

Summing Up

Randomized Controlled Trials as an Identification Strategy, and Labour Supply

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Lecture 5

Labor Economics I

ECON 87100

Three objectives for today's class

1. Review some parts of the mid term test
 - ▶ particularly the advantages and challenges of Randomized Controlled Trials
2. Review the assignment
 - ▶ focusing on a recent case study
3. Establish term paper topics and presentation schedule

1. Review

Potential outcomes framework and the self-selection problem

1. some notation

- ▶ let i index individuals, with $i = 1 \dots N$
- ▶ let D index program participation
 - ▶ $D = 1$ means a program participant
 - ▶ $D = 0$ means a non participant
- ▶ let $Y_{i,j}$ indicate an outcome of interest for individual i
 - ▶ where $j = 1$ and $j = 0$ indicates receipt or not of the treatment

2. we wish to estimate the impact on the outcome for individual i when treated

- ▶ $\Delta = Y_{i,1} - Y_{i,0}$
- ▶ we cannot observe the same individual in two different states

1. Review

Potential outcomes framework and the self-selection problem

3. we focus on the average over a number of individuals

- ▶ $E(\Delta) = E(Y_{i,1} - Y_{i,0})$
- ▶ but in designing an experiment we actually estimate
 - ▶ $E(\Delta|D_i = 1) = E(Y_{i,1} - Y_{i,0}|D_i = 1)$
 - ▶ this is the impact of treatment on the treated
 - ▶ not all individuals in the treatment group need be “compliers”
- ▶ to estimate $E(Y_{i,1} - Y_{i,0}|D_i = 1)$ we need to estimate $E(Y_{i,0}|D_i = 1)$
 - ▶ but this can't be estimated from $E(Y_{i,0}|D_i = 0)$ without raising the threat of a selection bias

1. Review

Potential outcomes framework and the self-selection problem

the selection bias

$$\begin{aligned}\Delta^* &= E(Y_{i,1}|D = 1) - E(Y_{i,0}|D = 0) \\ &= E(Y_{i,1}|D = 1) + E(Y_{i,0}|D = 1) \\ &\quad - E(Y_{i,0}|D = 1) - E(Y_{i,0}|D = 0) \\ &= E(Y_{i,1}|D = 1) - E(Y_{i,0}|D = 1) \\ &\quad + E(Y_{i,0}|D = 1) - E(Y_{i,0}|D = 0)\end{aligned}$$

the true effect plus another term reflecting a difference in the expected outcome in the absence of treatment between participants and non participants

1. Review

The advantages and challenges of randomized controlled trials

“In a carefully designed and well-documented experiment, there is usually a pervasive case that the experimental data can produce an internally valid estimate of average treatment effect.”

Burtless G (1995). “The Case for Randomized Field Trials in, Economic Policy Research.” *Journal of Economic Perspectives*,, 9(2)., page 68

1. internal validity

- ▶ unbiased measurement of the treatment effect in the sample actually used in the experiment

2. external validity

- ▶ estimation of a treatment effect that can be extrapolated to the population represented by the sample used in the experiment

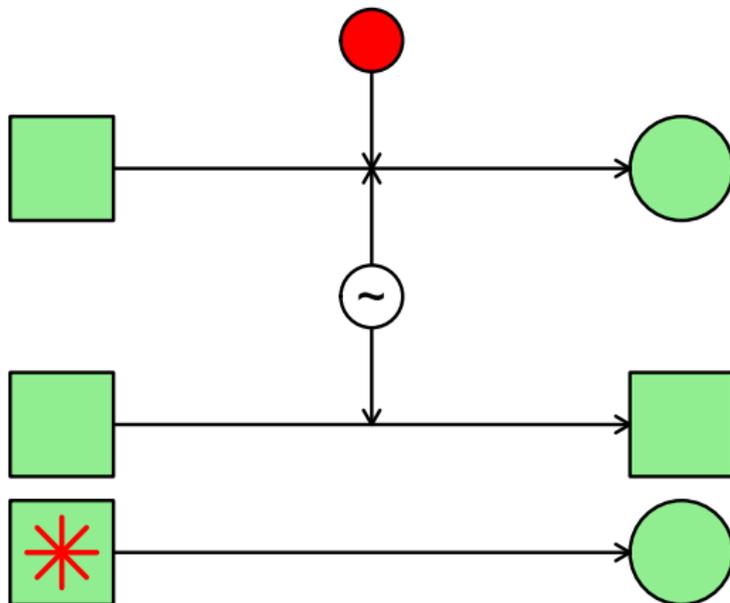
1. Review

The advantages of randomized controlled trials

1. Randomized controlled trials address the bias that potentially results from the selection problem
 - ▶ selection arises from the fact that there is missing information on factors that influence both the participation in the program and the outcome
 - ▶ by randomly denying treatment a properly run trial creates variation in exposure to the treatment that is independent of the decision to participate
 - ▶ observational studies rely on collecting more information, or using more sophisticated statistical methods to model the selection process

1. Review

The causal problem, and the "ideal" solution



1. Review

The advantages of randomized controlled trials

The advantages of randomized controlled trials are all conditional on internal validity

1. Randomized controlled trials address the bias that potentially results from the selection problem
2. They offer the possibility of measuring treatments not previously observed
 - ▶ policy changes that have never been entertained, or that have been too small to have a discernable impact
3. They are easy to communicate
 - ▶ to policy makers and the general public

1. Review

Remember the “Questions to discuss next class”

1. What are the disadvantages of randomized controlled trials?
2. What are the challenges of implementing a randomized controlled trial in the social sciences?
3. In what ways does the “Self-Sufficiency Project” reflect these advantages, and address the challenges?

1. Review

The challenges of randomized controlled trials

internal validity

1. Cost

- ▶ real resources
- ▶ time (and time lags in determining the results)
- ▶ potential political costs
 - ▶ new treatments

1. Review

The challenges of randomized controlled trials

internal validity

1. Cost
2. Ethical issues
 - ▶ the possibility of doing harm to human subjects
 - ▶ treatment (or the denial of treatment) may cause harm
 - ▶ perception of beneficial treatment may be hard to deny to some
 - ▶ use of fully informed consent and a justification for randomization in the context of budget constraints

1. Review

The challenges of randomized controlled trials

internal validity

1. Cost
 2. Ethical issues
 3. Limited Duration
- ▶ the behaviour of participants may be conditioned by the (known) limited duration of the program

1. Review

The challenges of randomized controlled trials

internal validity

1. Cost
2. Ethical issues
3. Limited Duration
4. "Hawthorne effects"

1. Review

The challenges of randomized controlled trials

internal validity

1. Cost
 2. Ethical issues
 3. Limited Duration
 4. "Hawthorne effects"
 5. Attrition and Interview Non-response
-
- ▶ differential attrition in treatment and control groups during the administration of the treatment or during follow-up (often through surveys)

1. Review

The challenges of randomized controlled trials

internal validity

1. Cost
 2. Ethical issues
 3. Limited Duration
 4. "Hawthorne effects"
 5. Attrition and Interview Non-response
 6. Substitution bias
- ▶ the members of the control group may seek substitutes for the treatment, leading potentially to an understatement of the treatment effect

1. Review

The challenges of randomized controlled trials

internal validity

1. Cost
2. Ethical issues
3. Limited Duration
4. “Hawthorne effects”
5. Attrition and Interview Non-response
6. Substitution bias

1. Review

The challenges of randomized controlled trials

internal validity

external validity

1. Randomization bias

- ▶ participants in small scale experiments may not be representative of those who would participate in an ongoing, full-scale, implementation of the program
- ▶ lack of information
- ▶ reluctance to be randomly assigned
- ▶ program administrators not following randomization by restricting access to those perceived to benefit the most

Heckman JJ and Smith JA (1995). "Assessing the Case for Social, Experiments." *Journal of Economic Perspectives*, 9(2), pp., 85-100.

1. Review

The challenges of randomized controlled trials

internal validity

external validity

1. Randomization bias
2. Program entry effects
 - ▶ the enrolled population does not represent the population affected by the treatment in an ongoing, national program
 - ▶ perceived benefits of an ongoing program may induce entry, or the opposite . . . an onerous program may reduce entry

1. Review

The challenges of randomized controlled trials

internal validity

external validity

1. Randomization bias
 2. Program entry effects
 3. Site specific effects
- ▶ samples or the treatment may be contaminated, and there may be site self-selection that question both internal and external validity

1. Review

The challenges of randomized controlled trials

internal validity

external validity

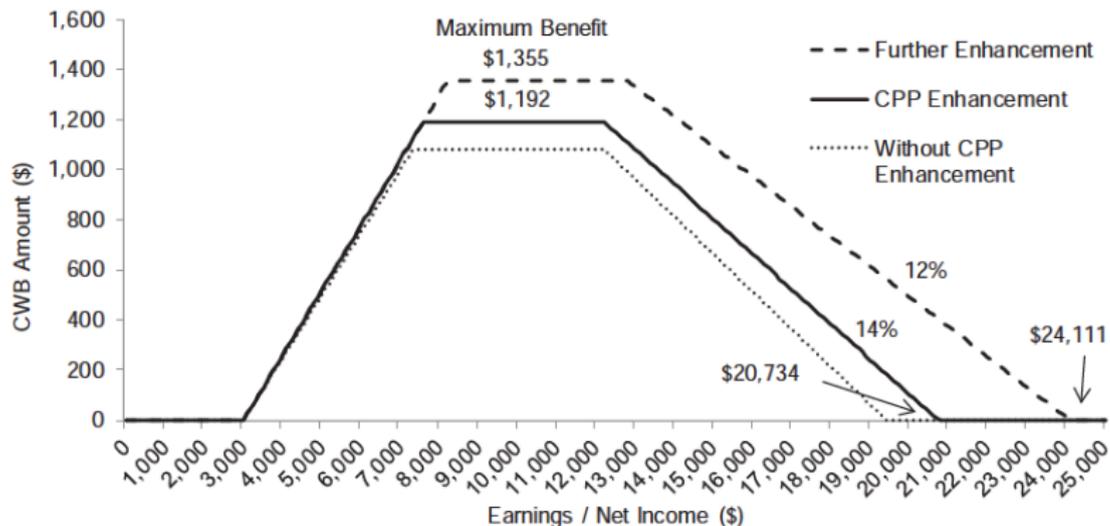
1. Randomization bias
 2. Program entry effects
 3. Site specific effects
 4. Partial equilibrium versus general equilibrium
- ▶ fraction of the population enrolled in the experiment is usually small so there are no general equilibrium effects
 - ▶ information, social interactions, and norms may evolve in a different way in a scaled up program in which participants can interact

2. Assignment Case Study

Recent reform of conditional cash transfers in Canada

Chart 1.2

CWB Enhancement for Unattached Workers, 2019



2. Assignment Case Study

Recent reform of conditional cash transfers in Canada

1. Eligibility rules for qualifying
 - ▶ what's different compared to the EITC in the United States?
 - ▶ which demographic groups can qualify?
 - ▶ income requirements to receive benefits?
2. Take up rates
 - ▶ what fraction of those eligible actually take up benefits?
3. Program parameters and labour supply
 - ▶ distribution of participants across the program phases
 - ▶ average wage rates and hours
 - ▶ compensated and uncompensated elasticities

2. Assignment Case Study

Developing a framework to assess labour supply incentives

Ashenfelter OC and Heckman J (1974). "Estimating labor-supply, functions." In Cain G and Watts H (eds.), *Income Maintenance and, Labor Supply*, pp. 265-78. Rand McNally, Chicago.

$$PX = W(T - L) + Y = WH + Y$$

$$PX + WL = WT + Y = F$$

- ▶ "Full" income is spent on WL dollars of leisure and PX on market goods
- ▶ the individual is given exogenous values of P , W , and Y and chooses optimal values of X and L to satisfy this budget constraint
- ▶ at the optimum

$$\frac{\delta U}{\delta L} = \lambda W, \quad \frac{\delta U}{\delta X} = \lambda P$$

- ▶ these two equations and the budget constraint can be solved for

$L = L(W, P, Y)$, a demand for leisure, since $T - L = H$
then $-dH = dL$ in $H = H(W, P, Y)$, the supply of labour

2. Assignment Case Study

Developing a framework to assess labour supply incentives

Consider a negative income tax scheme, and think about assessing its impact on labour supply.

The budget constraint becomes

$$PX = G + (1 - t)(WH + Y)$$

where G is a guaranteed level of income (the “basic” income) and t is the tax rate on income

2. Assignment Case Study

Developing a framework to assess labour supply incentives

- ▶ If $I \equiv WH + Y$ is money income before the program, and $G + I(1 - t)$ is money income after the program, then the individual receives an income transfer of $G + I(1 - t) - I = G - tI$.
- ▶ The new budget constraint holds for $I < G/t$, the original budget constraint otherwise. This is the “break even” level of income.
- ▶ The policy decision is to choose G and t , trading-off income support through transfers with labour supply disincentives. So the question becomes: how large is the impact on labour supply?

2. Assignment Case Study

Developing a framework to assess labour supply incentives

The change in the hours of work is:

$$\Delta H = H[W(1 - t), P, G + Y(1 - t)] - H(W, P, Y)$$

we are assuming that $\frac{\delta H}{\delta Y} < 0$, that leisure is a normal good. And we know from theory that

$$\frac{\delta H}{\delta W} = S + H\left(\frac{\delta H}{\delta Y}\right)$$

Totally differentiate the labour supply function and substitute the Slutsky equation gives us a way of thinking about the labour supply disincentives.

2. Assignment Case Study

Developing a framework to assess labour supply incentives

$$dH = S(dW) + \frac{\delta H}{\delta Y}[H(dw + dY)]$$

where $dP=0$, and if we treat S and $\frac{\delta H}{\delta Y}$ as constant over the range in which we are varying Y and W , then if $dW = -tW$, and $dY = G - tY$, the change in the hours of work is:

$$dH = -tWS + \frac{\delta H}{\delta Y}[G - t(WH + Y)]$$

The change in the hours of work induced by the program is the negative of the tax rate times the wage rate times the substitution effect added to the product of the income effect and the amount of the transfer.

- ▶ the first component must be negative
- ▶ the second part is also negative if leisure is a normal good

2. Assignment Case Study

Developing a framework to assess labour supply incentives

The challenge in our assignment is to use our knowledge of:

- ▶ labour supply at the extensive margin
- ▶ the standard Slutsky equation for an interior solution
- ▶ this framework

in a way appropriate for understanding the labour supply impacts of EITC-type programs, where income transfers are received only conditional upon employment.

What else do we need to know?

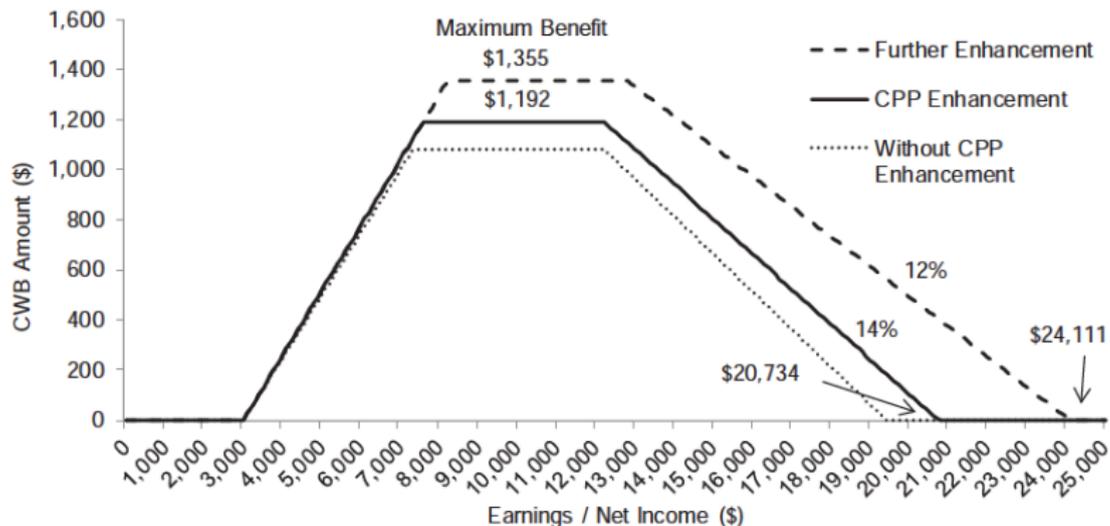
- ▶ what are the magnitudes of the appropriate elasticities?
- ▶ how are individuals distributed across the budget constraint?
- ▶ average wage rates and hours

2. Assignment Case Study

Recent reform of conditional cash transfers in Canada

Chart 1.2

CWB Enhancement for Unattached Workers, 2019



3. Presentations and term papers

The course outline is amended and the first draft of the paper is due on April 30th, to be handed to the professor in person in Room 6203.12. The final draft remains due as originally stated on May 10th.

1. Instrumental Variables and the Returns to Education

- ▶ Meeting with professor: March 26th
- ▶ Presentation: March 29th

2. Field experiments and Unemployment

- ▶ Meeting with professor: April 9th*
- ▶ Presentation: April 12th

3. Regression Discontinuity and Union Wage Effects

- ▶ Meeting with professor: April 16th
- ▶ Presentation: April 19th

4. Quasi-Experiments and Minimum Wages

- ▶ Meeting with professor: April 23rd
- ▶ Presentation: April 26th