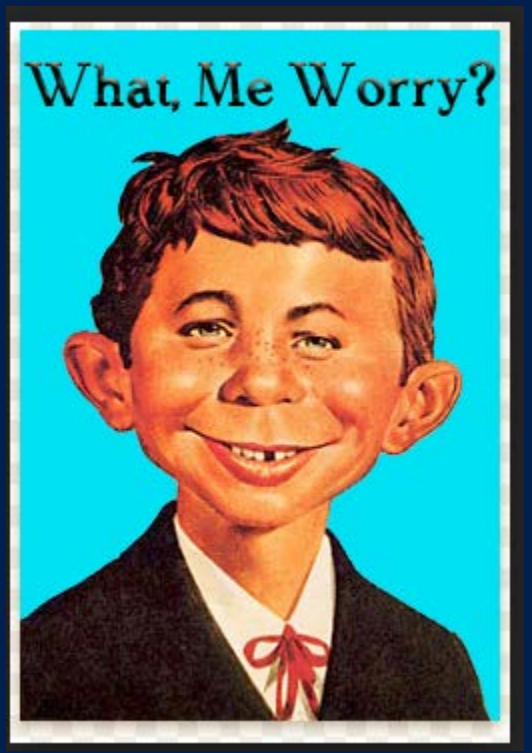
Critiques, Complications and other things to worry about



And then things got complicated…

1. Deaton critique
2. Choice of scale
3. Heterogeneity and Distributional effects
4. Spillovers
5. A Role for Theory

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Critique: Deaton (2009)

- Instruments: exogenous versus external
  - E.g. rail stations and poverty (river; earthquake)
  - Irrigation dams (land gradient)
  - Child class size; some people don't stay treated (heterogeneous response to instrument)
  - Intent to Treat vs Treatment. Really evaluating those communities/individuals who were induced to change. May not be representative of all communities

Critique: Deaton (2009)

- Important question is not ‘if it works’ but ‘why (or when and where) it works’
  - RCT:
    - *relies on mean; what if distributions between T and C differ?*
    - *Heterogeneity (one guy wins big, everyone else loses)*
    - *Scaling up? (general equilibrium effects)*
    - *Generalizability – is it meaningful?*
    - *Controlling for other things can be a problem with heterogeneity*
- Tests of theory versus test of programs (help with external validity)

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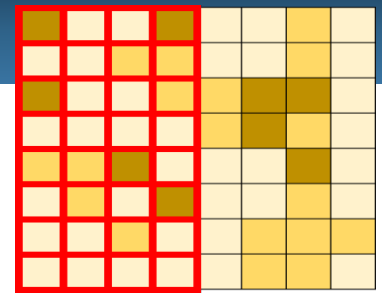
Multiple outcomes and scales

- Different ecological and economic outcomes from the same project
- May occur at different scales
- The appropriate unit of observation is not always obvious
- And the unit of observation will affect the ‘match’ of controls
  - Too large: bad matches, lose precision, imprecise measure of treatment
  - Too small: higher probability of spatial autocorrelation, can lead to errors in variables bias

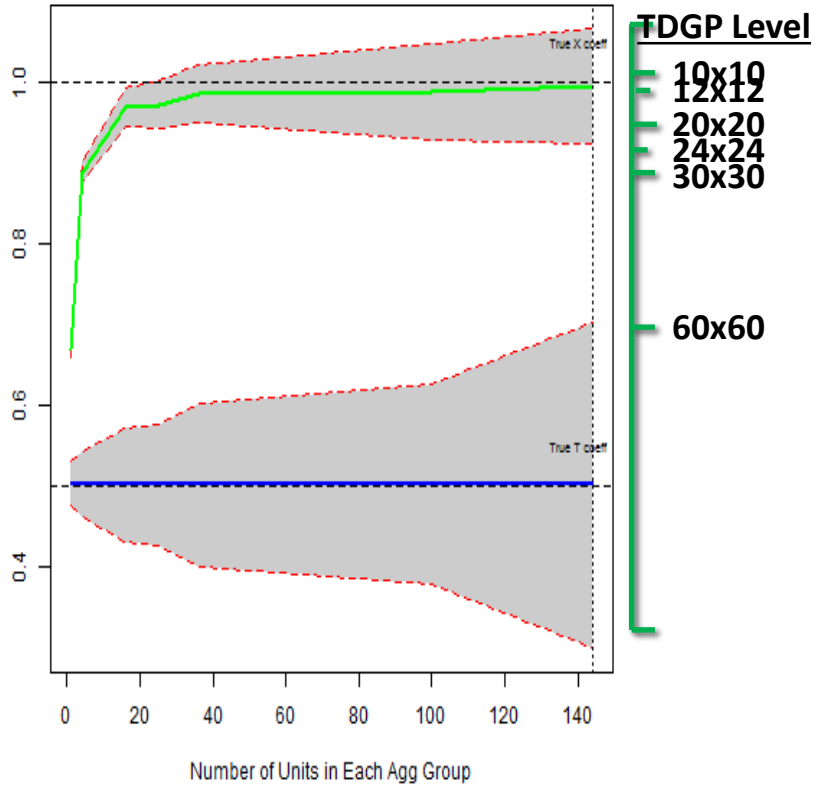


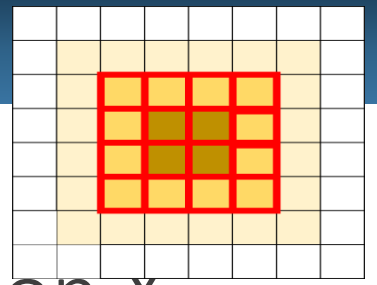
Smaller is not always better

- Y random, X random, T clustered

- Effects:
  - **Efficiency loss** (previous result)
  - Disaggregation induces error in variables → **bias**

- Mitigation:
  - Aggregation smooth away some of the noise reducing the bias



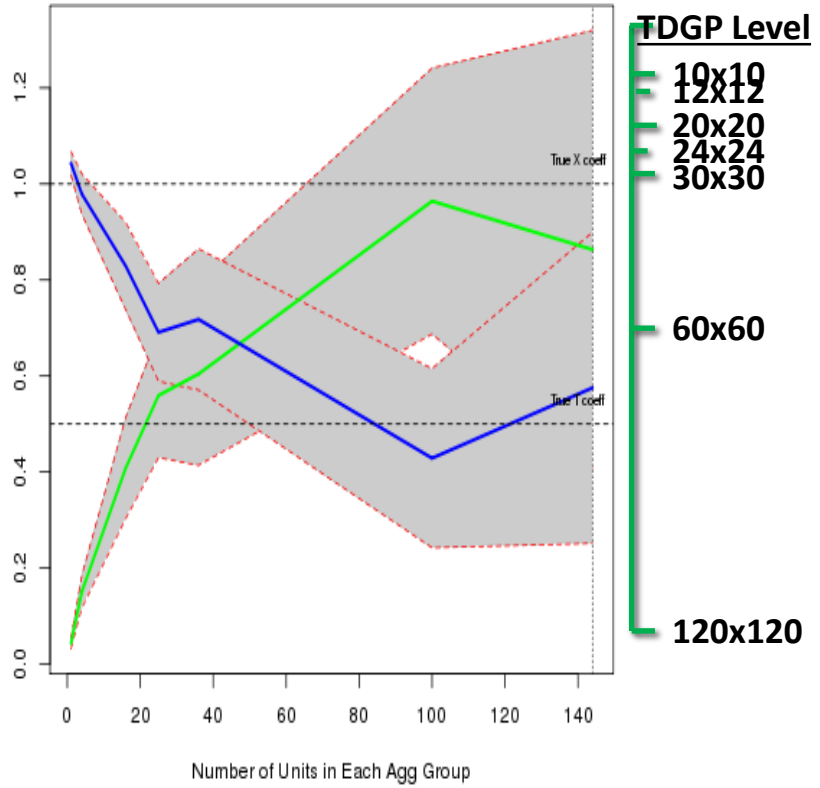


Things get worse when T depends on X

- Y random, X spatially autocorrelated, T dependent on X

- Effects:
  - **Efficiency loss** + **bias** (previous result)
  - OLS compensates loss in explanatory power: more "precise" variables tend to be overestimated and less precise underestimated → **bias**

Depends on the degree of correlation and precision gap



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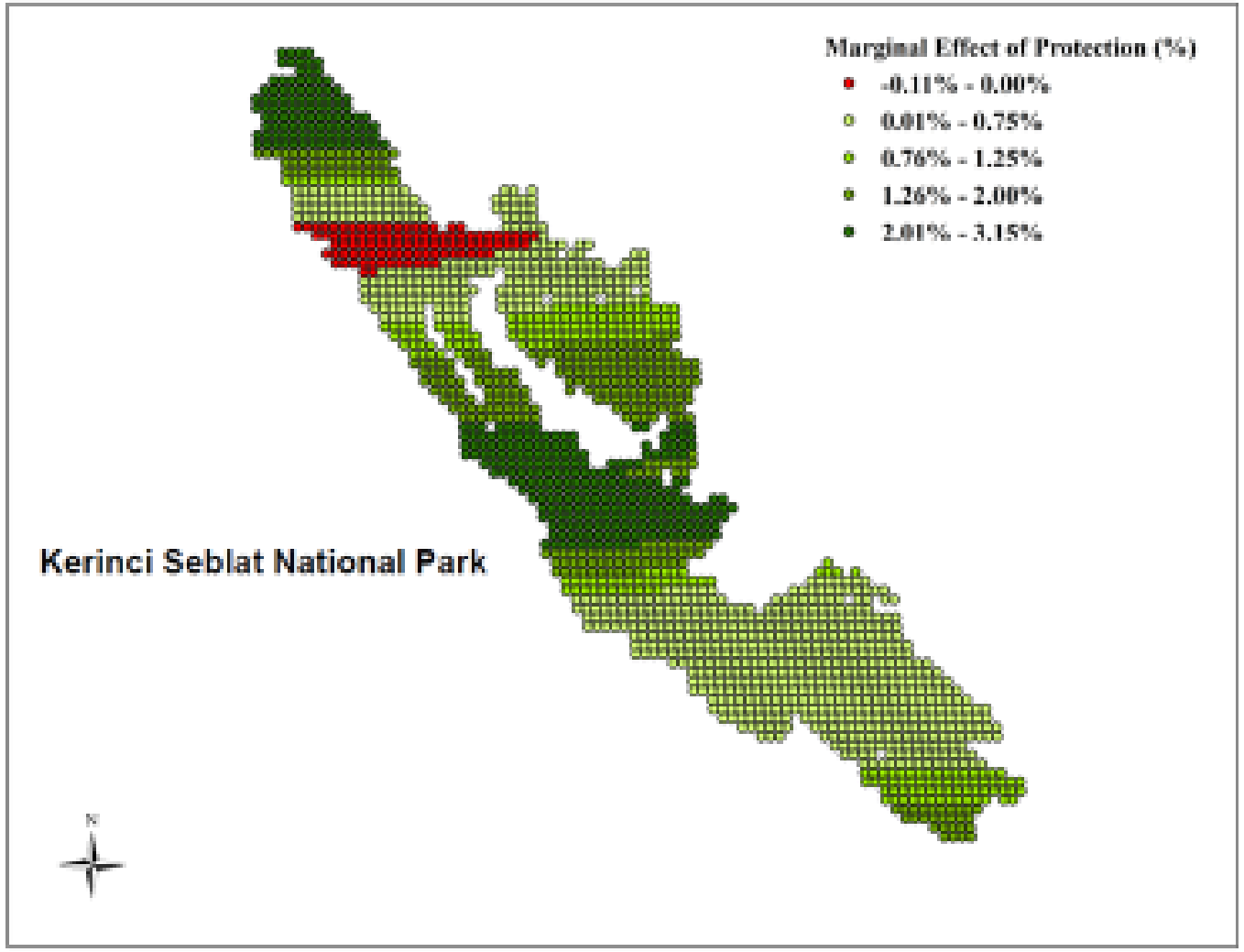
Heterogeneity

- Ideally build into experimental design
- Often people do ex-post heterogeneity analysis (parametric)
  - E.g. interact treatment (new seed variety) with soil type, or rainfall
- (semi-parametric) Locally-weighted regressions
  - Allow parameters to vary over space

Within Park Variation



Distributional Effects

- MTE
- Quantile (conditional, unconditional, IV)
  - May be very important if treatment is intended to specifically help some households. May not expect to see an overall effect
  - E.g. nutrition programs designed to reduce stunting
  - E.g.2 agricultural technologies only designed to help reduce yield loss from extreme heat

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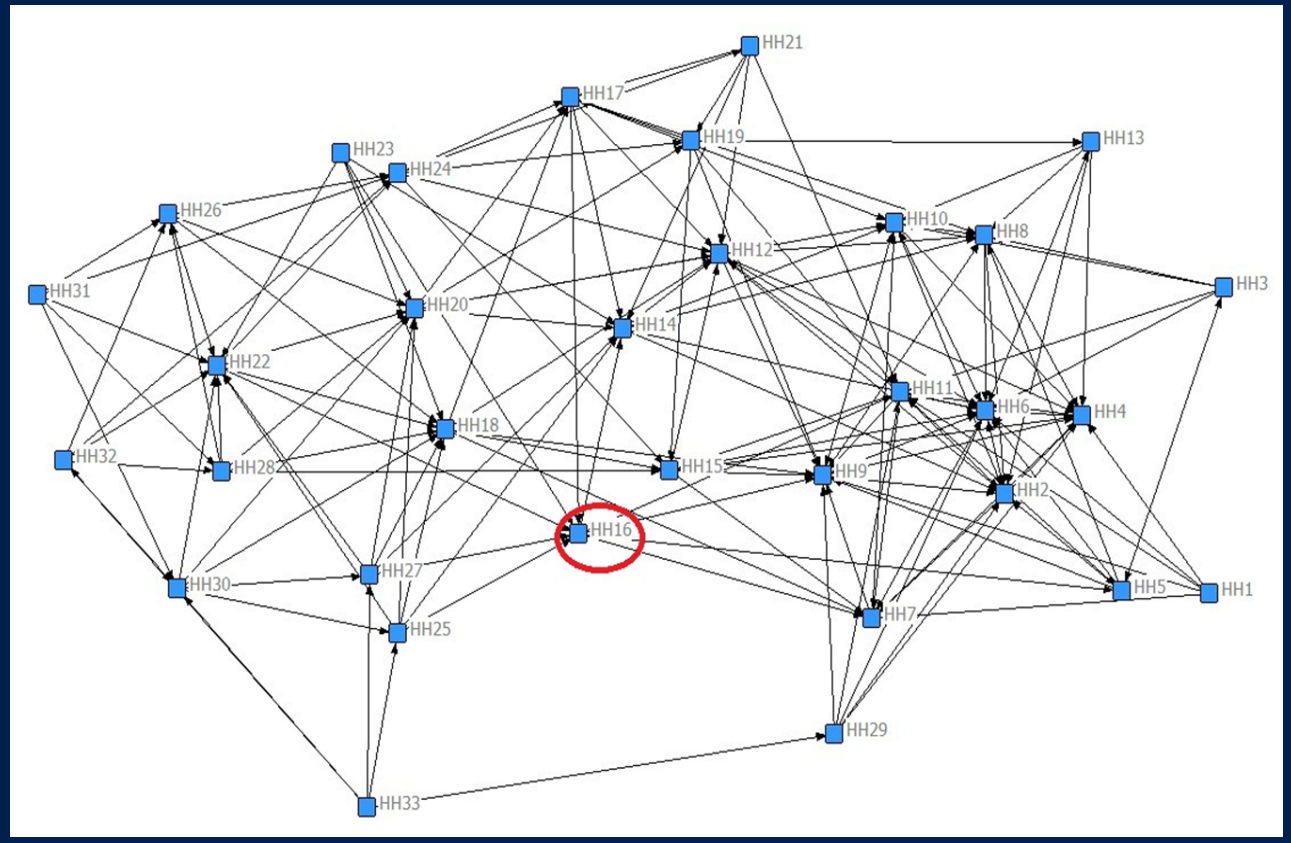
Spillovers (when SUTVA falls apart…)

- Social Networks
- Peer Effects
- Threshold Effects
- Spatial Spillovers

- *Bias estimated treatment effects*
- *Often important in and of themselves*
- *Ideally integrate into research design*

Social Network Effects

- Where a program is placed within a social network matters
- Banerjee et al (2011) – microfinance in India
- Songersemsawas et al (2015) – contract choice



Peer Effects

- Reflection Problem
- Can solve through using characteristics of friends of friends as instruments
- Do peer effects through social networks affect cash crop revenue?
  - Input use in new crops (Conley and Udry 2010)
  - Land allocation to new crops (Munshi 2004)
  - In market mechanisms (Fafchamps and Minton 1998, 1999, 2002; Michelson 2015)
  - In agricultural revenue (Songsermsawas et al 2015b)
- from friends?

Mechanism?

- Influence versus Information (Montgomery and Casterline)
- Oster and Thornton (2012)
  - *Wanting to do like friends?*
  - *Switching behavior because of friends' positive benefits?*
  - *Learning how to use a new technology*

Within village spillovers and threshold effects

Within Village Spillovers

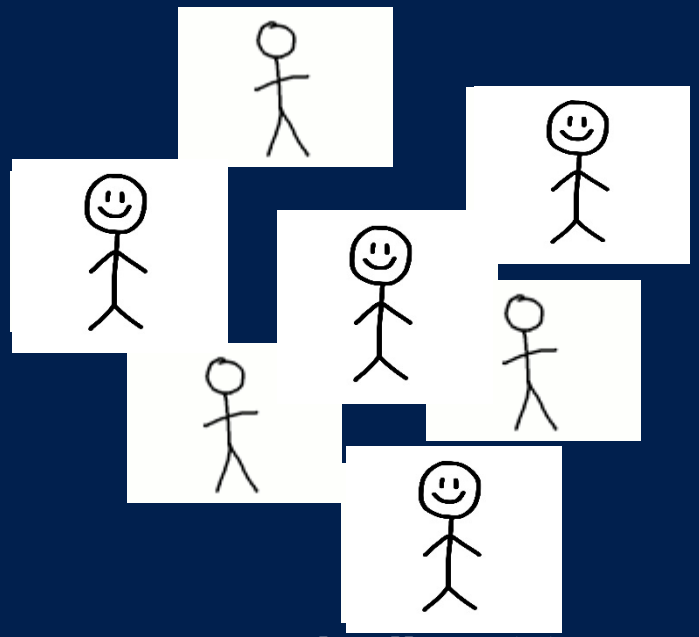
- Can identify through different intensity of treatment (Baird et al 2015)
- Can identify through modeling peer networks

Threshold Effects

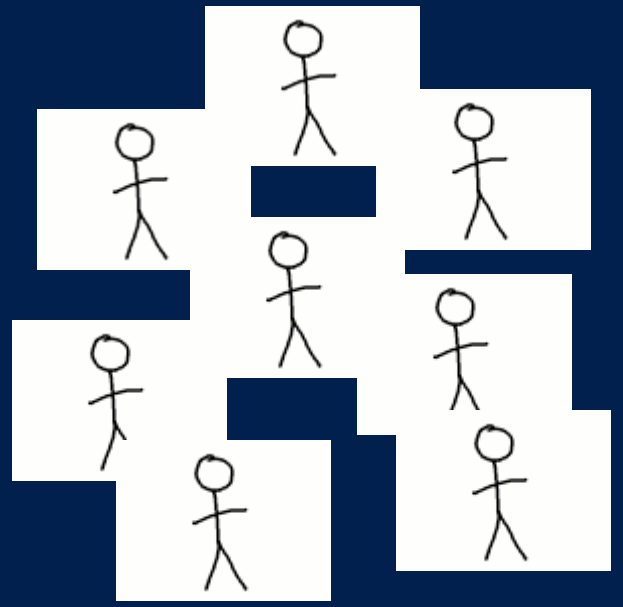
- Idea that an intervention needs to reach a certain saturation point to have an effect

example

- Only some people eligible



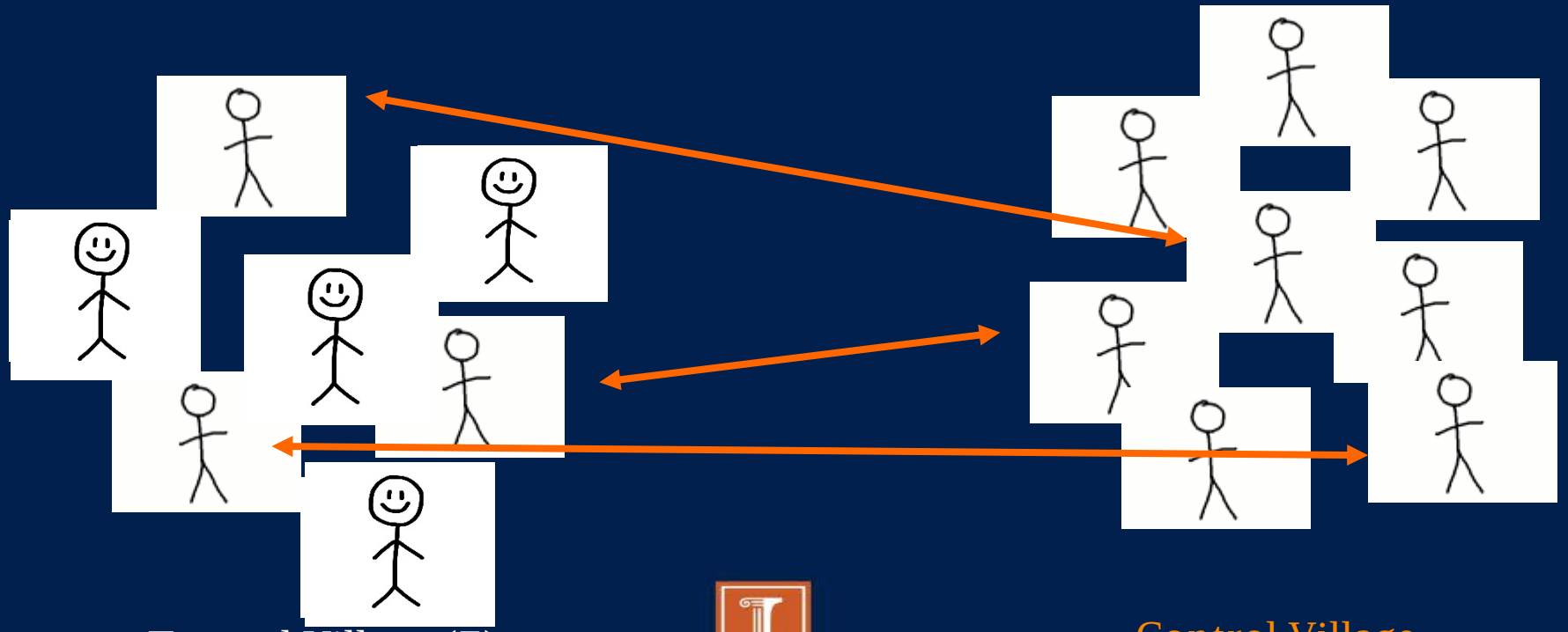
Treated Village (Z)



Control Village

example

- Only some people eligible



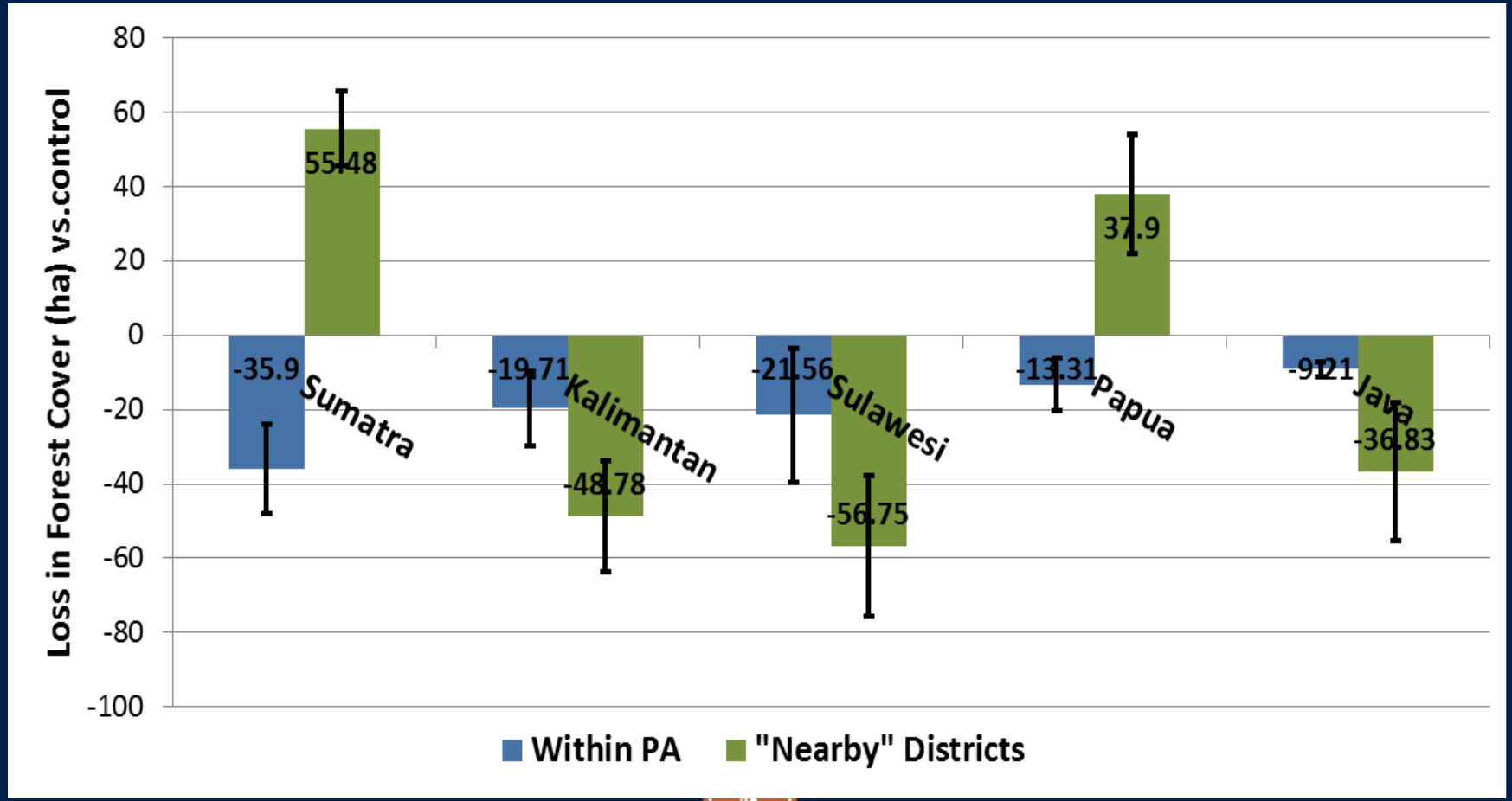
Treated Village (Z)

Control Village

Between Villages: Even if one randomizes....

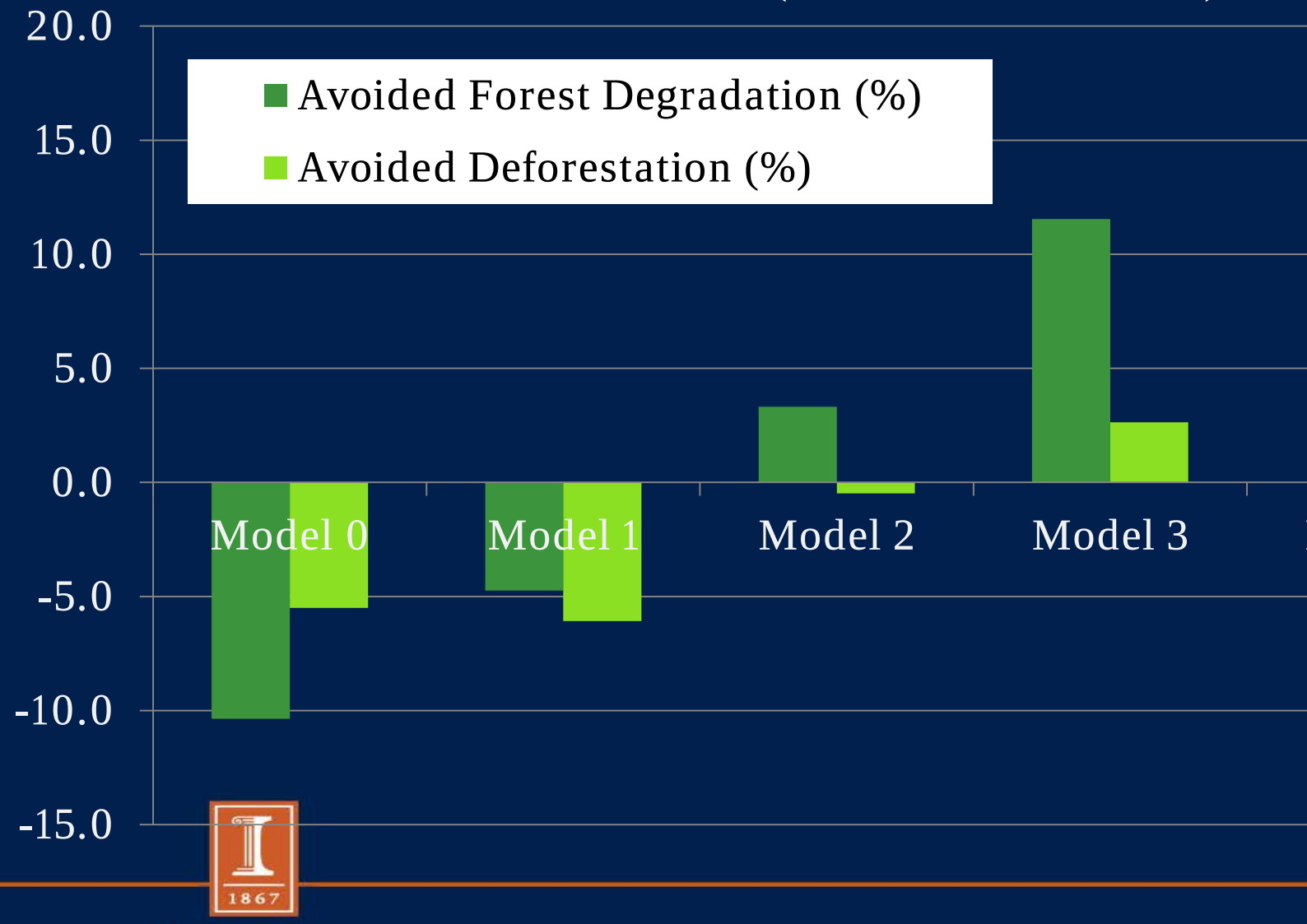
	Spatial Correlation Parameter					
	0.00	0.10	0.25	0.50	0.75	0.90
DD						
% Bias	-0.9	1.2	3.3	21.2	83.0	282.4
Rejection rate (95% Conf.)	93.4	94.5	92.1	86.0	68.1	50.2
DD with village fixed-effects						
% Bias	-0.9	1.2	3.3	21.2	83.0	282.4
Rejection rate (95% Conf.)	93.2	94.3	92.0	85.9	68.1	50.1
DD with individual fixed-effects						
% Bias	-0.9	1.2	3.3	21.2	83.0	282.4
Rejection rate (95% Conf.)	75.6	77.4	73.8	61.4	35.7	18.5
Spatial AR-DD						
% Bias	-0.9	0.7	-0.8	-0.2	0.3	0.2
Rejection rate (95% Conf.)	93.6	94.7	92.7	93.9	93.2	94.2

Spillovers: Forest Leakage from Protected Areas (PAs)



Avoided forest loss (1993 vs 2009):

- Model 0: DiD, FE
- Model 1: DiD with Matching
- Model 2: DiD with Spatial Matching
- Model 3: Removing neighbouring controls



Even without explicit spillovers…

- Error terms across neighbouring observations may be correlated
  - E.g. plot level data correlated by household
  - All households in a village being treated
  - Clustering standard errors

Spatially-correlated errors

	Spatial Correlation Parameter					
	0.00	0.10	0.25	0.50	0.75	0.90
DD						
% Bias	-0.1	-0.9	-0.6	-1.2	-0.6	4.4
Rejection rate (95% Conf.)	87.1	86.8	86.2	80.6	57.7	19.1
DD with village fixed-effects						
% Bias	-0.1	-0.9	-0.6	-1.2	-0.6	4.4
Rejection rate (95% Conf.)	87.0	86.5	86.0	80.6	57.7	19.1
DD with individual fixed-effects						
% Bias	-0.1	-0.9	-0.6	-1.2	-0.6	4.4
Rejection rate (95% Conf.)	64.6	65.3	62.6	54.1	25.4	4.9
Spatial Error-DD						
% Bias	-0.1	-0.9	-0.5	-1.1	-0.1	1.9
Rejection rate (95% Conf.)	87.7	86.6	87.1	83.0	78.6	76.2

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A role for theory

- And a role for multidisciplinary work;
- Integrating qualitative data
- Particularly important if ‘theory of change’ is not transparent
- Avoids ‘kitchen sink’ approach
  - E.g. measuring effects of social capital
  - E.g. estimating adoption