Randomized Evaluations II: Applications

Erick Gong (thanks to K. Ajayi)

UC Berkeley & CEGA

September 22

Agenda

- Administrative
- Randomized Evaluations: Applications for cost/benefit
- Problem Set 1: Using STATA and data from a R.E.

Clowns Without Borders

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Course

- Attendance at lectures
- Problem Sets (1st passed out today)
- Research Project (individual or work in groups)

Duflo, Kremer & Robinson (2008)

- Why don't farmers use fertilizer?

Low Returns or High cost => Not profitable
Preference for traditional Farming Methods
Lack of Information
High fixed costs (costs of learning, traveling to obtain inputs)
Risk Aversion (fertilizer increases risk)

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- Is Fertilizer Use profitable? (If not, then this might explain behavior)
- Answer seems obvious?
- Real world maybe different . . . .
- Can we compare farmers who are using fertilizer vs. those that aren't?

Farmer's experience / ability / education
Soil quality

- So on average, farmers who use fertilizer might be very different from farmers who don't use fertilizer (i.e. higher ability) [Selection problem / Omitted Variables]

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Evaluation Framework

- Y (Outcome)

Crop Yield
Rate of Return (profit)

- X (Observed Covariates)

Fertilizer
Hybrid Seed

- Z (Omitted Variables) Can't observe them!

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Soil Quality

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In Math

$$Yield/Profit = \beta(fertilizer) + \delta(farmer's\,ability) + other\,stuff$$

$$Y = \beta X + \delta Z + \varepsilon$$

Now let's take it to the data, meaning we can observe X (fertilizer) and Y (profit)

$$\mathbb{E}[Y|X] = \beta\mathbb{E}[X|X] + \delta\mathbb{E}[Z|X] + \mathbb{E}[\varepsilon|X]$$

$$\mathbb{E}[Y|X] = \beta X + \delta\mathbb{E}[Z|X] + 0$$

For farmer's who use fertilizer $X = 1$

$$\mathbb{E}[Y|X = 1] = \beta + \underbrace{\delta\mathbb{E}[Z|X = 1]}_{Omitted\,Variable\,Bias}$$

What is $\mathbb{E}[Z|X = 1]$? It's the average ability given that the farmer is using fertilizer. It might be positive. This will lead to a bias on the result.

Solution: Randomized Experiment

- Duflo, Kremer & Robinson (2008)
- Randomly Select Farmers
- Measure 3 adjacent equal-sized plots on each farm
- Randomly assign farming package for each plot
  Top dressing fertilizer (T1)
  Fertilizer and hybrid seed (T2)
  Traditional seed (C)
- Calculate yield and profit for each plot

Yield vs. Profit

Yield

$$\frac{Crop\ Output}{Land}$$

Rate of Return (profit)

$$\frac{Value\ Treated\ Land - Value\ Control\ Land - Input\ Cost}{Input\ Cost}$$

You can have large increases in yield but little change in profit.

Results

TABLE 1—RETURNS TO FERTILIZER

	Mean (1)	Median (2)	Std. error (3)	Obs. (4)
Panel A. ¼ Teaspoon Top Dressing Fertilizer				
Percentage increase in yield	28.1	8.9	6.8	112
Rate of return over the season	4.8	−27.7	38.8	112
Annualized rate of return (at the mean and median)	8.4	−42.6		112
Panel B. ½ Teaspoon Top Dressing Fertilizer				
Percentage increase in yield	47.6	24.3	6.1	200
Rate of return over the season	36.0	23.9	16.9	202
Annualized rate of return (at the mean and median)	69.5	44.4		202
Panel C. 1 Teaspoon Top Dressing Fertilizer				
Percentage increase in yield	63.1	30.6	8.2	273
Rate of return over the season	−10.8	−16.9	8.4	274
Annualized rate of return (at the mean and median)	−17.8	−27.3		274
Panel D. Full Package Recommended by Ministry of Agriculture				
Percentage increase in yield	90.6	48.7	15.4	82
Rate of return over the season	−38.9	−49.4	10.4	85
Annualized rate of return (at the mean and median)	−48.2	−59.7		85

Notes: See text for description of rate-of-return calculation. The rates of return are annualized at the mean and median raw return. The official package recommended by the Ministry of Agriculture includes planting fertilizer, fertilizer at top dressing, and hybrid seeds.

Yield Increases!

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But not profit . .

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Take Away Thoughts

- More comprehensive package increased yield BUT Lower cost package had highest rate of return
- Lab results don't always apply in the field
- Randomization produces two results:
  1) Effect of fertilizer on yield (does it work?)
  2) Why don't people use more of it (is it profitable?)
- Duflo, Kremer & Robinson (2008): Might be other reasons for low adoption (behavioral economics)

Problem Set Goals

- Proficient in STATA
- How to Interpret Results
- Do not panic!
- Optional Questions are geared for graduate students / advanced undergraduates
- Standard method of analyzing R.E. (write your own paper!)

Poverty Action Lab

Typical Profile of a Research Assistant
Research Assistants typically have a Bachelor's Degree in
economics, social sciences, or other related fields. Excellent
organizational, communication, and writing skills are required along
with strong quantitative skills.
Knowledge of STATA or other data analysis software is preferred.
These positions are ideal for those seeking hands on research
and/or development experience and for those planning to go on to
graduate studies.

STATA

- Do File [Write your code]
- Log File [Results]

Thornton (2008, AER)

"The Demand for and Impact of Learning HIV Status"

- Why don't more people get HIV tests?
- Field Experiment in Rural Malawi Offered Cash incentives to learn results of HIV tests and varied distance required to get test results.

Treatment/Control

- What is treatment in this case?
- What is control?

Treatment/Control

- What is treatment in this case? [Cash Incentives & Close Distance to Get Test Result <1.5 km]
- What is control? [No Cash. Far Distance (>1.5 km)]

Getting Started

- Download the data from AER website (already in STATA format)
- Advice: Use example do file and replace variables

Command Line

- des
- tab (male)
- [command] "variable"

Do File (Preliminaries)

/* Set Memory */

clear all

set mem 100m

set more off

version 10 cap

log close

Do File: Working Directory

/* Change Directory to Working Directory */
cd "C:\Documents and Settings\ERICK\My Documents\Fall_2009\ps1"
log using problem_set1, text replace
/* Get Data */
use "C:\Documents and Settings\ERICK\My
Documents\Fall_2009\ps1\Thornton HIV Testing Data.dta", clear

Do File: Ignore this but keep in file

```
/* Relevant Observations */
gen MainSample = 1 if test2004==1 & age!=. & villnum!=. & tinc!=.
& distvct!=. & hiv2004!=-1 & followup_test!=1
label var MainSample "Sample in Study"
keep if MainSample==1
```

Part I: Summary Statistics

```
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* PART I: Summary Statistics *

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/* Quesiton 1 */

/* Summary Statistics */

*Describe the variables

des mar educ2004

*Summary Statistics for variables

sum mar educ2004
```

Compare Treat vs. Control

/* Question 2 */
*Compare Treatment and Control Groups
sum male eversex if under==0
sum male eversex if under==1

- Note: The Treatment variable here is "under". The treatment
  variable you should use is "any"
  under = testing site under 1.5 km
  any = received a cash incentive

Part II: Graphical Analysis

graph bar (mean)anycond , over(under)

- anycond = purchased a condom
- under = treatment variable

Part III: Regression

/* Question 6 */
*Effect of Any Cash Incentive
reg anycond under, robust
reg anycond under age male mar educ2004 hadsex12 eversex usecondom04 tb land2004, robust

- What is thre treatment variable here?
- Advice: For Q7 replace "any" with "Ti"

Interpret Results (Q8)

- What is the estimate of β?
- What is statistical signifigance (look at p-values)?
- Interpret Results

Last Thoughts

- Don't panic
- Don't drop because of problem set
- Use my example file
- Spend 30-45 minutes on it before next week

Send in the Clowns

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