An Introduction to Cost-Effectiveness Analysis

Anusuya Banerjee
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AN OVERVIEW OF CEA
IMPACTS ON TEST SCORES: RESULTS FROM RANDOMIZED TRIALS OF PRIMARY SCHOOL PROGRAMS IN THE DEVELOPING WORLD

Impact on Test Scores (in SD), with 90% Confidence Interval

- Unconditional cash transfers, Malawi 4
- Minimum conditional cash transfers, Malawi 4
- Girls merit scholarships, Kenya 8
- Village-based schools, Afghanistan 10
- Providing earnings information, Madagascar 16
- Reducing class size, Kenya 20
- Textbooks, Kenya 23
- Flipcharts, Kenya 24
- Reducing class size, India 21
- Building / Improving libraries, India 36
- School committee grants, Indonesia 25
- School committee grants, Gambia 37
- Textbooks for top quintile, Kenya 23
- Adding computers to classrooms, Colombia 27
- One Laptop Per Child (OLPC), Peru 26
- Diagnostic feedback, India 39
- Read-a-Thon, Philippines 38
- Individually-paced computer assisted learning, India 21
- Extra contract teacher + tracking, Kenya 19 & 20
- Remedial education, India 21
- Tracking by achievement, Kenya 19
- Contract teachers, Kenya 20
- Teacher incentives (year 1), Kenya 30
- Teacher incentives (long-run), Kenya 30
- Camera monitoring, India 28
- Teacher incentives (year 2), Kenya 30
- Training for school committees, Indonesia 25
- Grants & training for school cmts, Gambia 37
- Electing school cmts & linking to local govt, Indonesia 25
- Linking school cmts to local govt, Indonesia 25

Additional SD per $100 (Log Scale)

Source: This figure draws on the results from 18 randomized studies, referenced in the endnotes, which report test score outcomes. It also relies on detailed cost data provided by the authors of these studies and discussions with them about the most appropriate way to calculate cost-effectiveness. The underlying data and calculations are available at www.povertyactionlab.org/policy-lessons/education/student-learning.
How is CEA different from Cost-Benefit Analysis?

- **Outcomes**
  - CBA: Ratio of costs of program to *all* identified outcomes (benefits)
  - CEA: Ratio of costs of program to *one* defined outcome (benefit)

- **EXAMPLE:**
  - Ratio of cost of education program as a ratio to its impact on learning, physical and mental health, household bargaining power, future labour market outcomes, intergenerational well-being
  - Ratio of cost of education program as a ratio to its impact on learning
What does Cost-Effectiveness Analysis (CEA) tell us?

- Ratio of cost of a program to one outcome (or vice versa), it can tell us:
  - Impact on one outcome for a fixed amount of program spending
  - Program cost to create impact of a certain amount

EXAMPLE: ratio of the cost of an education program to its impact on learning (assume learning is measured by test scores)
  - Impact on test scores for Rs. 6000 program spending
  - Program spending necessary to increase test scores by 10%
When and why is CEA useful?

- Good option when there is one key specific outcome of interest, which is often the case in policy
  - CBA requires quantifying outcomes that are difficult to quantify (controversial)
- CEA can allows comparison of multiple programs by comparing impact in terms of one outcome across schemes
  - Helps with decisionmaking, particularly under a fixed budget (i.e., which will give the most impact for the least cost?)
CEA Requirements and Considerations

- Comparative CEA compares the cost-effectiveness of different programs and requires impact estimates (for the same outcome) and information on program costs
- Impact estimates
  - Consistent approaches to measuring impact?
  - Standardizing estimates?
- Program Costs
  - Costs to provider and beneficiary?
  - Sunk vs incremental costs?
Comparative Cost-effectiveness Analysis

AN EDUCATION EXAMPLE
Comparative CEA

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0.01 0.1 1 10 100

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Cost & Impact Assumptions

- Focus on incremental costs
  - Assumption that fixed costs would exist regardless of the new program
- Inclusion of provider and beneficiary costs
  - Interest in costs to society as a whole
- Creating “common units” adjusted for inflation, exchange rates, and year of implementation
  - USD standard exchange rates (2011)
  - Discount rate for costs incurred over multiple years (10%)
  - Inflation from year of study to year of analysis (average annual US inflation rate)
- Standardizing estimates
  - Make impact estimates comparable across contexts, test formats, etc. by expressing them in terms of standard deviations
Standard Deviation Refresher

How to make test scores across contexts, subjects, formats, etc. comparable?

• Put scores in terms of Standard Deviations (values reflect position in distribution in relation to the average rather than a test score in a particular context)

• Impact estimate shows change in learning outcome in relation to the average of the comparison group (e.g., 0.2 SD increase)
Access to Education

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Sources: Baird, McIntosh, and Ozler (2010); Kremer, Miguel, and Thornton (2009); Burde and Linden (2012); Nguyen (2008).
Pedagogical Innovations

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Extra contract teacher + tracking, Kenya
Remedial education, India
Individually-paced computer assisted learning, India
Tracking by achievement, Kenya

Additional SD per $100 (Log Scale)

Sources: Barrera-Osorio and Linden (2009); Cristia et al. (2012); Muralidharan and Sundararaman (2010); Abeberese, Kumler, and Linden (2012); Duflo, Dupas, and Kremer (2011); Duflo, Dupas and Kremer (2012); Banerjee et al. (2007).
Remember...

- A CEA/Comparative CEA is not enough information to make a policy decision, but it can be a good starting point.
- There are always multiple considerations that need to be made in terms of what costs to include, which outcome to choose, and how to standardize – no right way, but assumptions need to be transparent.
  - If assumptions, etc. are stated clearly a prospective analysis can be taken in a specific context to verify the cost-effectiveness of a program in that context.
QUESTIONS?