Geospatial Impact Evaluation

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Geospatial Impact Evaluation

- Use spatial information on program activities
  - ➢ Where did the activities take place (and when)?

- Merged with high-resolution geo-referenced outcomes
  - ➢ Geo-referenced surveys
  - ➢ Media or third-party reported geo-referenced events data
  - ➢ Remotely sensed (forest cover, nighttime lights)

- Causal attribution possible
  - ➢ Using *matching*, *fixed effects*, and *discontinuity* techniques
  - ➢ Can say that the program caused improvements in outcomes

Geospatial Impact Evaluation

- Examples in growing number of fields/sectors
    - *Land rights*
    - *Health*
    - *Governance*
    - *Post-conflict*
    - Education

Evaluating Indigenous Land Right Projects in the Amazon

AidData and KfW

Project Description

- In 1988 constitution, Gov of Brazil committed to demarcating indigenous people's territories

- Between 1995-2008, with funding and tech support from KfW and the World Bank, the PPTAL project identified, recognized, and studied 181 community lands.

- By 2008, 106 community lands demarcated, covering 38 million hectares (~35% of all indigenous lands in Amazon)

Data

- Program treatment
  - Boundaries of community lands
  - Administrative data on demarcation dates
- Merged with satellite-based greenness measure
  - NASA Land Long Term Data Record (LTDR), 1982-2010
  - Processed to Normalized Difference Vegetation Index (NDVI)
  - Range is [0, 1] (0 = rocky, barren; 1 = dense forest)
  - Annual NDVI max and mean measures

- Covariates
  - Climate (precip., temp.); topology (elevation, slope); distance to rivers; gridded, interpolated population

Empirical methodology

- Propensity Score Matching
  - Differences over time across matched treated/comparison communities
  - Match on baseline levels, pre-trends, & covariates
  - Demarcated vs. not; "Early" ('95-'01) vs "Late" ('01-'08)

- Fixed effects
  - Control for time-invariant community unobservables
  - Treatment status at finer time intervals

Sample communities

1997   2008

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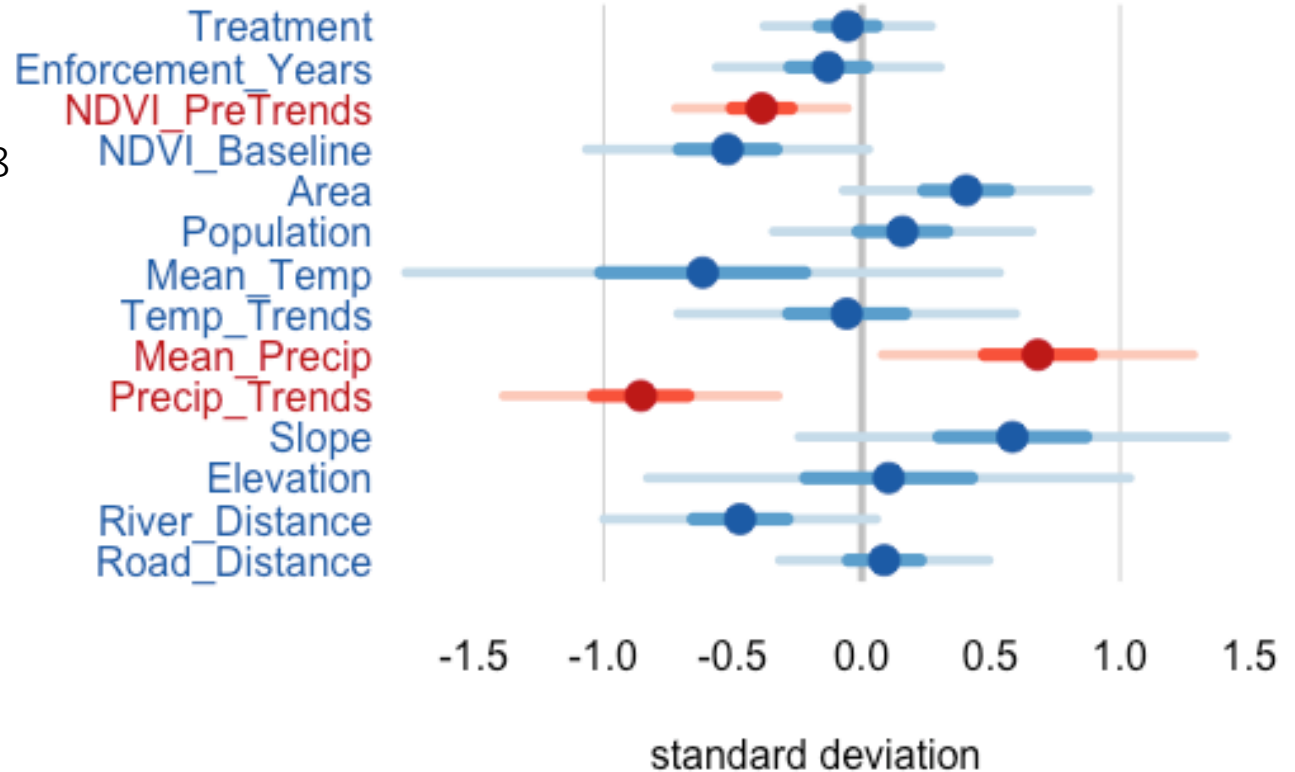
NDVI trends
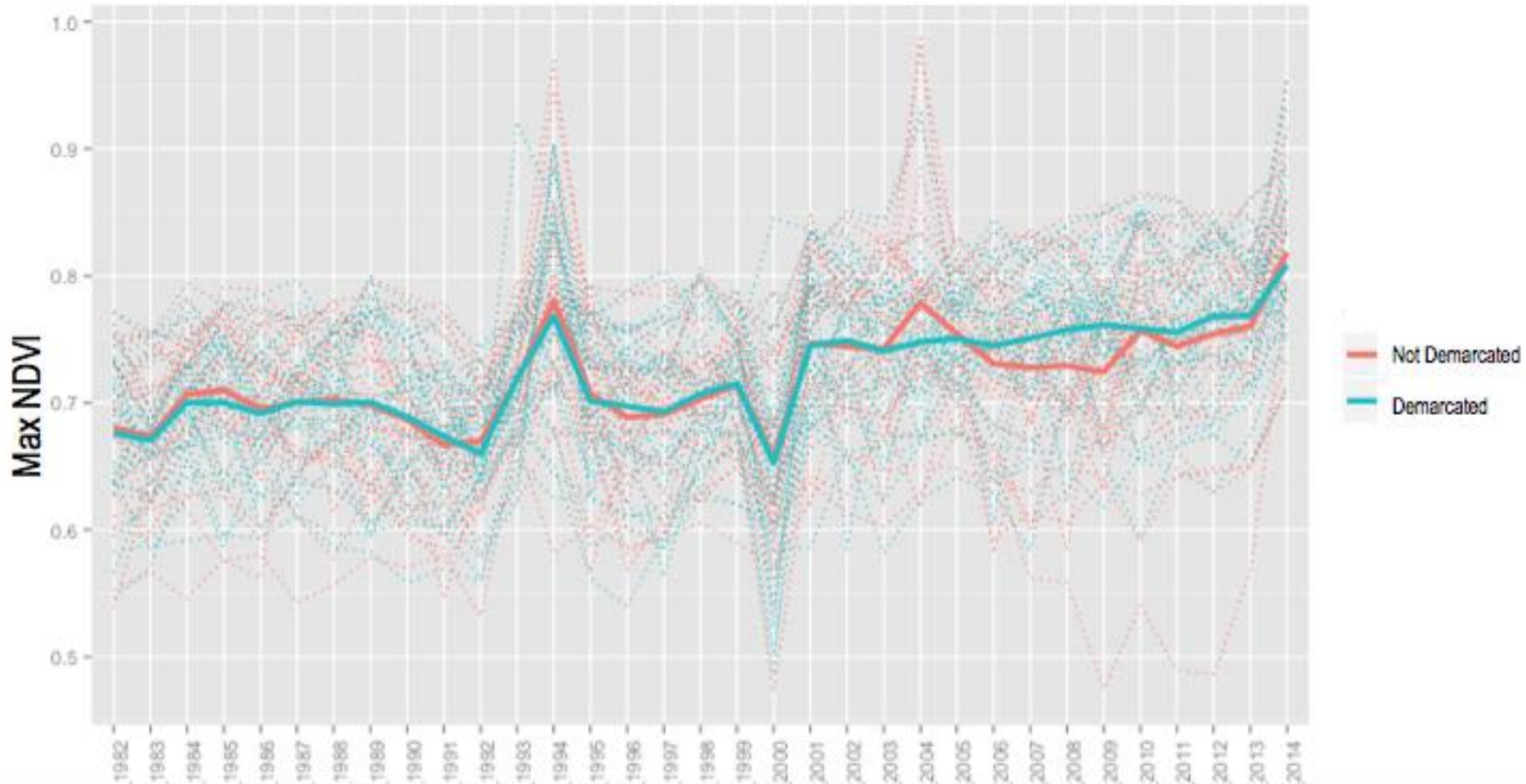
Differences-in-differences:

Demarcated vs. non-demarcated

Treatment = demarcated begins '95 and ends in '08

Outcome = Change in mean NDVI between '95 and '10

Sample: 30 community pairs, matched on covariates

Cross-Section Results, Max NDVI, 1995-2010

Treatment
Enforcement_Years
NDVI_PreTrends
NDVI_Baseline
Area
Population
Mean_Temp
Temp_Trends
Mean_Precip
Precip_Trends
Slope
Elevation
River_Distance
Road_Distance

-1.5   -1.0   -0.5   0.0   0.5   1.0   1.5

standard deviation

Panel model

Outcome = Level of max
NDVI in year

Covariates include
community fixed effects and
year trends

Sample: 2128 annual
observations for
demarcated communities

Standard errors clustered by
community & year

Panel Results, Max NDVI

Treatment_Demarcation

Treatment_Enforcement

-0.005   0.005   0.015   0.025

standard deviation
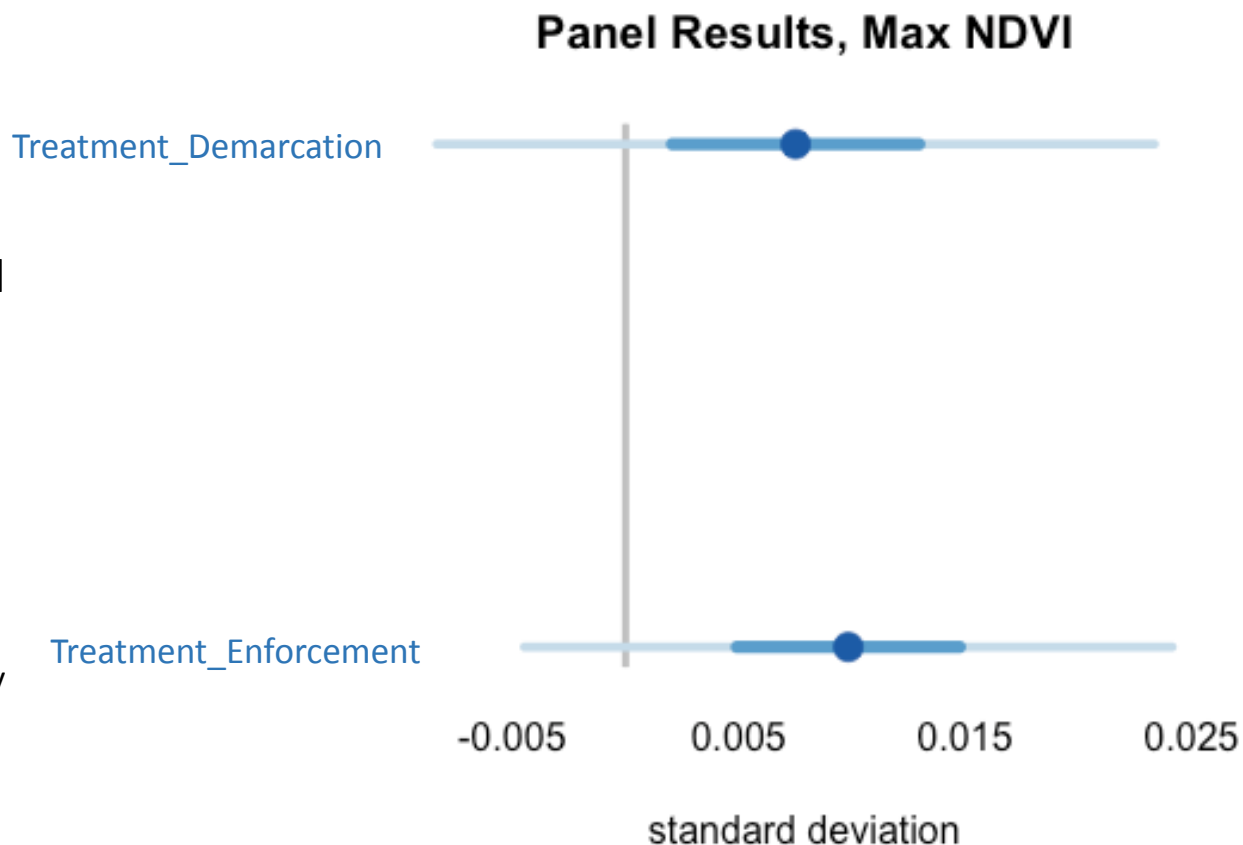
Conclusions

- No clear, robust evidence of differences in deforestation attributable to the PPTAL project

- Much lower rates of deforestation on indigenous lands in cross-section may not be related to land tenure status of these lands (or may be mediated through multiple, complex channels)

- Now adding data on land-related conflict experienced by indigenous communities
  - Extracting timing, locations, etc from Indigenous Missionary Council reports (2003-2014)

Evaluating Malaria Aid

Ariel BenYishay (W&M), Carrie Dolan (VCU), Karen Grepin (NYU), Gordon McCord (UCSD), Jeffrey Tanner (World Bank)

Effectiveness of malaria aid

- In 2008-2013, World Bank, US PMI, and other donors funded mass distribution campaigns of LLITNs
  - Campaigns were rolled out by province, varying over time

- Does child mortality decrease after a province experiences mass distribution?

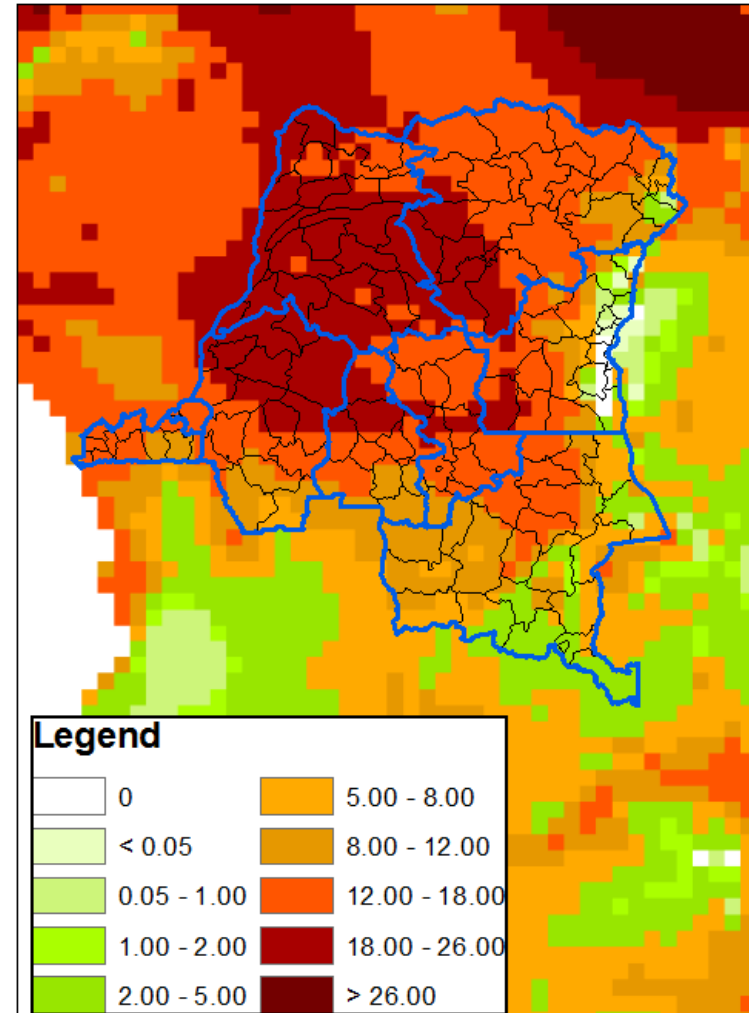- Survival analysis with differences-in-differences and province-level fixed effects and trends as controls
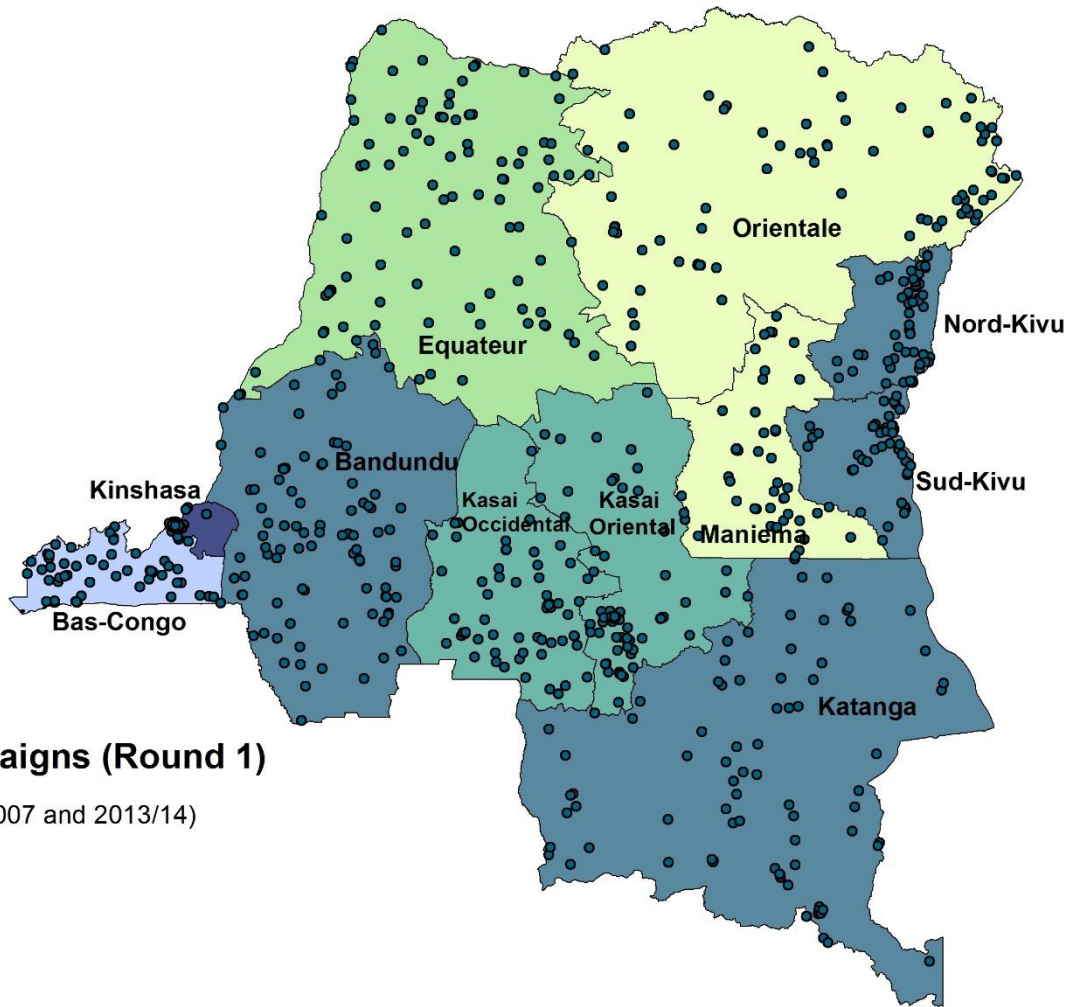
DRC LLIN mass campaigns (Round 1)

- DHS survey locations (2007 and 2013/14)

- 9/1/2009 (n=2)
- 12/1/2010 (n=1)
- 8/1/2011 (n=1)
- 7/1/2011 (n=2)
- 4/1/2012 (n=4)
- 11/1/2012 (n=1)

Map labels: Orientale, Equateur, Nord-Kivu, Sud-Kivu, Bandundu, Kinshasa, Kasai Occidental, Kasai Oriental, Maniema, Bas-Congo, Katanga

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Variation in malaria ecology

- Is this effect larger in locations where underlying malaria risks are higher due to ecological conditions?

- Even more granular (time-varying) data on climate conditions

| Legend	
0	5.00 - 8.00
< 0.05	8.00 - 12.00
0.05 - 1.00	12.00 - 18.00
1.00 - 2.00	18.00 - 26.00
2.00 - 5.00	> 26.00

Findings

- Campaigns dramatically improved all-cause child mortality, especially in the short-run
  - Effects after 3 years are still significant but smaller

- Effects are smaller in "holoendemic" areas where ecology is very conducive (and prevalence very high)
  - Many potential sources of infection
 - Population has already adapted, so lower baseline mortality
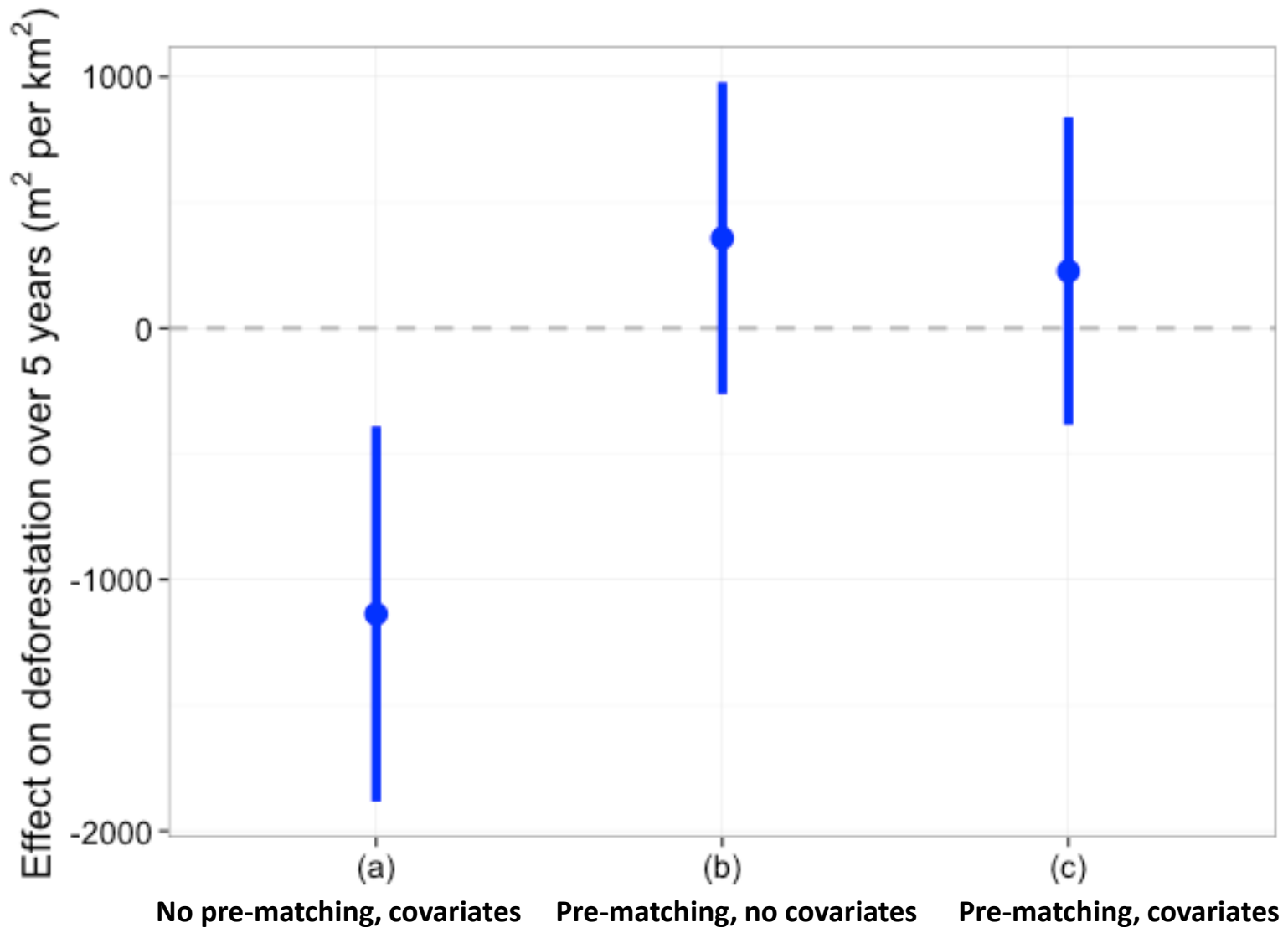
Town

Slope

Road

Treated Plot

Control Plot

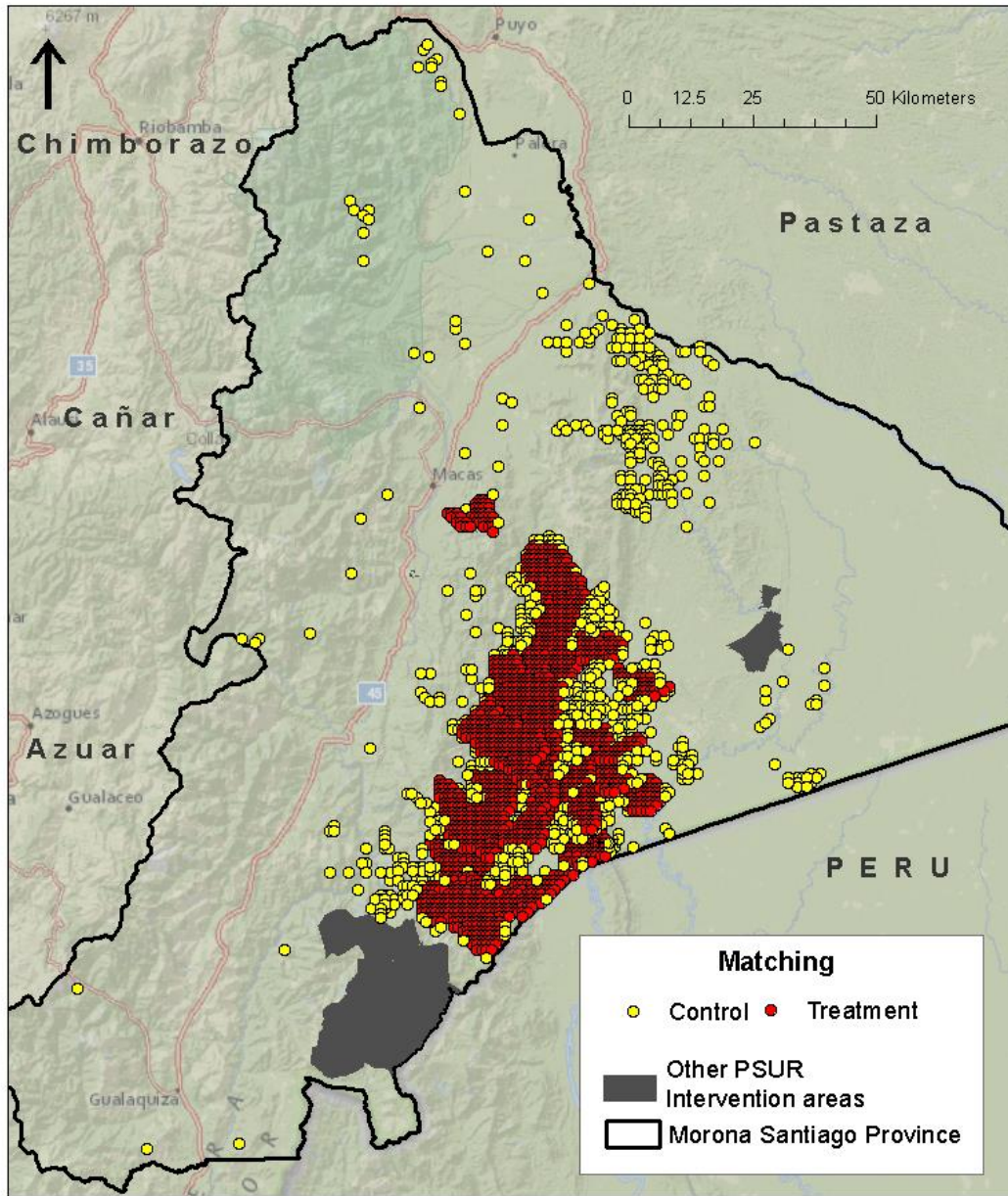Town

Slope

Road

Treated Plot

Control Plot
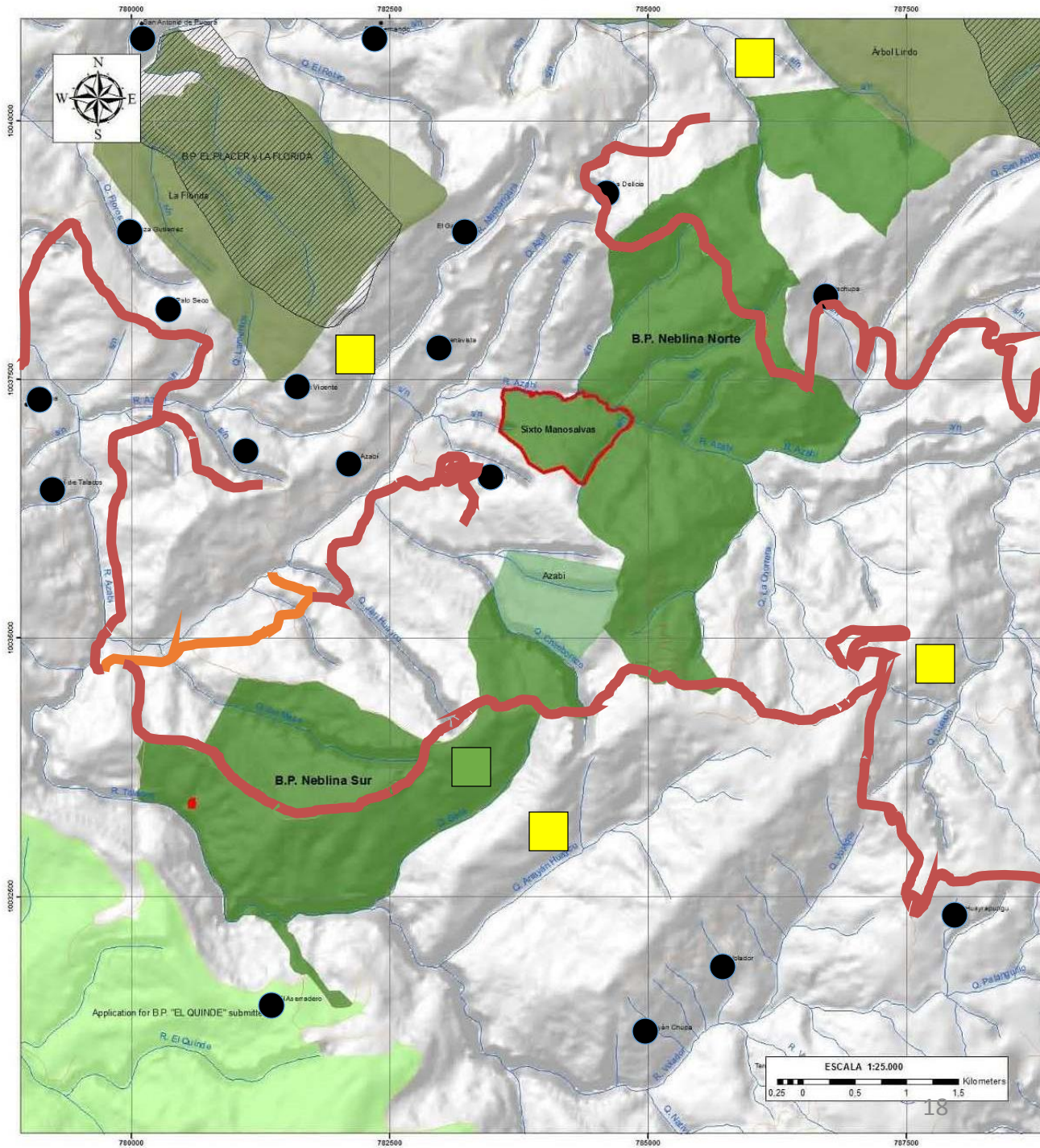
Matching variables

	Source	Temporal Granularity	Native Resolution
Forest Loss	Hansen et al. 2013	annual	30m
Forest Loss within 5 km² (t-1)	Hansen et al. 2013	annual	30m
Forest Cover Percent (t-1)	Hansen et al. 2013	annual	30m
Distance to Major Roads	OSM, VMAP1, MAE	various, 1993, 2012	vector
Distance to Electric Grid	VMAP1, MAE	1993, 2012	vector
Distance to River	VMAP1, MAE	2012	vector
Distance to Disturbed Land Classification	MOD12Q1	annual	.5 km
Indigenous Shuar Land	TNC	2012	vector
Protected Area Status	WDPA, MAE, TNC	annual	vector
Elevation / Slope	Souris, IRB	2001	30m
Population Density within 5 km² (t-1)	Landscan	annual	1 km
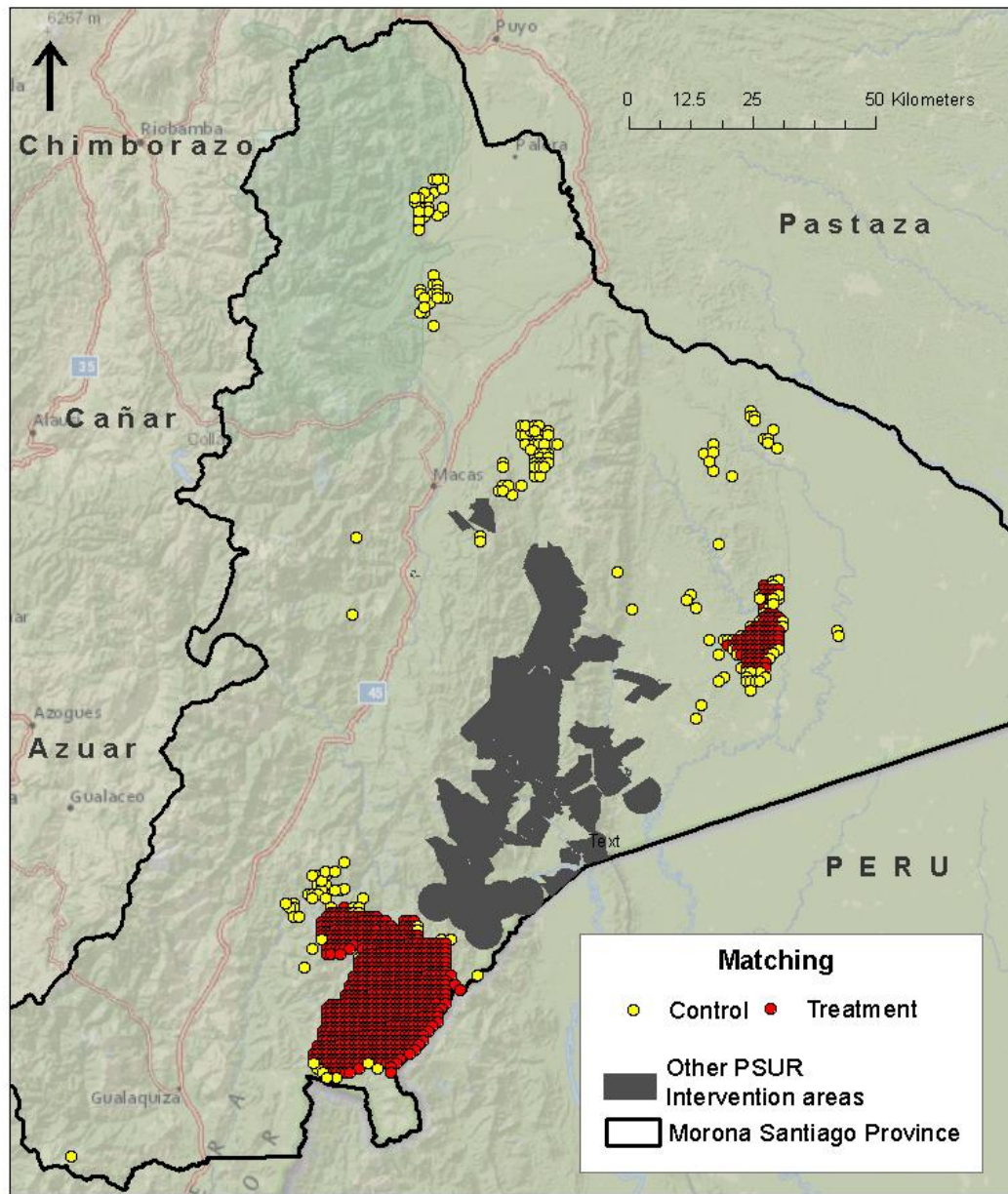
Treatment Effect of Legalization Only

Treatment Effect of Legalization and Community Management Plan

Effect on deforestation over 5 years (m² per km²)

(a) No pre-matching, covariates
(b) Pre-matching, no covariates
(c) Pre-matching, covariates
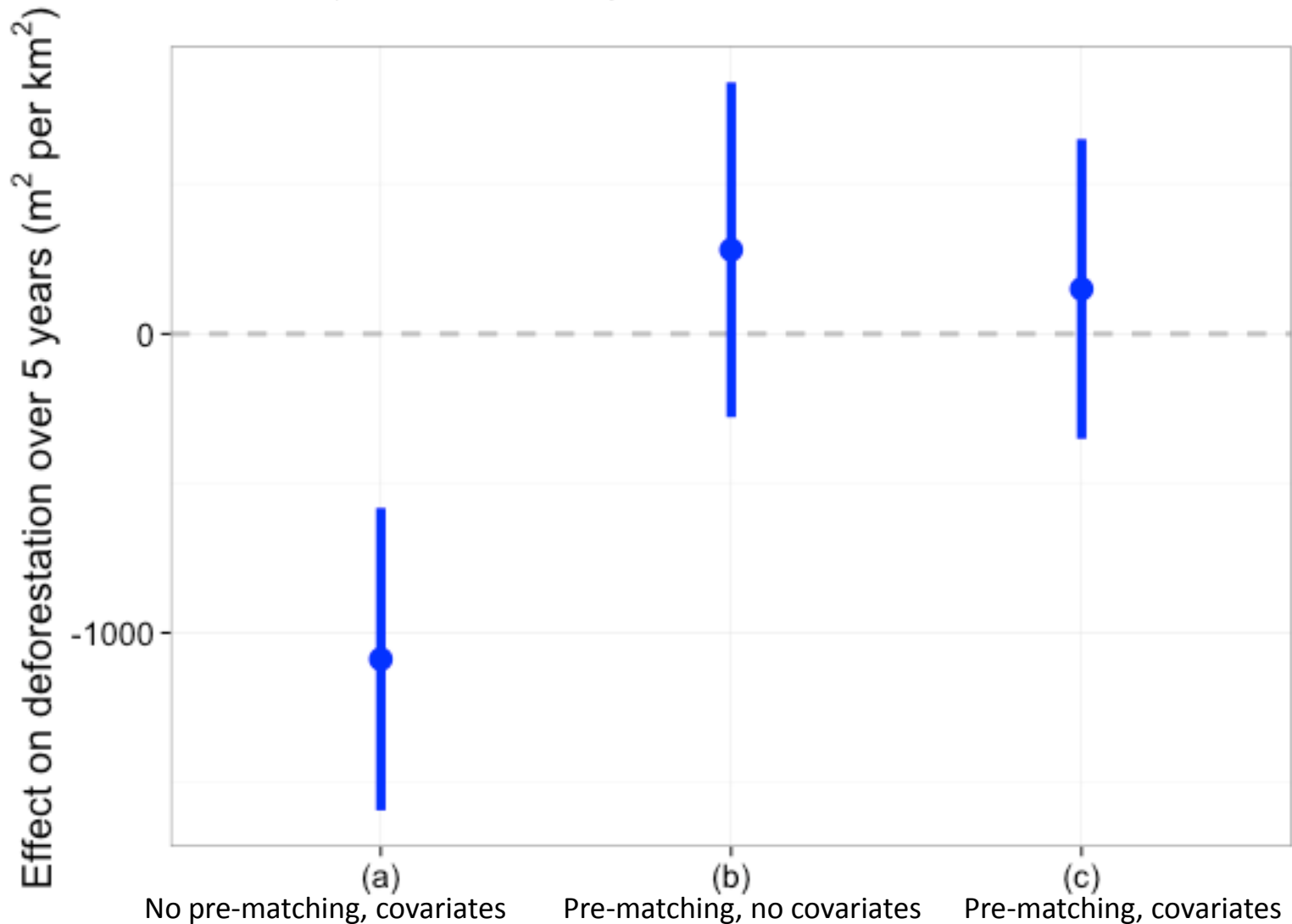
Colombia Municipal Governance IE

AidData, Michael Findley (U. of Texas), Joseph Young (American U.)

Regional Governance Activity (RGA) in Colombia

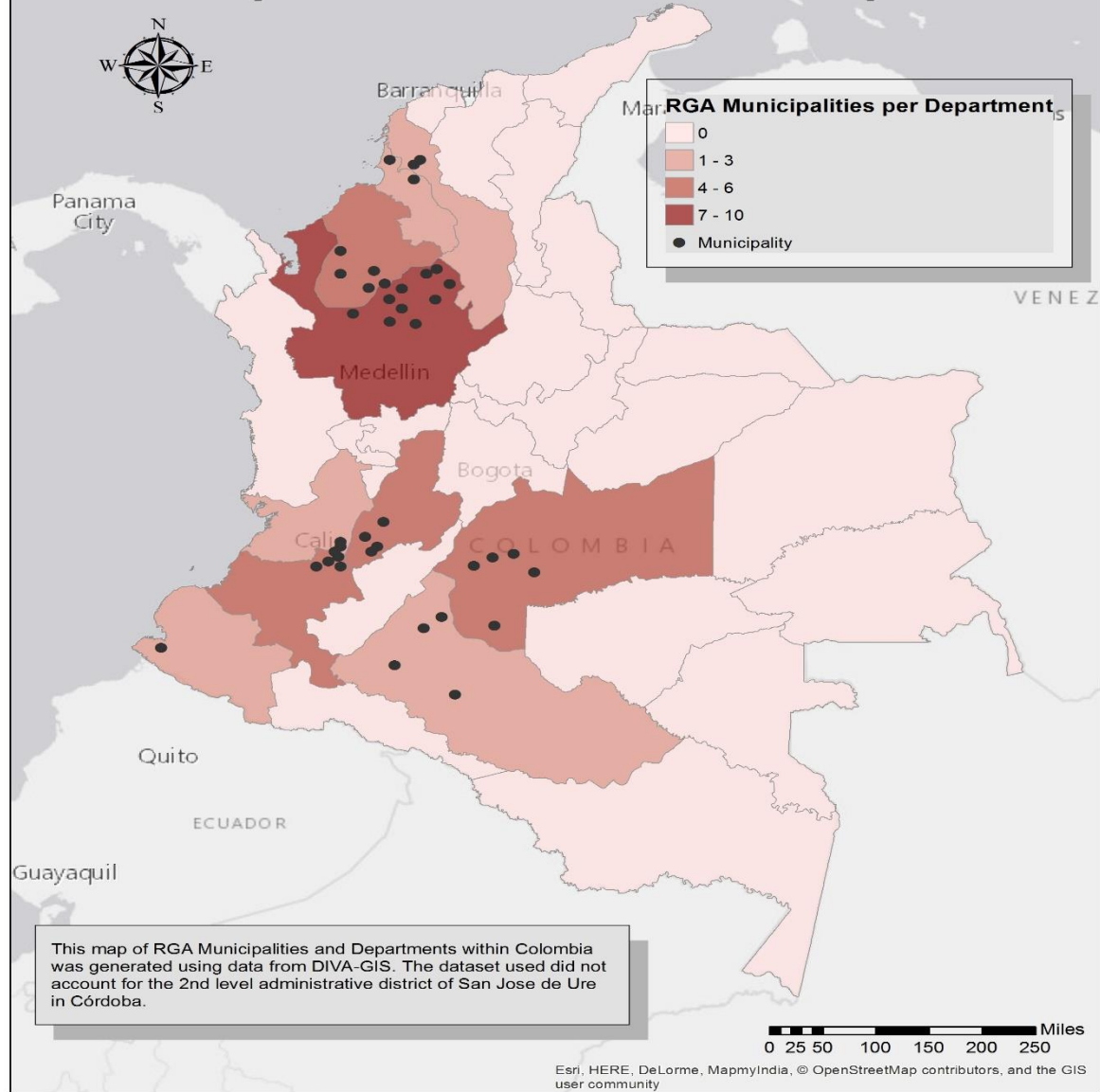**Researchers:** Michael Findley, Joseph Young

USAID Partners: USAID Colombia

RGA Description: Improve subnational governance in **40** conflict-affected municipalities through **5 channels**

RGA Goal: increase municipal capacity & legitimacy → decrease violence and increase stability

Evaluation to be conducted **Summer 2015 - Summer 2019**

RGA Departments and Municipalities

RGA Municipalities per Department
- 0
- 1 - 3
- 4 - 6
- 7 - 10
- Municipality

This map of RGA Municipalities and Departments within Colombia was generated using data from DIVA-GIS. The dataset used did not account for the 2nd level administrative district of San Jose de Ure in Córdoba.

Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

Miles
0 25 50   100   150   200   250

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RGA Colombia Project Description

Evaluate the RGA to see if there is:

1. Improved **financial management** & **performance**
2. Increased **citizen participation**

Matching strategy used to identify comparisons
- Matched on level of violence, demographic & economic characteristics, international involvement (aid)

Baseline/Midpoint/Endline Data Collection:

1. Interviews
2. Surveys
3. Document review
4. Observational statistical data

Combine program roll-out with data collection and compare to matched municipalities for **final evaluation report**

GIE in post-conflict setting: Burundi

- Michael Findley, UT-Austin faculty member member of the AidData Research Consortium → Geospatial Impact Evaluation of UN Peacebuilding Fund (PBF) activities in Burundi, 2007 - 2013

- Matching collines (low-level subnational units nested within communes) that are similar in all aspects *except for PBF activities*

- Found that PBF improved inter-group social cohesion among returning ex-combatants, internally displaced persons, and their host communities
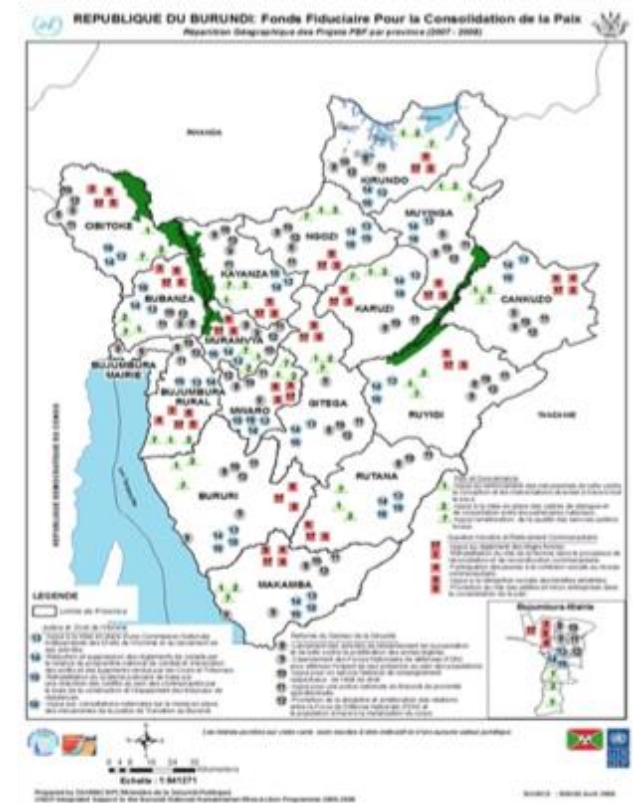
GIE in post-conflict setting: Liberia

- Evaluation of the conflict effects of natural resource concessions in Liberia
- Digitized polygons (tracts of land granted to investors for exploration and extraction) from concession contracts made available via EITI
- Outcome measure is geocoded conflict incidence data from ICEWS
- Matching algorithm to preprocess data such that our treatment and control locations as similar as possible on a wide variety of characteristics (inequality, local institutions, religious fractionalization, & economic development levels and trends)
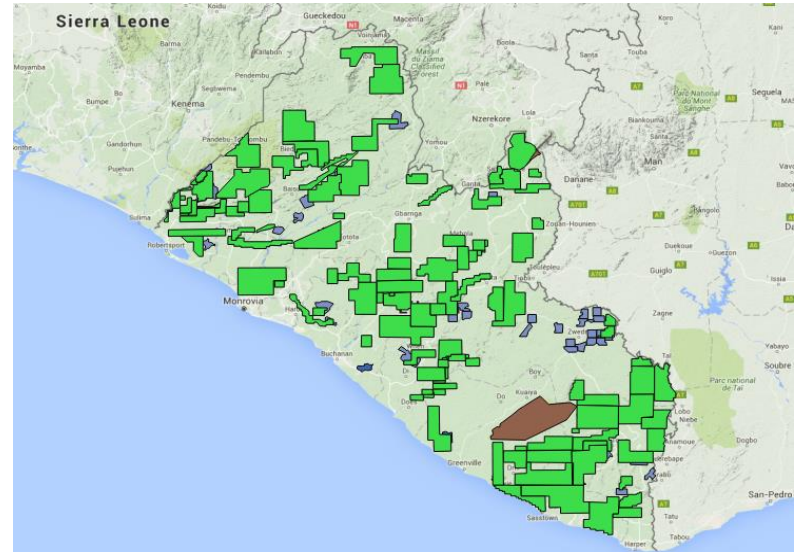
Sources of Spatiotemporal Conflict Data

- **UCDP Georeferenced Event Dataset (UCDP GED)**
  - ✓ Measures organized lethal violence (state-based, one-sided, and non-state conflict) in sub-Saharan Africa and Asia. Events geocoded to the level of individual villages, with temporal durations disaggregated to single, individual days.
  - ✓ Includes "conflict polygons" dataset showing the geographical spread of conflict.

- **Integrated Crisis Early Warning System (ICEWS)**
  - ✓ Contains worldwide, daily political events machine-coded from media sources
  - ✓ Each event includes source, target names, CAMEO codes, intensity scores, and subnational geocodes (1995-present)

- **Armed Conflict Location and Event Data (ACLED)**
  - ✓ Dates and locations of all reported political violence and protest events in over 60 developing countries in Africa and Asia
  - ✓ Covers 1997-present in Africa, 2010-present in Asia

- **The Social Conflict Analysis Database (SCAD)**
  - ✓ Measures protests, riots, strikes, inter-communal conflict, government violence against civilians not systematically tracked in other conflict datasets. Covers 1990-2014.