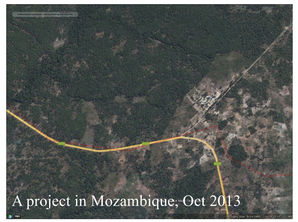
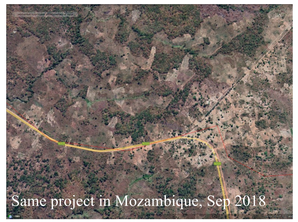
Are Carbon Offset Projects an Effective Vehicle for Carbon Emission Reduction?

Zirui Wang
McCombs School of Business, University of Texas at Austin

① Motivation

- Reducing carbon emissions has been a top priority for governments and firms globally
- The **carbon offset market** is one of many endeavors, projected to surge to $250 billion by 2050 (Morgan Stanley, 2023)
- The **effectiveness** of this burgeoning market, however, lacks a thorough investigation





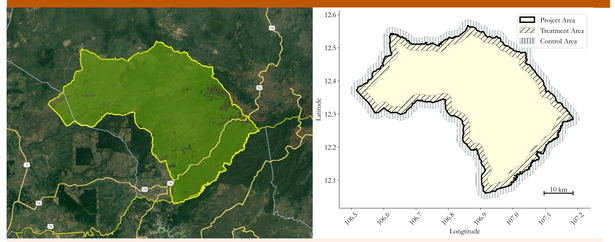
② This Paper

- Focuses on REDD+ projects in voluntary carbon offset market
  - Projects aiming to reduce emissions from deforestation
- Constructs a **novel dataset** that includes
  - All available REDD+ projects
  - Time-series of forest coverage in 600 x 600 m^2 land units
- Evaluates the effectiveness of projects in reducing emissions
  - Employs a **Difference-in-Differences (DID)** approach
- Finds most of the projects have *nearly zero effect* of slowing down deforestation

③ Data

- **Carbon offset project data** from the public registry
  - Issuance and retirement, project area, corporate buyers
- **Forest loss data** from Hansen et al. (2013)
  - Global forest changes analyzed using Landsat images
  - High resolution grid cells of approx. 30 x 30 m^2
  1. Forest coverage dataset
     - Cross-sectional snapshot of year 2000
     - Percentage range from 0 to 100
  2. Year of forest loss event dataset
     - Cross-sectional data per grid cell
     - Convertible to a panel dataset, annually from 2001-2022

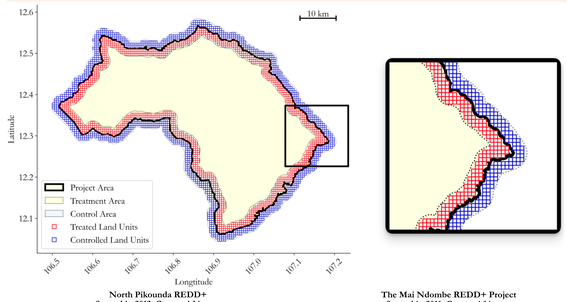
④ Empirical Design

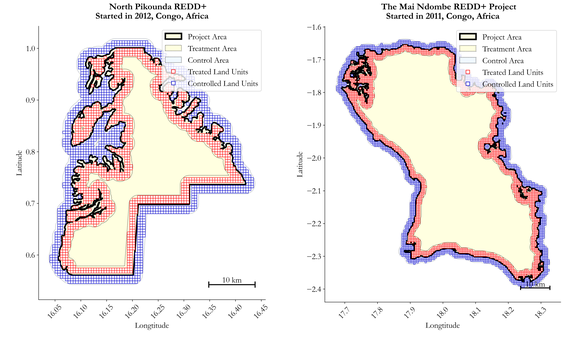


- Construct a panel dataset comprising 2 million observations
  - 68 **projects (*p*)** (All REDD+ Projects up to 2024)
  - 3,000 individual 600 x 600 m^2 **land units (*i*)** per project (*p*)
  - 9-year time-series data (*t*) per land unit (*i*)
- Employ a DID approach, nested within a RDD framework
  - **Treatment group**: Individual land units located 2 kilometers *within* the project boundary
  - **Control group**: Individual land units located 2 kilometers *outside* the project boundary
- The baseline regression I estimate is as follows

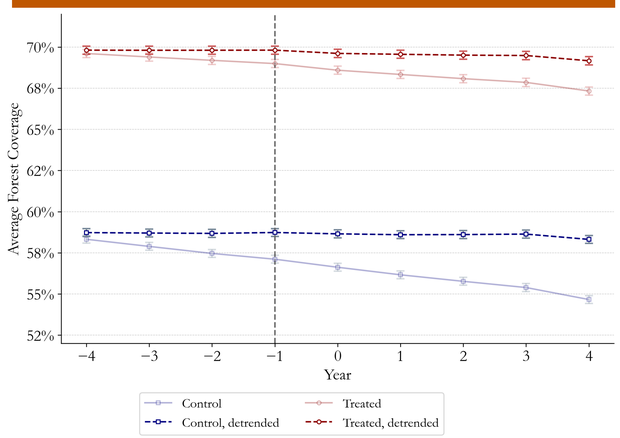
$$ForestCoverage_{ipt} = \beta(Treat_{ip} \times Post_{tp}) + FEs + \epsilon_{ipt}$$

- The following figures display the land units and some projects

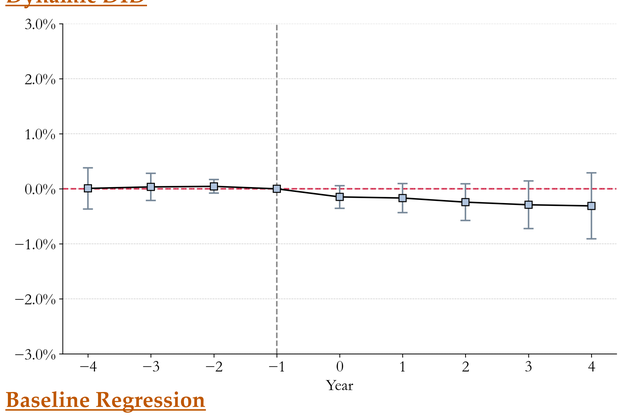




⑤ Main Results



Dynamic DID

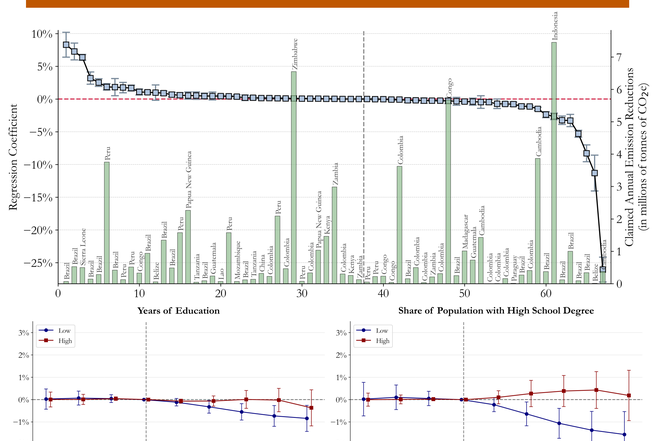


Baseline Regression

	Detrended *ForestCoverage*		
	(1)	(2)	(3)
Treat × *Post*	-0.0019	-0.0019	-0.0025
	(0.0023)	(0.0023)	(0.0022)
Project FE		✓	
Land Unit FE			✓
Project-Year FE			✓
Observations	1,945,575	1,945,575	1,945,575
R^2	0.0206	0.7168	0.9903
Mean of Dep. Var.	0.6387	0.6387	0.6387
Std of Δ Dep. Var.	0.0284	0.0284	0.0284

Project-clustered standard-errors in parentheses

⑥ Heterogeneous Effects



⑦ Conclusion

- This paper
  - Examines the effectiveness of projects in preserving forest
  - Documents a precisely estimated **nearly zero effect** of slowing down deforestation
  - Finds **access to financing, culture,** and **education** are important factors for project success
- If you have any feedback about the paper, please let me know!
- You can find me here:
  - www.zirui-wang.com
  - zirui.wang@utexas.edu