

A Prospective Evaluation of Afghanistan's National Emergency Rural Roads Project

Sandra Sequeira, Justin Grimmer, Andrew Beath

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Do Rural Roads “help” Afghanistan’s Citizens?

- ▶ Major Investments in Afghanistan (WB, USAID, UN, ...)
- ▶ Rural Road Projects: A Major Success?
- ▶ Anecdotal Evidence: Yes !
- ▶ The Problem of Road Evaluation

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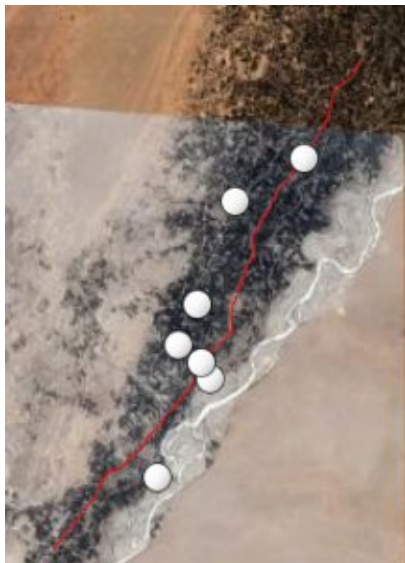
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Outline

- ▶ NERAP and Roads in Afghanistan
- ▶ Research Design to Estimate Causal Effects
- ▶ Outcomes/Surveys



Program Background

- ▶ **Afghanistan's Poor (Road) Infrastructure**
- ▶ First Programs: NEEP/NEEPRA/LIPW/...
- ▶ NERAP Second Attempt At Road Improvement

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NERAP Program Background

NERAP Goals:

- ▶ Connect Rural Villages
- ▶ Provide Boost in Employment
- ▶ Increase Access to Basic Resources
- ▶ Facilitate Further Economic Development

Total Cost: US \$ 137 Million

NERAP Program Background

- ▶ Afghan Ministries (MRRD, MPW) Coordinate
- ▶ Private Contractors Do Actual Road Building
- ▶ Private Contractors Draw Labor from Surrounding Communities

Our Goal:

Measure the *effects* of road projects on a variety of economic, social, and political outcomes

Overview of Research Design

Observational Study (unfortunately)

“Triply” Robust Design

1. Matching
2. Difference-in-Difference on Matched Pairs
3. Parametric Models

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Selecting *Projects*

Infrastructure Based Choices

- ▶ Previous Commitments
- ▶ Community Requests
- ▶ Connectivity
- ▶ Compliments

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Maximize Returns (and safety) (van De Walle 2002)

- ▶ Terrain
- ▶ Safety
- ▶ Large (Dense) Populations
- ▶ Access To Nearby Resources

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Identification Strategy 1: Matching

Key to Selection:

Roads are Selected based on Summary Characteristics of Villages

Treatment at Road (cluster) Level, Causal Effects at Road, Village, Household, Individual Level.

We Extend Assumptions in Rosenbaum and Rubin (1983) for Road Selection

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Roads are Treated

All Villages 1 KM (or less) from Road Project are “Treated”

All Villages 10 KM (or less) from Road Project are
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Matching Assumptions

Stable **U**nit **T**reatment **V**alue **A**ssumption (SUTVA) for Road Projects

Potential Outcomes for an individual not affected by treatment assignment of individuals along *other roads*.

In other words:

- ▶ Interference within Road Projects: OK
- ▶ No Interference Across Road Projects

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Covariates

Define Road- Level Covariates

- (1) Summary Statistics of Villages Along the Road (Min, Mean, Median, etc)
- (2) Characteristics of the Road (Length, Location, etc.)

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Selection on Observables

Overlap: Each Village Could have Been in Treatment or Control (population)

Given Road Level Covariates, there are no latent differences between treatment and control groups.

Causal Quantity of Interest: Average Treatment Effect on the Treated (notation)

$$ATT = E[\underbrace{Y(1)|T=1}_{\text{Observed}}] - \underbrace{E[Y(0)|T=1]}_{\text{counterfactual}}$$

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ATT Not Observed (FPCI)

Naive Difference Is Confounded

But

- ▶ Knowing Propensity Score (big assumption...)
- ▶ SUTVA
- ▶ Selection on Observables

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Exact Matching on Village Level Covariates is Insufficient.

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Matching Data

- ▶ New Data Set of 35,063 Villages
- ▶ Central Statistics Office (CSO) data (merged)
- ▶ Data on NEEPRA Projects
- ▶ NSP Projects
- ▶ Distribution of Hospitals

Matching Data (cont.)

81 Treated Roads to Survey (Security/Timing)

1,940 Control Roads (MRRD File)

Road Covariates

- ▶ Length
- ▶ No. Villages
- ▶ Density
- ▶ Closest Hospital
- ▶ Distance to Village Center

Nearest Neighbor, 2:1 Propensity Score Matching

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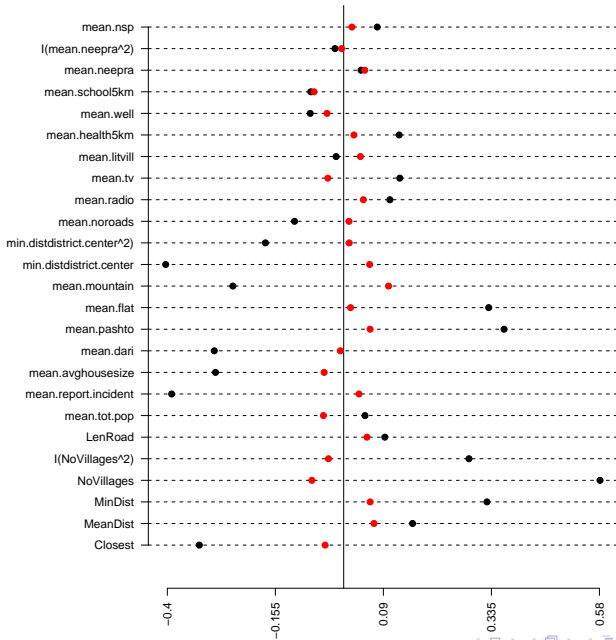
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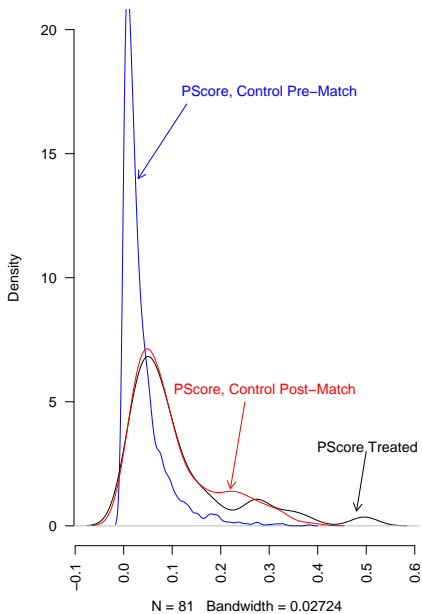
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Nearest Neighbor, 2:1 Propensity Score Matching

Standardized Bias Reduction



Propensity Score Before/After Matching



Identification Strategy 2: Difference-in-Difference

Collect Survey Data

- ▶ Baseline (large control group)
- ▶ Select Final Control Group
- ▶ 2-3 Follow Up Surveys

Panel at the *individual* , *focus-group*, and *village* level.

Identification Strategy 3: Parametric Adjustment

Data are hierarchical :

- ▶ roads
- ▶ villages
- ▶ households
- ▶ individuals

Follow other studies, fit hierarchical Model (extra variation).

Outcome Data

- ▶ Household data (Male and Female)
- ▶ Focus Groups (Male and Female)

Individual/Group Perspectives

Outcome Data

- ▶ Economic Questions
 - ▶ Price variation along road
 - ▶ Participation in Wage-Labor
 - ▶ Crop choice (income source)

Outcome Data

- ▶ Political/Social Questions
 - ▶ Community Governance Structure
 - ▶ Trust in Community
 - ▶ Resolution of Disputes
- ▶ Transportation Questions
 - ▶ Travel Times
 - ▶ Access to Transportation
 - ▶ Knowledge of Surrounding Communities

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Moving Forward

- ▶ Final Road Selection
- ▶ Baseline Survey
- ▶ NEEPRA, Poppy, Security