than expected (Pfaff et al., 2011, 2015)
  - ▷ Risk to reduce effective ones (Pack et al., 2016, Tesfaw et al., 2018)
- Forrest et al. (2015) and Golden Kroner et al. (2016): PADDD ⇒ increased deforestation, biodiversity losses and roads development
  - ▷ Selection biases?

# Litterature on PADDD impacts

- Scarce litterature accounts for selection biases
  - ▷ Pack et al., 2016: BACI, 2002 to 2011, Brazilian Amazon
  - ▷ Tesfaw et al., 2018: Difference-in-Difference, 2010, Rôndonia
- ▷ **No impact**
- Unobservable selection bias, deforestation at the PA scale, average OR ineffective PAs, comparison near PAs
- Going further:
  - ▷ Finer level
  - ▷ Comparison with broader landscape
  - ▷ Ineffective and effective PAs according to level of pressure

# Contribution and Research Question

What are the effect of enacted legal size reductions of PAs from 2009 to 2012 on forest cover losses until 2015 in the Brazilian Amazon?

- Conceptual framework to extend PADDD impacts
  - ▷ Links between PA and PADDD impacts
  - ▷ According to economic pressure in the landscape
- Empirical strategy
  - ▷ Matching strategy to control for observable selection biases
  - ▷ Comparison with previous impact
  - ▷ Threshold distances to nearest markets

## PAs location and impacts

- Von Thünen land rent (Angelsen, 2007, 2010; Robalino, 2007; Sims, 2014)

$$Y_i = P * f(Q_i) - T_i(d_i)$$

$$Y_i^P = P * f(Q_i^P) - T_i^P(d_i^P) - \pi_i^P f$$

- ▷ Without protection: clearings until  $d_i$  where  $Y_i = 0$
  - ▷ With protection: no clearings if  $\pi_i^P f$  makes  $Y_i^P = 0$
- **Negative** impact on forest cover loss if  $Y_i - Y_i^P > 0$ 
  - ▷ below  $d_i$
  - ▷ AND  $\pi_i^P f$  high enough

## PA withdrawal Location and Impacts

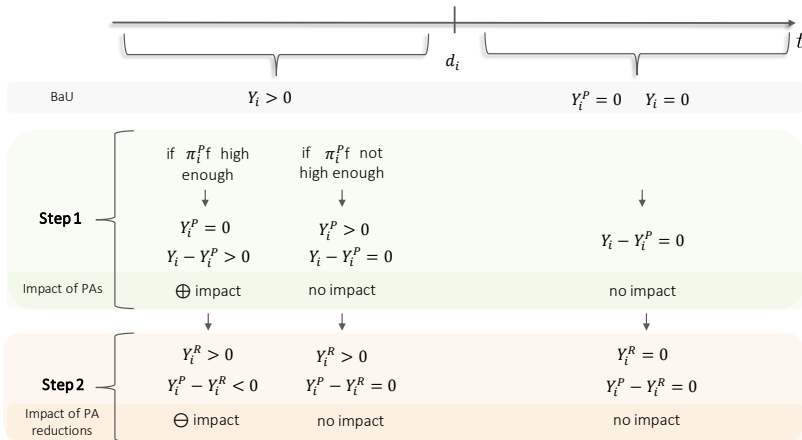
- Development agents may bargain for PA reduction if development benefits without protection could be high (Tesfaw et al., 2018, Keles et al., 2019)

$$Y_i^R = P * f(Q_i^R) - T_i^R(d_i^R)$$

- Positive** impact on forest cover loss if  $Y_i^P - Y_i^R < 0$ 
  - ▷ below  $d_i$
  - ▷ when  $Y_i^P = 0$  or  $< Y_i^R$  because of  $\pi_i^P f$
- Importance of the level of economic pressure and of the previous impact of protection



# Links between PAs and PA reductions impacts



Impact estimated below and after the threshold

# Matching Approach

- $\neq$  between forest cover loss in a protected P (reduced R) location and what would be observed had it never been protected NP (reduced NR)
  - ▷ Counterfactuals not observed:  $Y_i^{NP}|(P_i = 1)$  and  $Y_i^{NR}|(R_i = 1)$
  - ▷ Not possible to use  $Y_i^{NP}$  and  $Y_i^{NR}$
  - ▷ Quasi experimental matching

## Step 1: Protected locations

$$ATT_{Pr} = E(Y_i^{Pr}|(P_i = 1) - Y_i^{NP}|(P_i = 1))$$

$$ATT_{Pnr} = E(Y_i^{Pnr}|(P_i = 1) - Y_i^{NP}|(P_i = 1))$$

## Step 2: Reduced locations

$$ATT_R = E(Y_i^R|(R_i = 1) - Y_i^{NR}|(R_i = 1))$$