

Cost-Benefit / Cost-Effectiveness Analysis in the Context of Impact Evaluations

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Impact Evaluation and Efficiency Analysis

Topics

- **Adding a costing component to our impact evaluation**
- **Defining and measuring efficiency**
- **Cost-effectiveness, cost-benefit and Technical Efficiency**

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Why evaluate?

- **Are we doing the right thing?**
 - **Are the results we see due to our intervention?**
 - **What would have happened in the absence of our intervention?**
- **Are we doing it right?**
 - **Can we do things more effectively and efficiently?**
 - **What are the constraints to efficient production?**

Focus on outcomes and impact

- **What is effect of a *specific* program on *specific* outcomes?**
- **How much better off are beneficiaries because of the intervention?**
- **How would outcomes differ under alternative program designs?**
- **Does the program affect different people differently?**

Efficiency?

- **What are the costs associated with the program / alternative program designs?**
- **Is this “technology” the most efficient alternative we have to achieve the desired results?**

Why evaluate?

positive impact and cost-effective

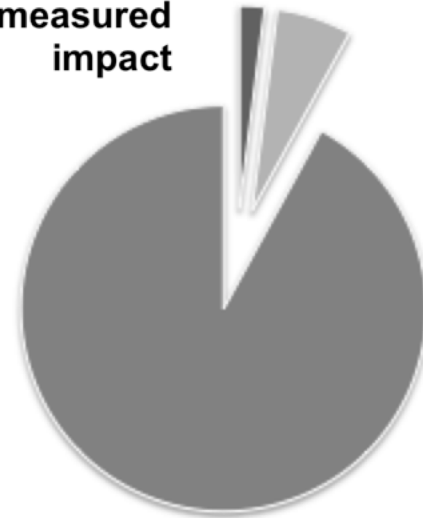


**From Betcherman's
youth labour review**

(14 of 289)

positive,
objectively-
measured
impact

positive impact



**From WDR review of
youth HIV evaluations**

(6 of 300+)

Basic ingredients

- **To start:**
 - ❑ **a clear goal,**
 - ❑ **a diagnosis of the problem, and**
 - ❑ **a solid theory of change.**
- **Then use whatever tools necessary to solve the fundamental evaluation problem:**

How can we know that differences in outcome are due to our intervention?

Measuring costs appropriately

- Adding a costing component to the evaluation does not represent a significant additional burden
 - Most of the information already exists
 - Additional information needed can be collected through the instruments used for the impact evaluation (community, facility, household)
- Adding a costing component allows to discuss efficiency issues, in addition to effectiveness issues

Impact Evaluation and Efficiency Analysis

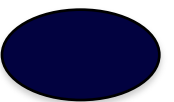
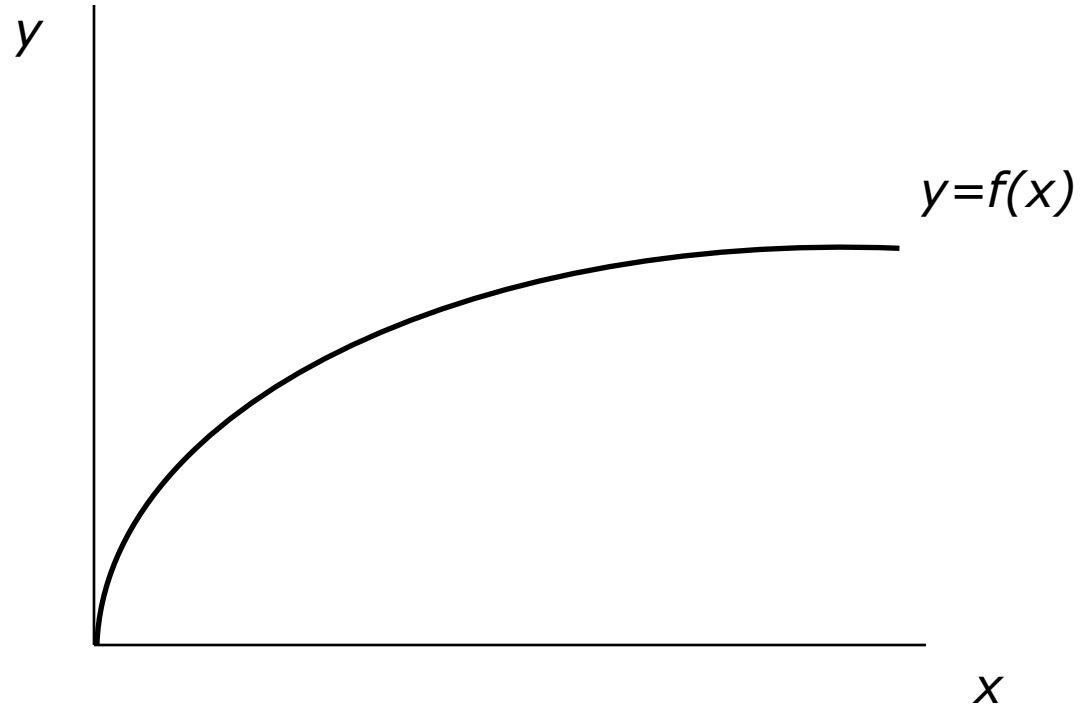
Topics

- Adding a cost component to our impact evaluation
- **Defining and measuring efficiency**
- Cost-effectiveness, cost-benefit and Technical Efficiency

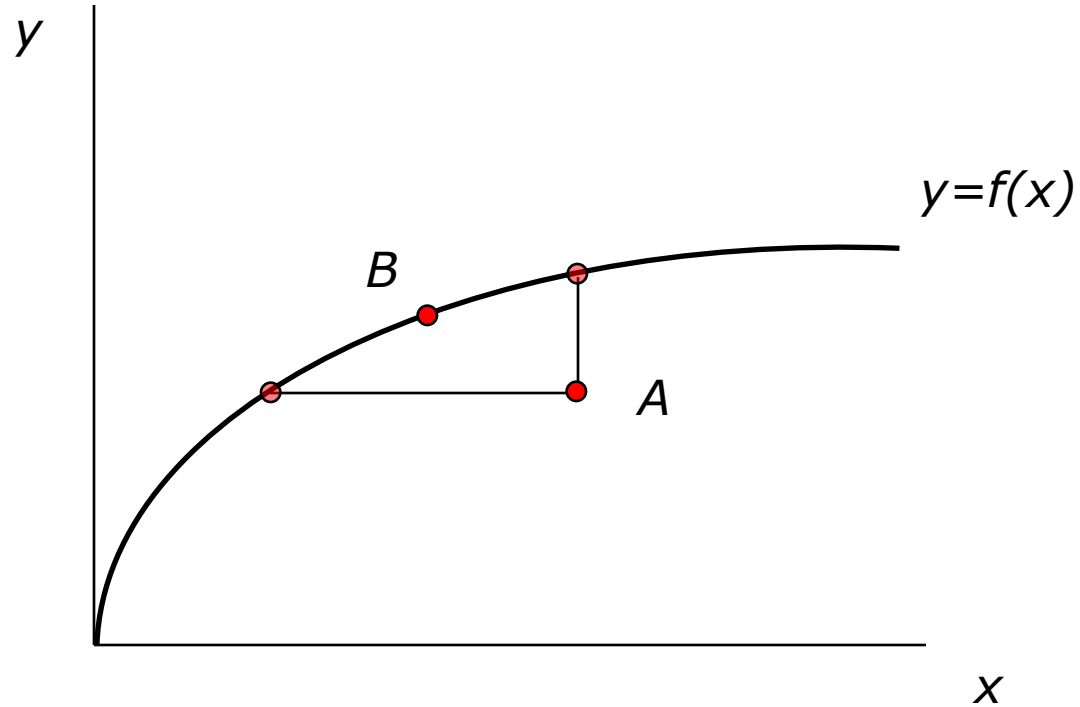
Production efficiency

- If an economy (public sector) is not efficient in producing a given service (outcome), it can produce more without reducing the production of other services
- It's about producing using available resources the best way possible
- In the context of public services, it means reaching more people

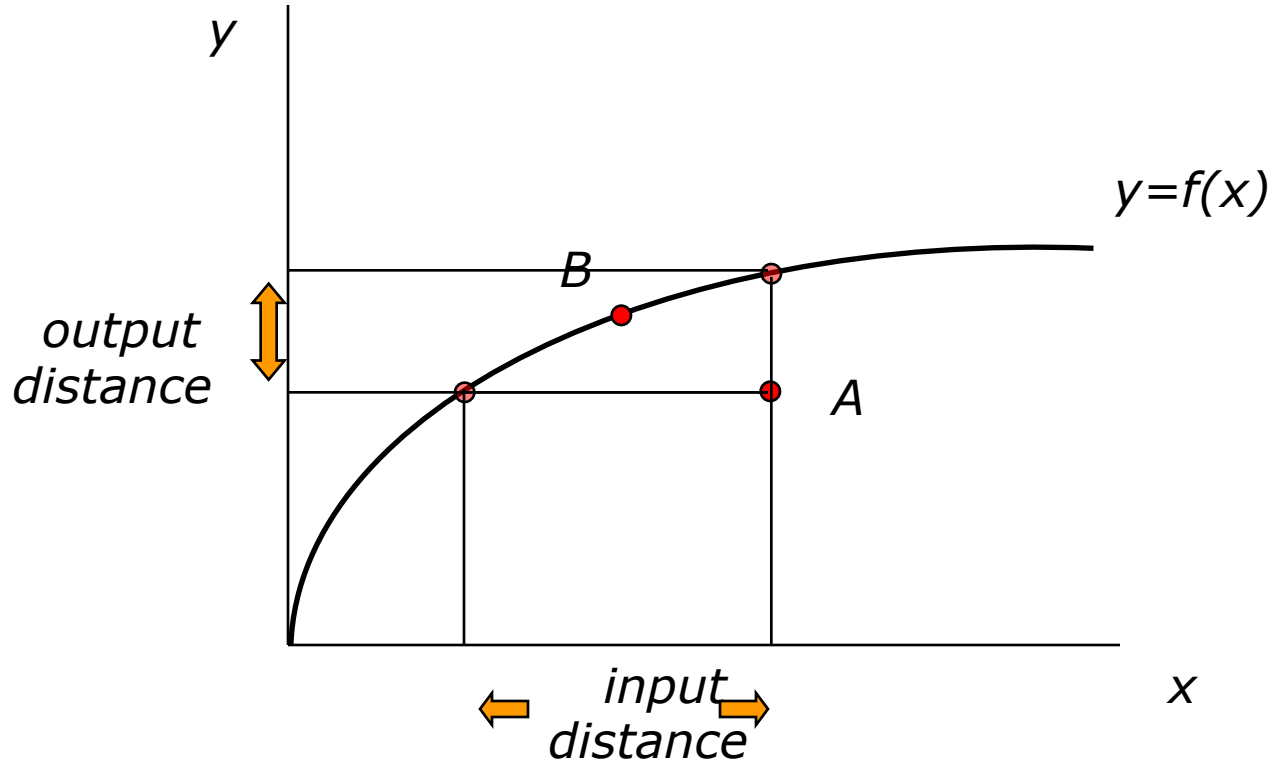
Production frontier



Technical efficiency



Distance from perfect efficiency



What do we need to do efficiency analysis? Measuring efficiency

- We have a few options:
 - CEA
 - CBA
 - Technical Efficiency Analysis (production/cost functions)
- All of them imply different approaches to deal with the question of efficiency
- All of them need basically the same type of information:
 - Production of outputs / outcomes
 - Costs

Why should we measure efficiency?

- Resources are limited:
- How do we know it is worthwhile to spend scarce tax resources on a particular strategy or program?
- How can we choose among alternatives?
- Is any intervention always better than none?
- Strong equity and ethical implications...

Impact Evaluation and Efficiency Analysis

Topics

- Adding a cost component to our impact evaluation
- Defining and measuring efficiency
- **Cost-effectiveness, cost-benefit and Technical Efficiency**

What is the difference between them?

- CBA: What is the social benefit achieved with intervention/program A?
- CEA: What is the cost per unit of output/impact that can be bought by intervention A?
 - ❑ Cost per youth trained
 - ❑ Cost per life saved
 - ❑ Cost per children without nutrition problems
 - ❑ Cost per DALY / QALY

How?

- CBA:
 - Measure impact
 - Value impact in monetary terms
 - Measure costs
 - Take difference
- CEA:
 - Measure incremental impact(s)
 - Measure incremental costs
 - Take CE ratio: costs/impact



Costs

- **Which costs should you measure?**
 - **Everything the program purchases**
 - **Any other resources the program uses, even things the program gets for free:**
 - **Volunteer labour**
 - **Donated equipment and supplies**
- **Why measure the cost of free stuff? Isn't it free?**

NO. FREE INPUTS ARE NOT FREE.

Costs

- **Why are free things not really free?**
- **Because they have an *opportunity cost*:**
 - **Each free thing can be used for a different purpose**
 - **Free things make resources available that would otherwise have been used to obtain them**
 - **free labour means lower wage payments;**
 - **free medicines means lower expenditure on medicines**

Costs

- **So how can you measure the cost of free things?**
 - ▣ **The *financial* or *accounting cost* method:**
Get estimates of similar inputs.
 - **What does input X cost, on average, in this place?**
 - **What does someone with these skills and experience usually earn?**

Costs

- **So how can you measure the cost of free things?**
 - **The *economic* or *shadow cost* method:**
Estimate a production function

$$Y = \alpha + X'\beta + Z'\gamma + \varepsilon$$

- **where Y = output, and β and γ are the returns to paid and unpaid inputs (X and Z), respectively, in terms of physical output.**
- **These estimates can be denominated in value terms.**

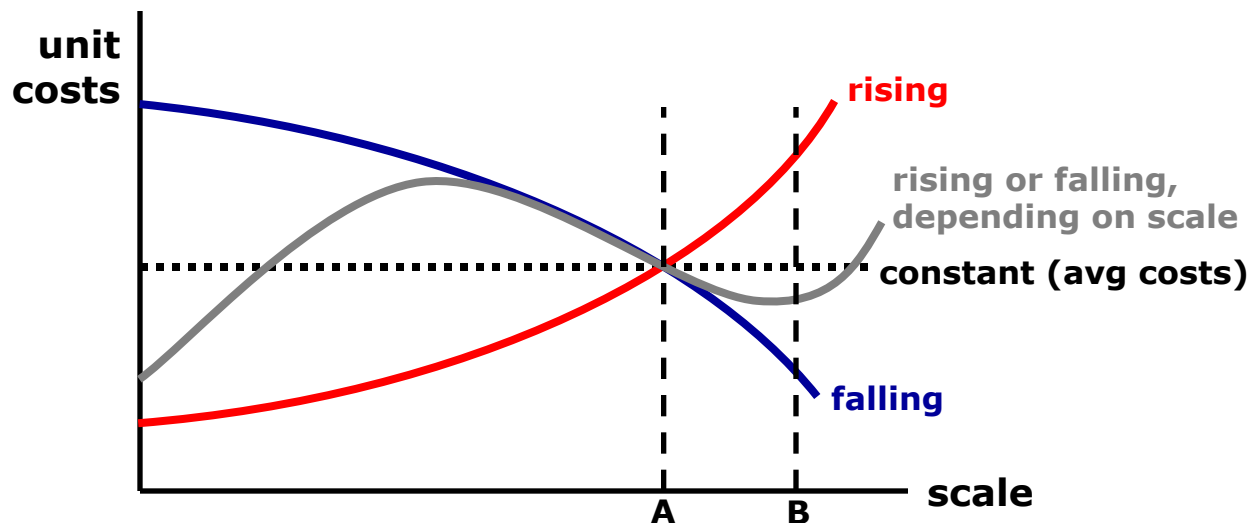
Costs

- **What difference does it make which method I use?**
 - **The accounting method gives estimates of the *average cost*.**
 - **The economic method gives estimates of the *marginal cost*.**
- **Marginal cost estimates are preferred for programming.**

Costs

- **Marginal costs vs Average costs:**

- What is the average cost of the input, or what does an average amount of expenditure (dollar, euro) buy?
- What will be the cost of the *next* unit of output, or how much of the output can I get for the *next* amount I spend?



- How much will it cost to scale up from A to B?

Discounting in principle

- **Why discount?**

- Acknowledge that resources have a cost (in real terms of borrowing and in terms of alternative investments)

- **Which discount rate should you use?**

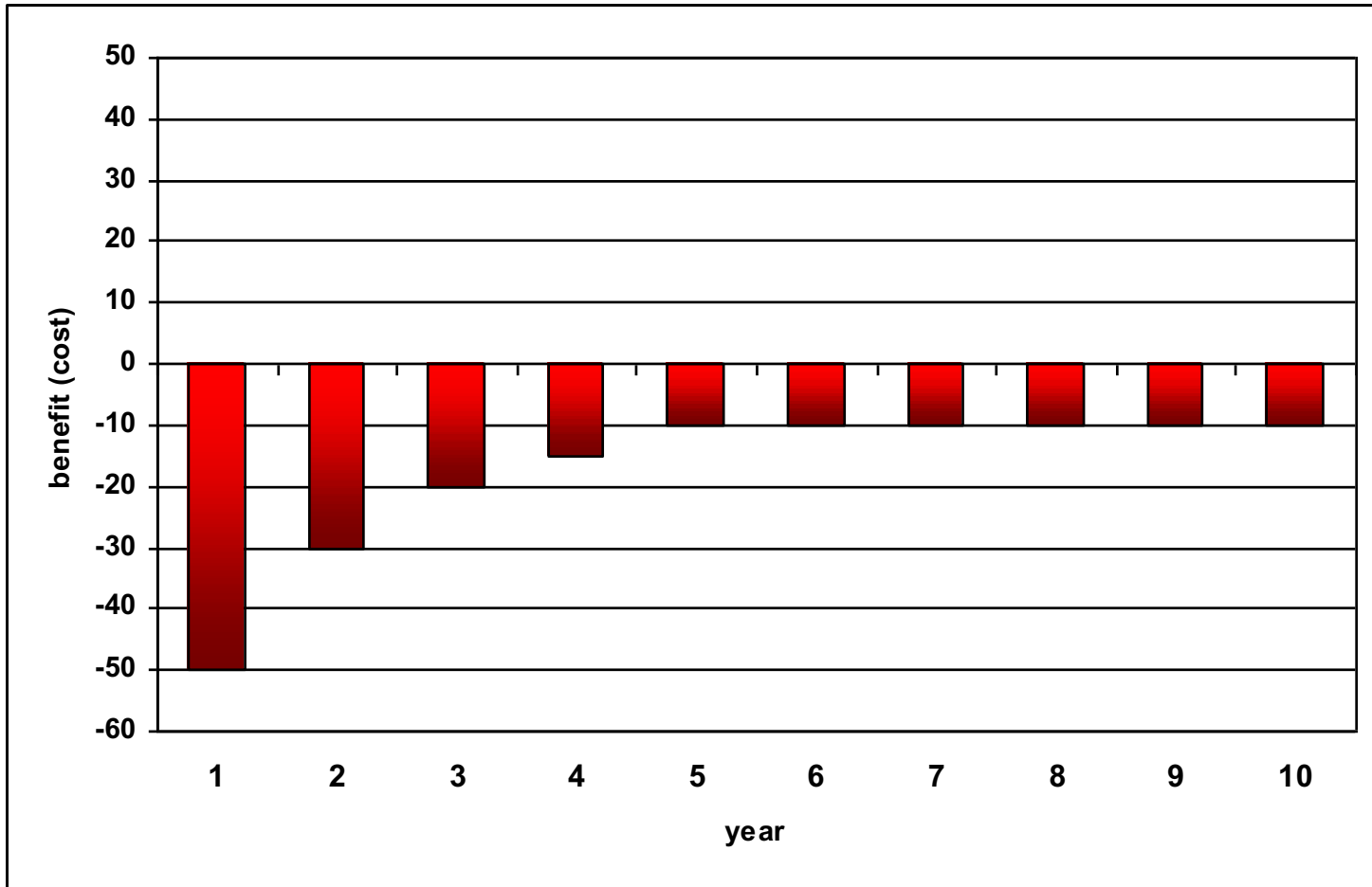
- Whichever accurately reflects the cost of capital. What would it cost if you had to borrow money to finance your project?

- **In general:**

- Higher discount rates give greater value to costs and benefits that occur more quickly.
- Projects that have delayed benefits relative to costs will have lower net returns.
- Consider both long-term and short-term costs and benefits.

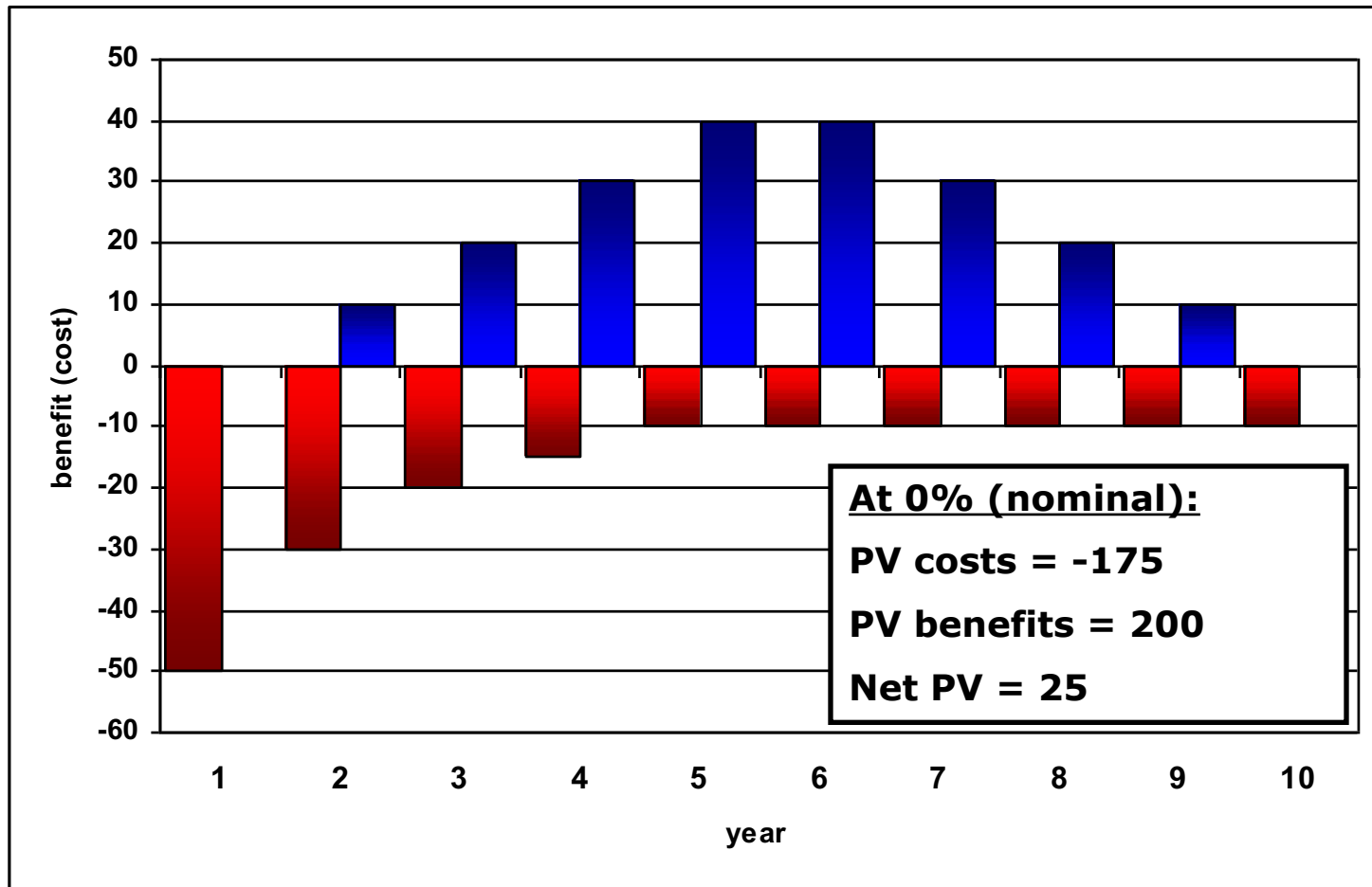
Discounting example

Project costs over time



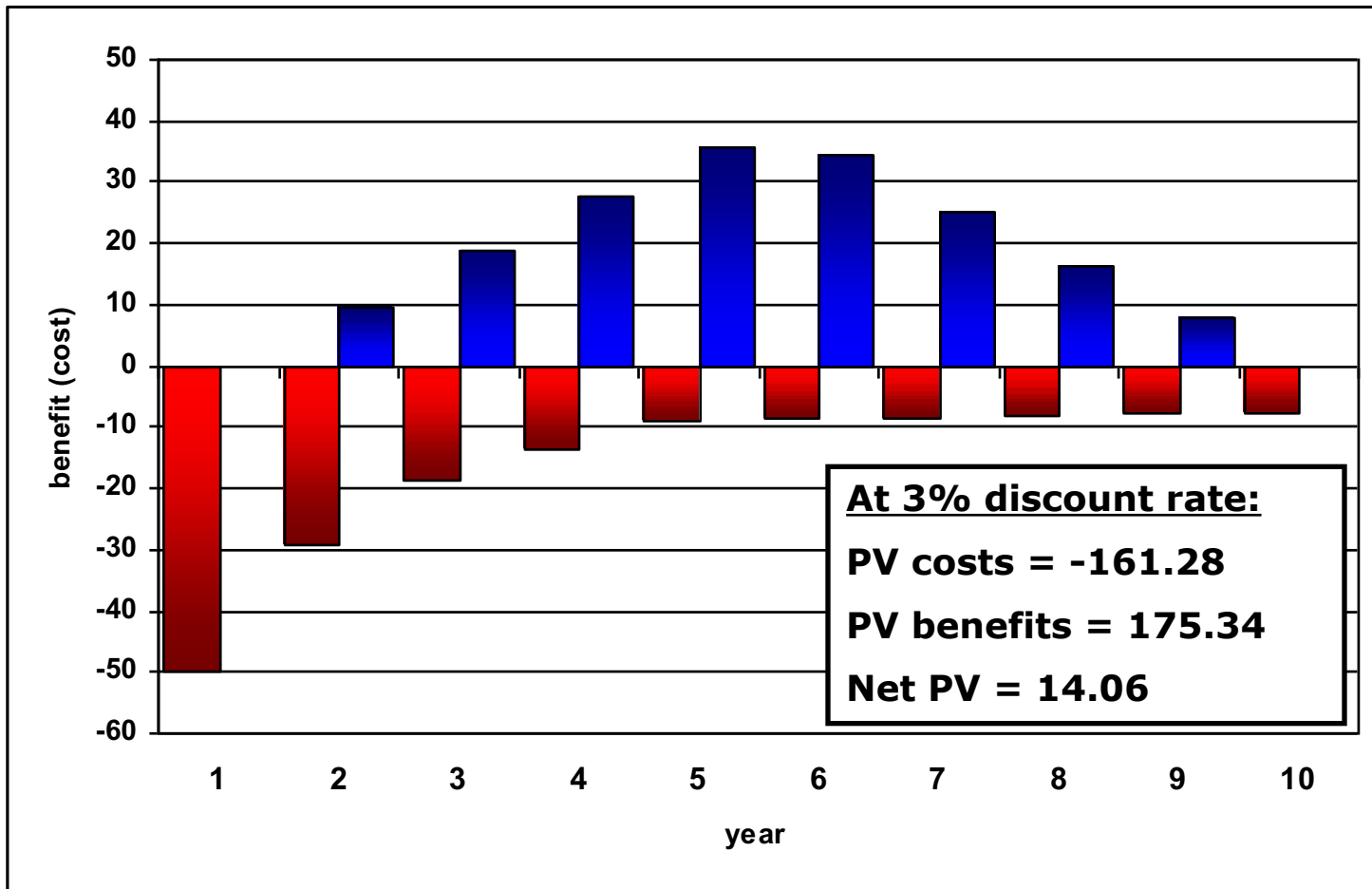
Discounting example

Project costs and benefits over time



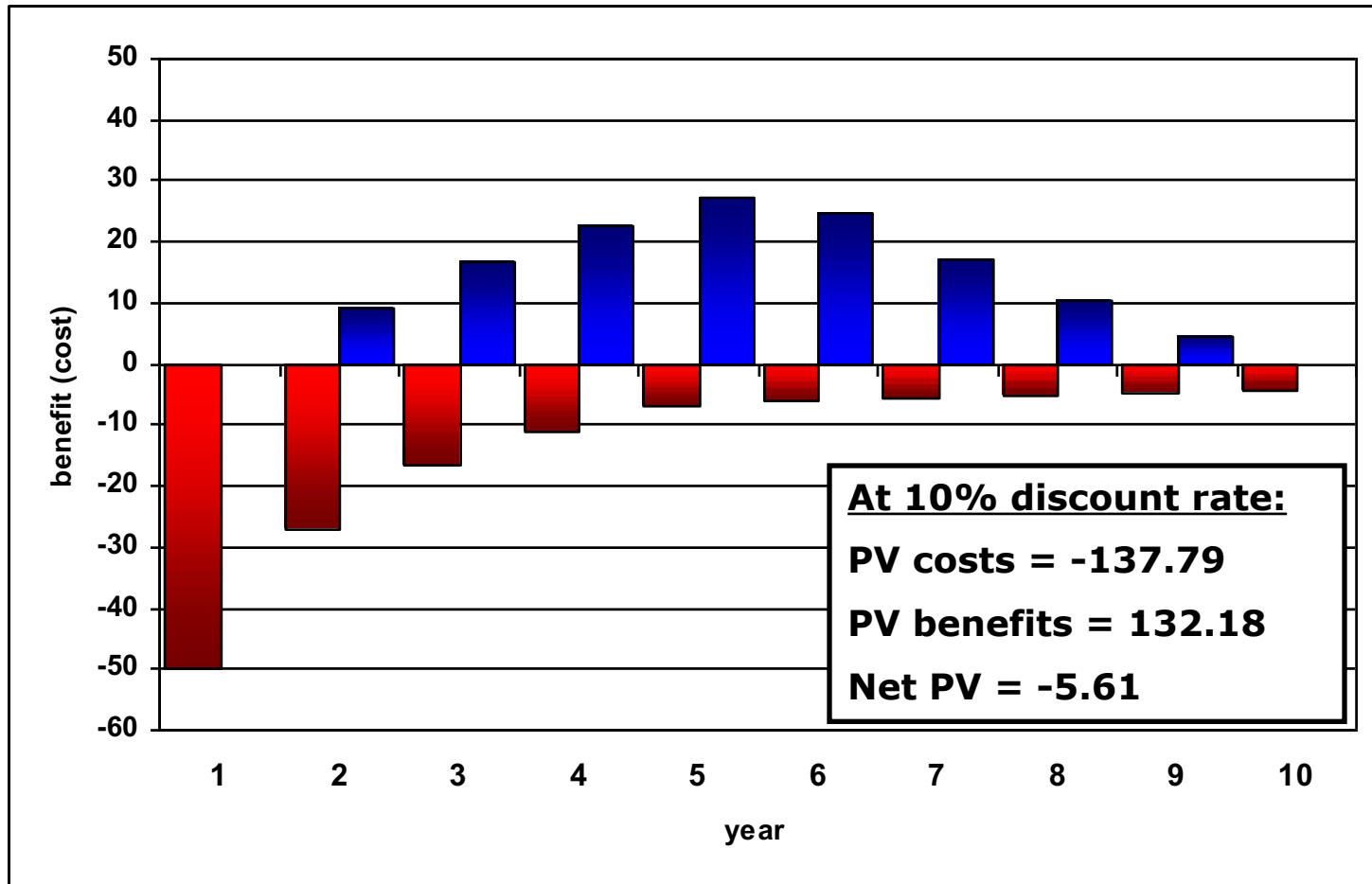
Discounting example

Project costs and benefits over time



Discounting example

Project costs and benefits over time



Cost-effectiveness analysis

- **What outcomes or impact do you get for each dollar's worth of program expenditure?**
 - ▣ **The number of HIV cases averted.**
 - ▣ **The number of young people employed.**
 - ▣ **The number of disability-adjusted life-years (DALYs) saved.**
- **Can be used to compare alternative methods of achieving a specific objective.**

Cost-effectiveness analysis

- Natural units of output/impact
 - Lives saved
 - Vaccinated children
 - Trained teenagers
- Composite units of impact
 - QALYs and DALYs
 - Useful to compare with other interventions
 - Useful to aggregate different outcomes

Cost-effectiveness example

Table 11: Estimated returns to various nutrition investments

	Cost per life saved (\$)	Returns to program cost (wages only)	Cost per discounted health life year gained (\$)
Under-nutrition Interventions			
Food Supplements	18,337	1.4	234
Nutrition Education	797	32.3	10.2
Integrated PHC-N	9,966	2.6	127
Food Subsidies	42,552	0.9	375
School Feeding	--	2.8	534
Iron Deficiency			
Supplementation of pregnant women only	800	24.7	12.8
Fortification	2,000	84.1	4.4
Iodine Deficiency			
Supplementation of reproductive-age women only	1,250	13.8	18.9
Supplementation (all persons under 60)	4,650	6	37
Fortification	1,000	28	7.5
Vitamin A Deficiency			
Supplementation (under 5 only)	130	50	4
Fortification	400	16	12.3

(Knowles and Behrman 2005, Table 11)

Cost benefit example

- **De-worming in rural primary schools in Kenya.**
 - ❑ **Randomized the timing of the introduction of de-worming treatment across 75 schools.**
 - ❑ **The treatment significantly reduced disease prevalence, and increased school attendance by about seven percent.**
 - ❑ **The study estimated discounted lifetime benefits over US\$30 per treated child, primarily from gains in lifetime income.**
 - ❑ **Benefits are more than 60 times greater than costs, based on an estimated cost of US\$0.49 per treated pupil.**

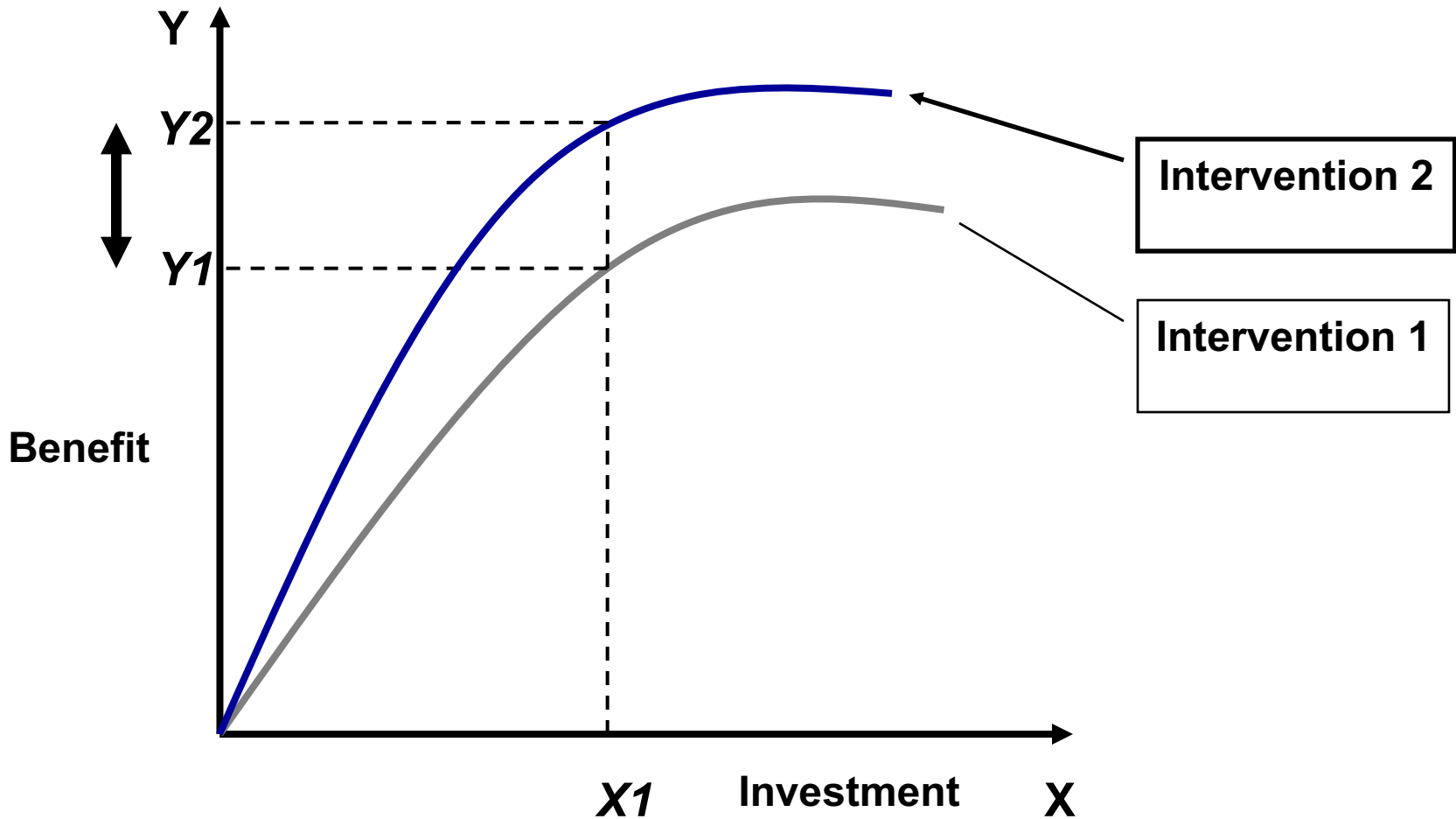
Efficiency within a program: technical efficiency analysis

The Public Sector...

- Firms are not profit-maximizing
- Firms may not be cost-minimizing
- Firms produce more than one output
 - ▣ Aggregation, valuing outputs
 - ▣ Jointness in production, economies of scope
- Firms may not know how much demand there is for their services



Production Function and Allocative Efficiency

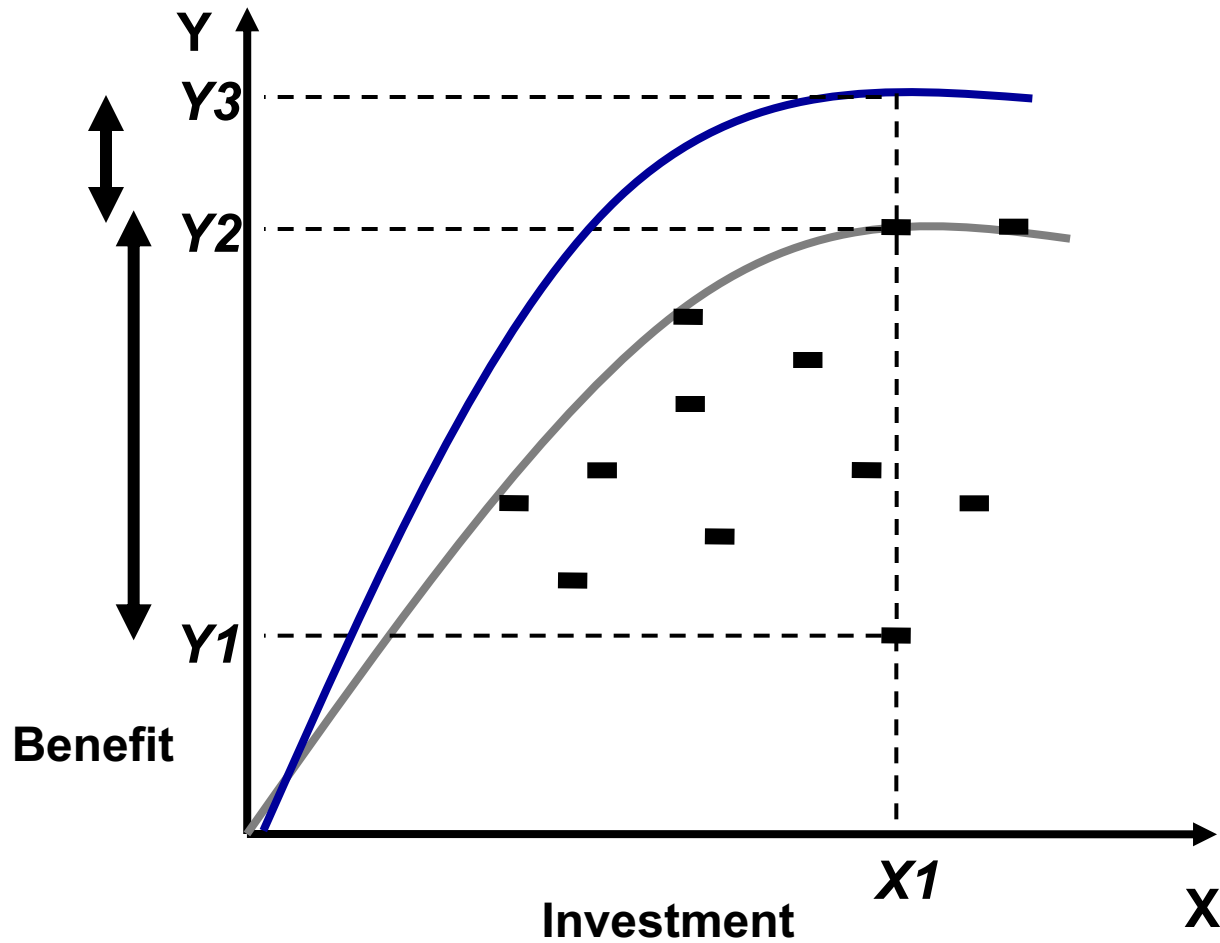


Allocative Efficiency

- Cost-effectiveness analyses typically assume:
 - Results are reproducible in different contexts and scales
 - Interventions are implemented at their efficiency frontier
- A “cost-effective” intervention can become very “cost-ineffective” if implemented inefficiently

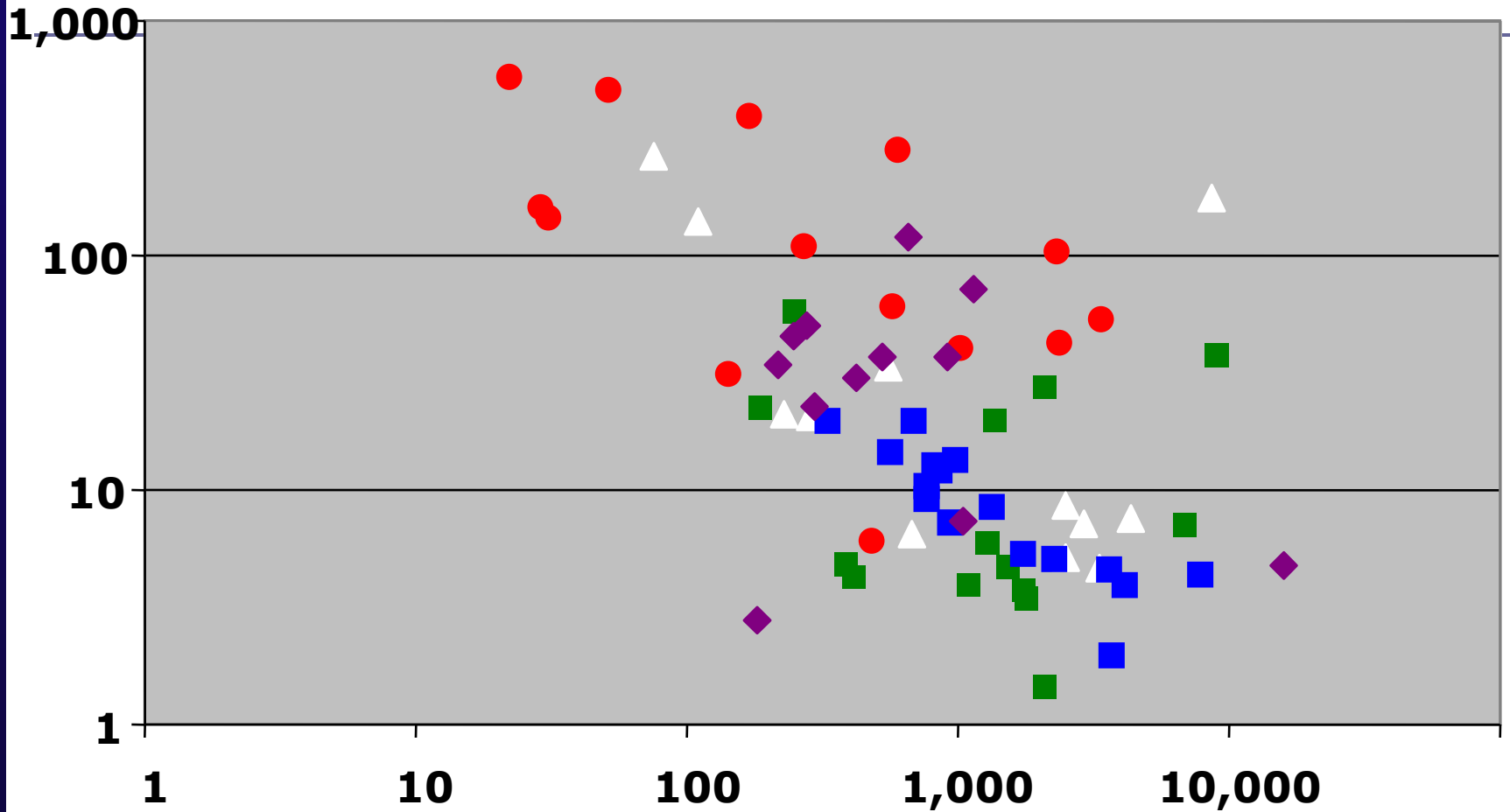


Production Function and Technical Efficiency



Scale and Average Unit Cost of VCT programs in 5 countries

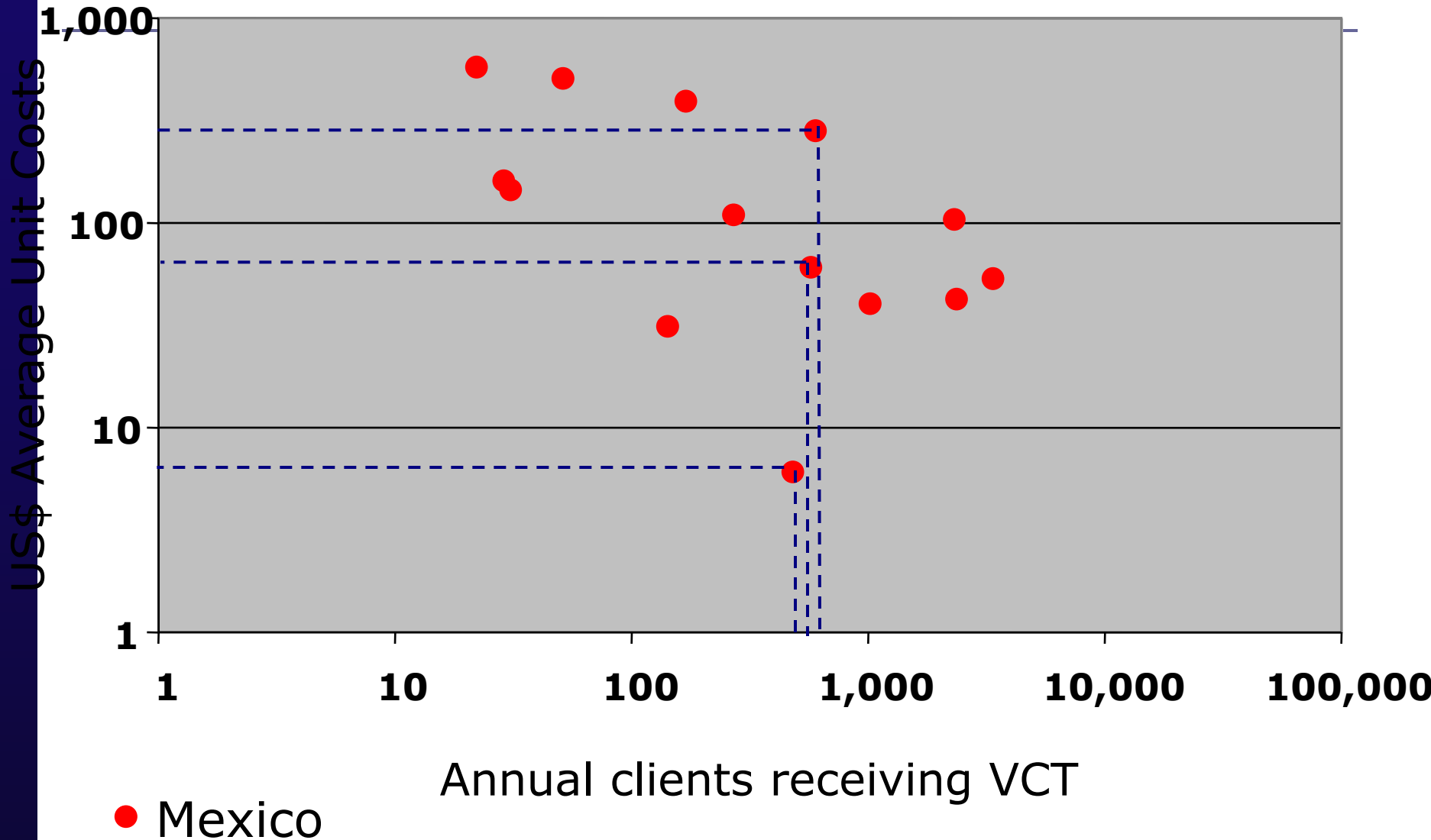
US\$ Average Unit Costs



Annual clients receiving VCT

- Mexico
- Uganda
- △ Russia
- India
- ◆ South Africa

Scale and Average Unit Cost of VCT programs in 5 countries



To conclude –

- Why measure efficiency?
 - ▢ Budget allocation decisions
 - ▢ Fiscal responsibility
 - ▢ Facility performance monitoring and management
- How can you measure it?
 - ▢ Add a costing component to your IE study
 - ▢ Choose an appropriate method – depends on the question you want to answer
- Evaluate technical efficiency
 - ▢ Public sector / NGOs are not like for-profit firms
 - ▢ Robust methods preferable – DEA or SFA
 - ▢ Try to understand *why* facilities differ

