Mechanisms & Spillovers

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Mechanisms

- Did the intervention induce changes in intermediate actions?
  - i.e. Did the farmers switch to more productive maize varieties?
- Was the program a package of interventions, with specific (but potentially complementary) goals?
- Remotely sensed data often provide 1 or 2 headline outcome measures (NDVI increased!)
  - In some cases, have additional ground-based data to complement
- Some of the mechanisms may imply other costs borne by local populations
  - Ex: Irrigation may have induced farmers to apply more fertilizer, spend on seeds
  - Affect overall cost effectiveness of the program

Mechanisms

- Use spatial configuration to test specific mechanisms:
  - Irrigation associations complement infrastructure?
  - Without strong governance, being farther away from irrigation canal start, more water diversion, lower gains?
- Other spatial features as time-invariant factors for heterogeneity in treatment effects
  - Slope / elevation
  - Soil type / suitability
  - Ethnolinguistic boundaries

Mechanisms: Climate Resilience?

- Longer, more complete time series from remotely sensed data allows to assess heterogeneous impacts from weather variations
- Works best for wide geographic scope samples, with within-year geographic variation in exposure

Mechanisms: Market Access

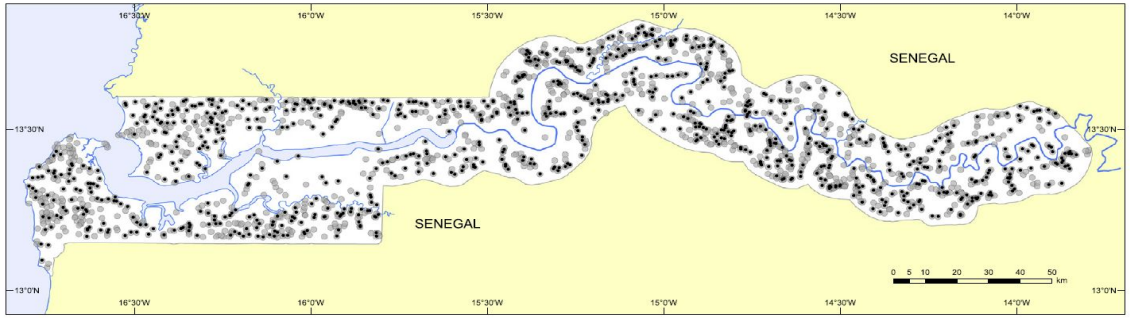
- Many interventions reshape rural communities' access to major markets for both production and consumption
- Some of these changes can impact other units (upstream or downstream)
- Can simulate changes in market access due to the program:
  - Identify markets at baseline (i.e., using GHS-GDC as contiguous areas >1,500 inhabitants/km2 and min 50,000 inhabitants)
  - Obtain GIS file of road network, use it to calculate shortest routing and distance to market for sample unit
  - Prior to treatment, constrain routings, then relax as each treatment kicks in
- Use the resulting distance measure as RHS treatment measure

Spillovers

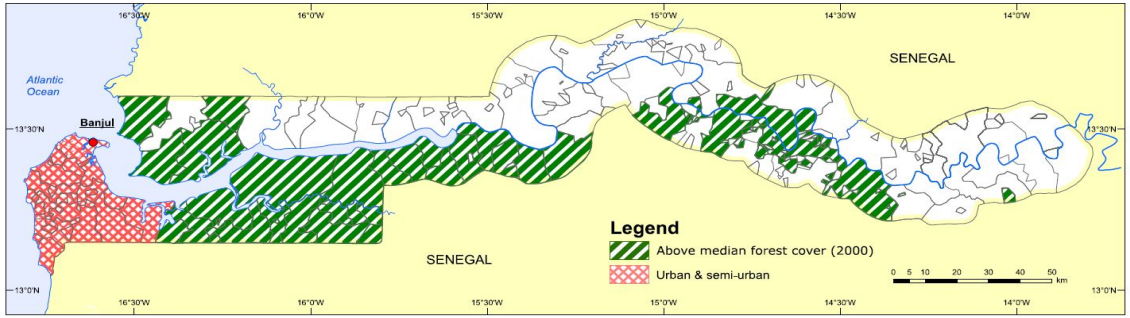
- These encapsulate
  - “Indirect treatment”, where the treatment itself reaches other units
  - “Network” or “Peer” effects, based on specific social interactions that lead to related changes in outcomes
- Specify structure, then test for presence
  - Effects of irrigation on downstream water users: Include additional summary measure of upstream treatments on RHS (i.e., count of upstream perimeters treated, possibly weighted by distance or within bands)

Spillovers

- Alternatively, aggregate to broader units to capture spillovers
  - Admin units (if T is sufficiently dense)
  - Buffers
  - Grid cells
  - Thiessen polygons
  - Voronoi polygons



(a) 1 km buffers



(b) Baseline forest cover in The Gambia (2000)

Fig. 1. Aggregation levels of forest cover and forest change used in the empirical analysis.
Notes: In Figure (a), dots represent settlements that were eligible for the CDD program. Figure (b) is based on calculations from the GFCD. The green areas indicate wards with above-median baseline forest cover (2000) outside of the urban and semi-urban areas.

Heß, Simon, Dany Jaimovich, and Matthias Schündeln. "Environmental effects of development programs: Experimental evidence from West African dryland forests." Journal of Development Economics 153 (2021)

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Measurement Error

- Alix-Garcia and Millimet 2021: Measurement error in satellite-based forest loss (Hansen et al 2013 GFC)
- Compare alternative data sources (based on Landsat 5 and 7 overlapping series) and show their disagreements…
  - Are correlated with key geographic features
  - Lead to attenuation bias
- Potential fixes
  - Non-rare events: Logit
  - Rare events: Scobit
- Code for both available