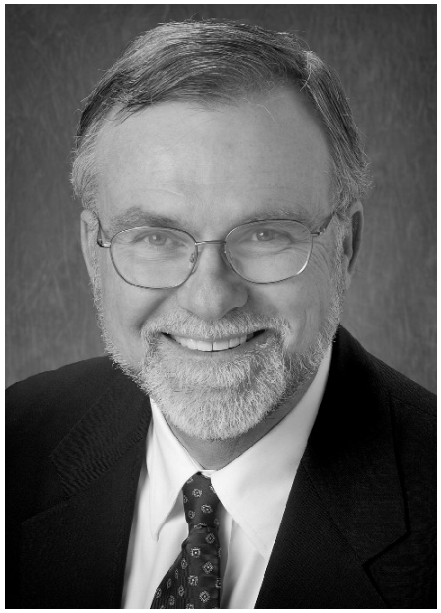
Overview of research on health care efficiency



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Scope of this talk

- Definition of health care efficiency
- Efficiency concepts
- Methods of measuring efficiency
- Ways to achieve health care efficiency
- Ethics and new applications

What is efficiency?

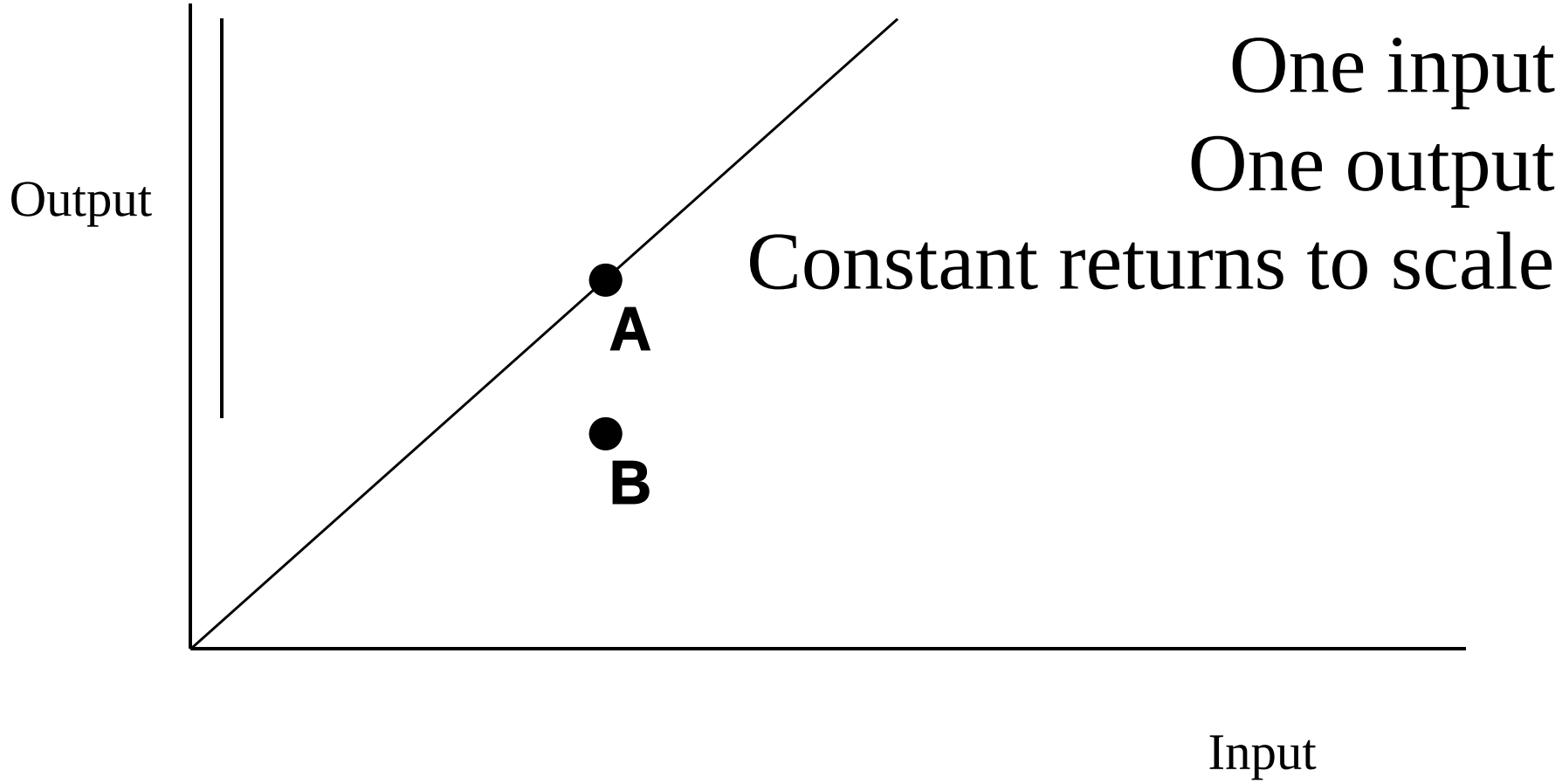
- A measure of performance
- Identifies resources used to create health care products
- Efficiency considers *both* inputs and outputs

An efficient provider

- Maximizes output for a given set of inputs
- Minimizes input for a given set of outputs

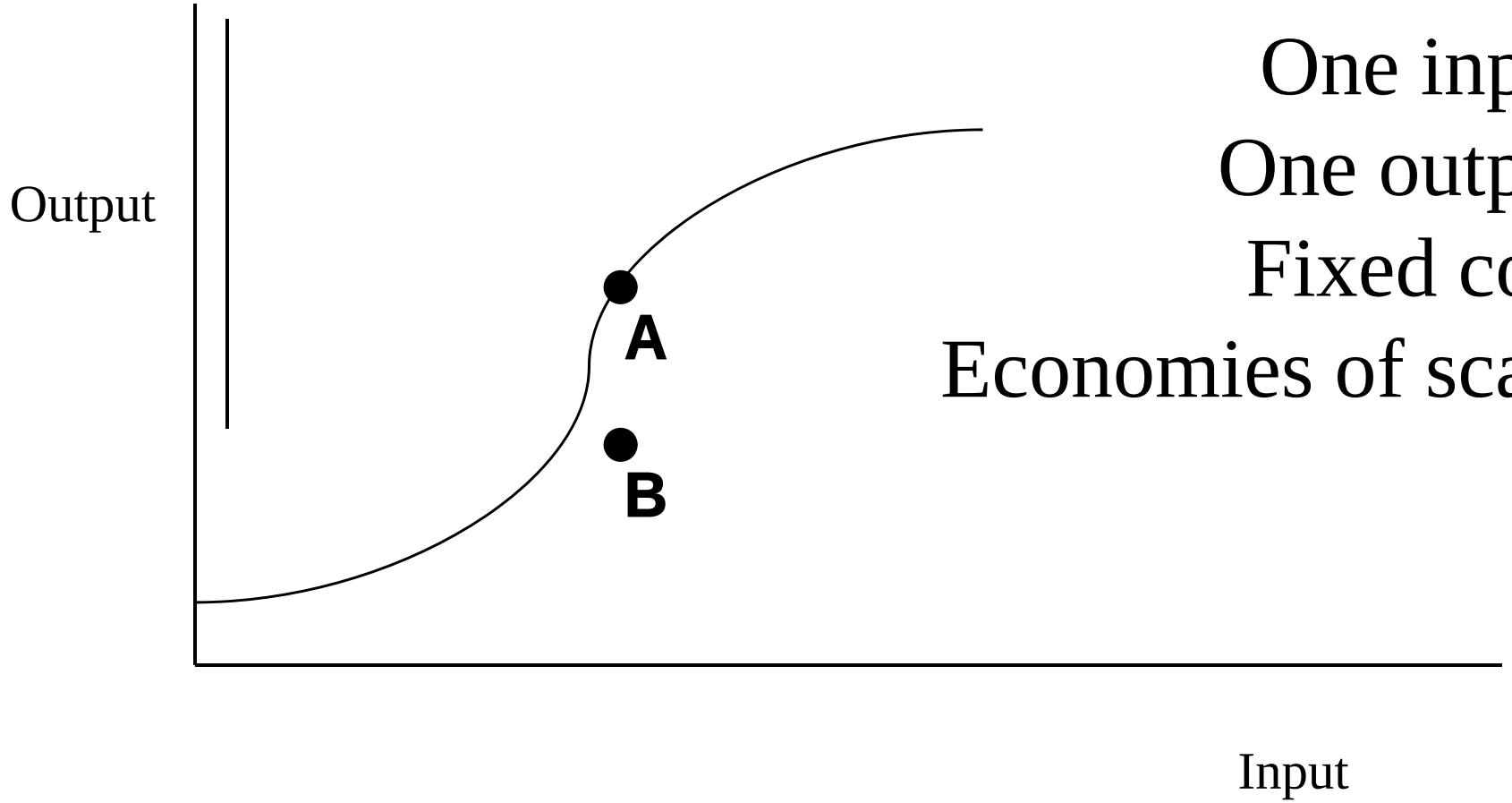
What types of health care products should be measured?

Simple production function



One input
One output
Constant returns to scale

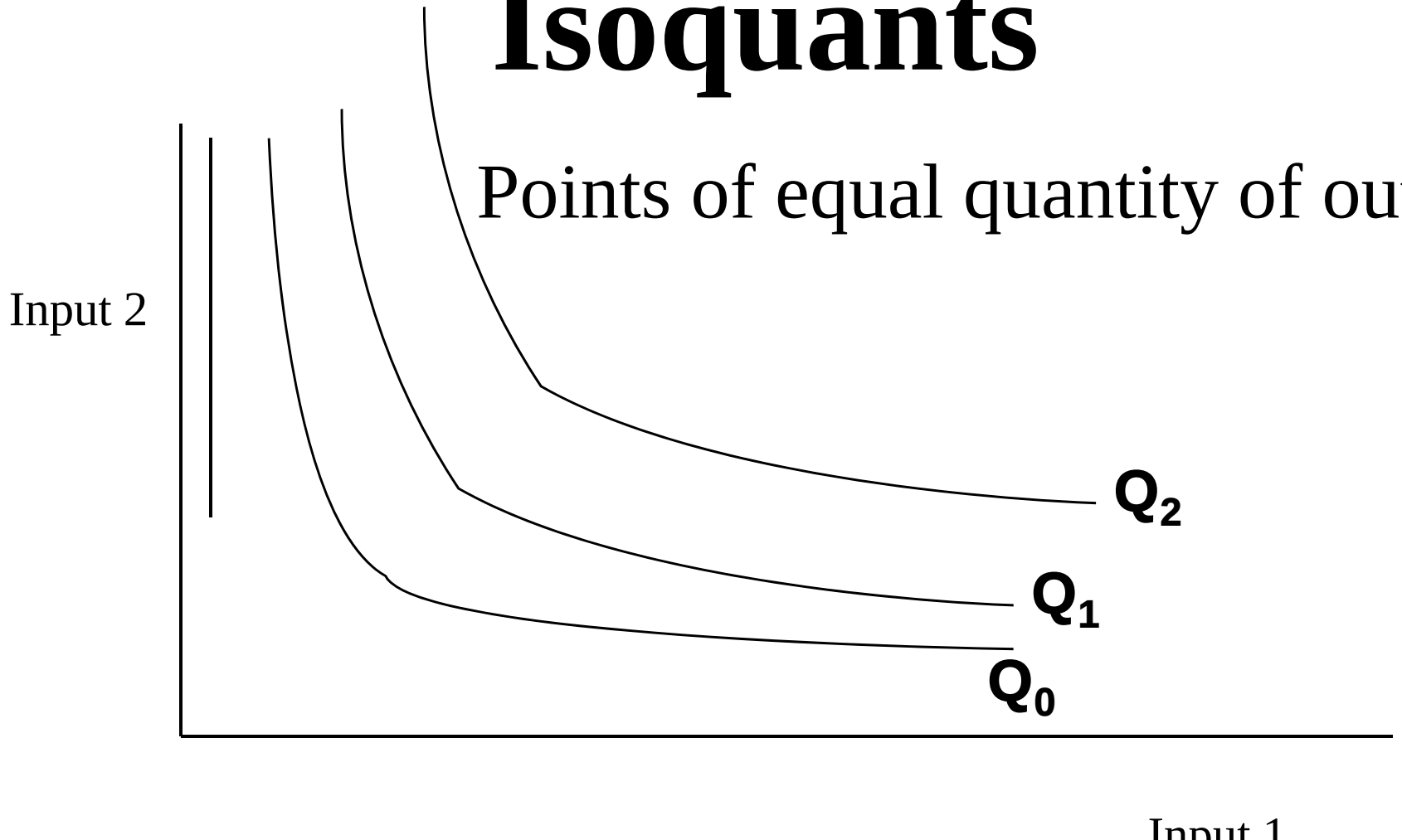
Production function



One input
One output
Fixed cost
Economies of scale

Isoquants

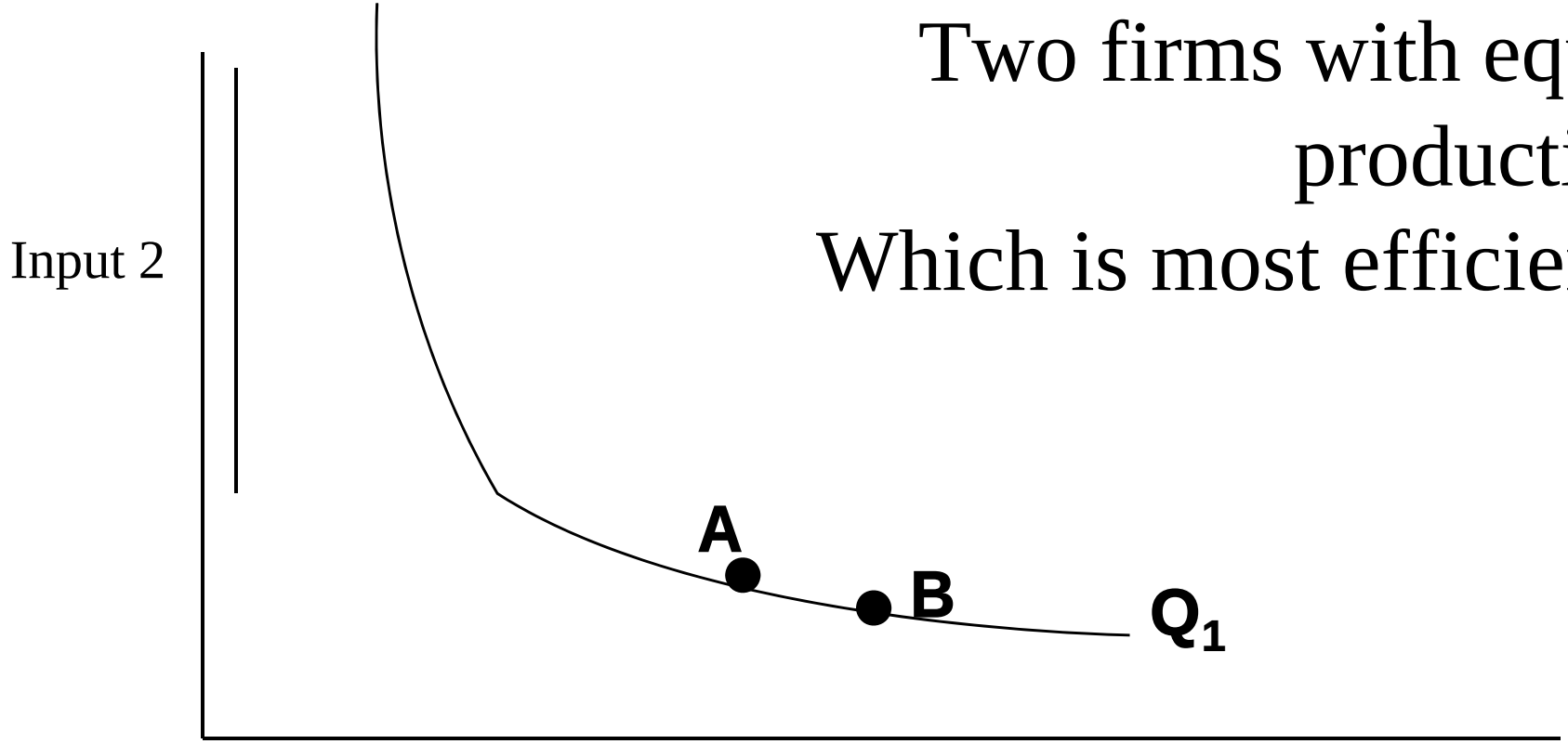
Points of equal quantity of output



Cost-minimization

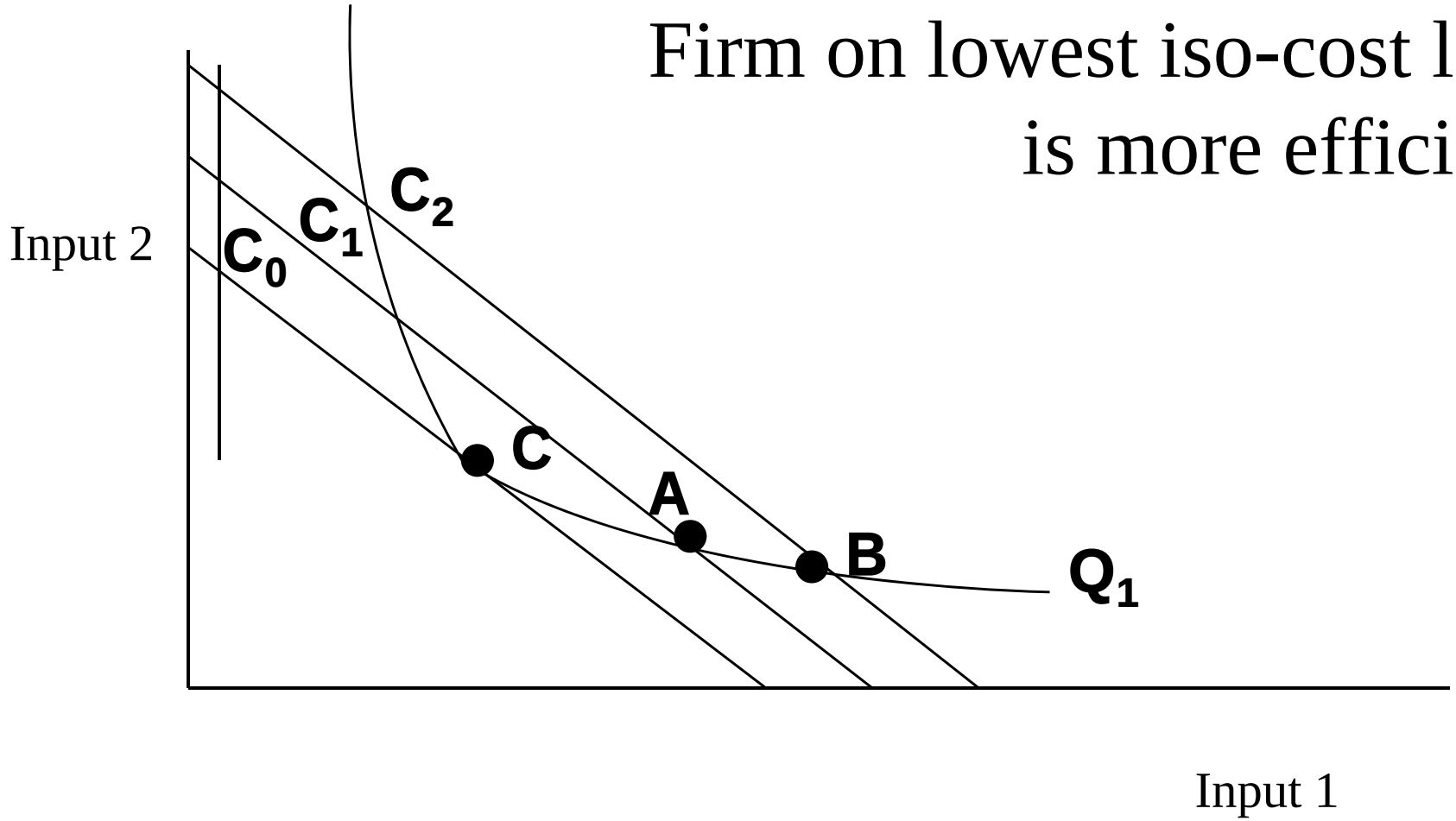
Two firms with equal production

Which is most efficient?



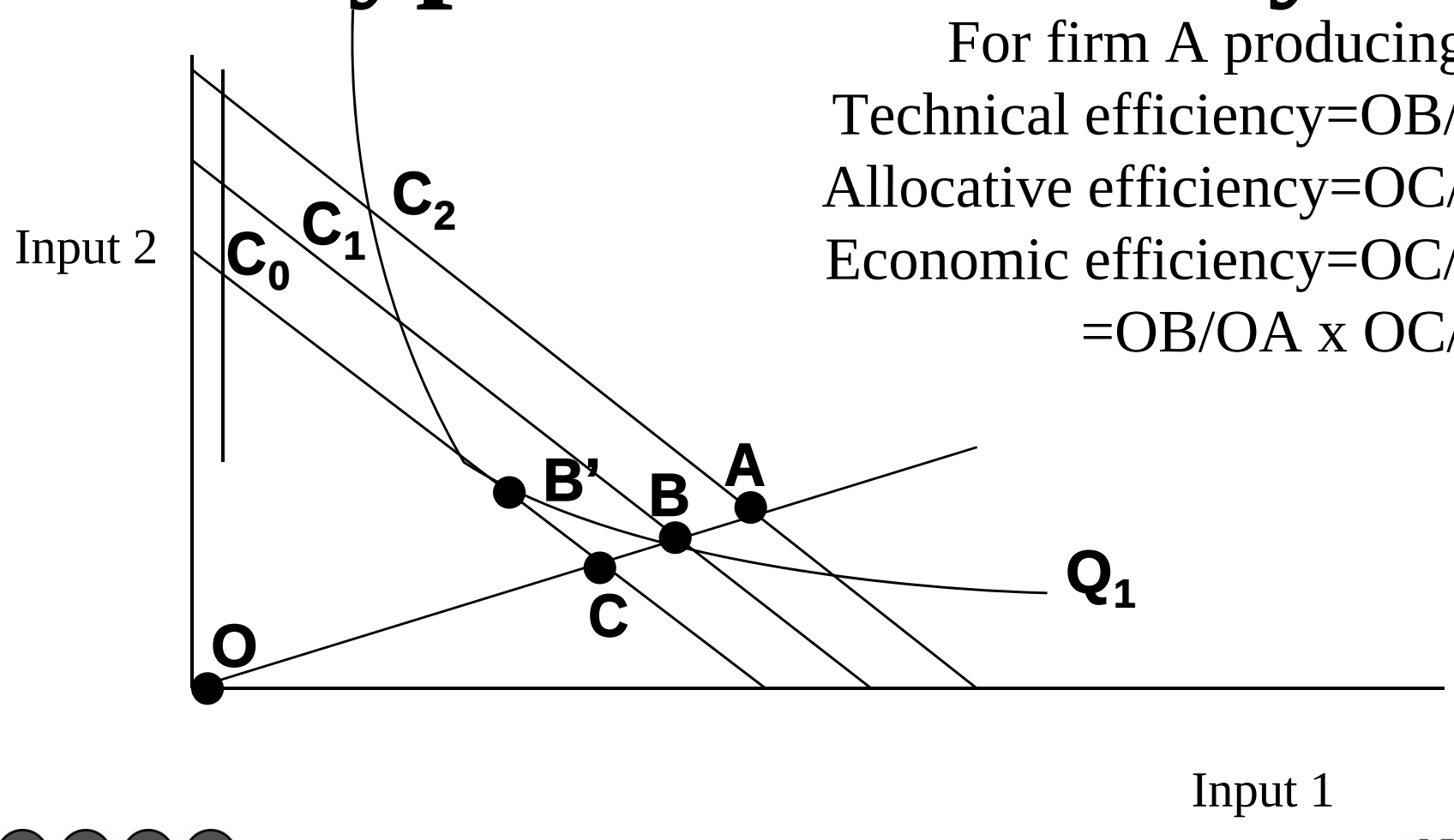
Cost-minimization

Firm on lowest iso-cost line is more efficient



Types of efficiency

For firm A producing Q_1
Technical efficiency=OB/OA
Allocative efficiency=OC/OB
Economic efficiency=OC/OA
=OB/OA x OC/OB



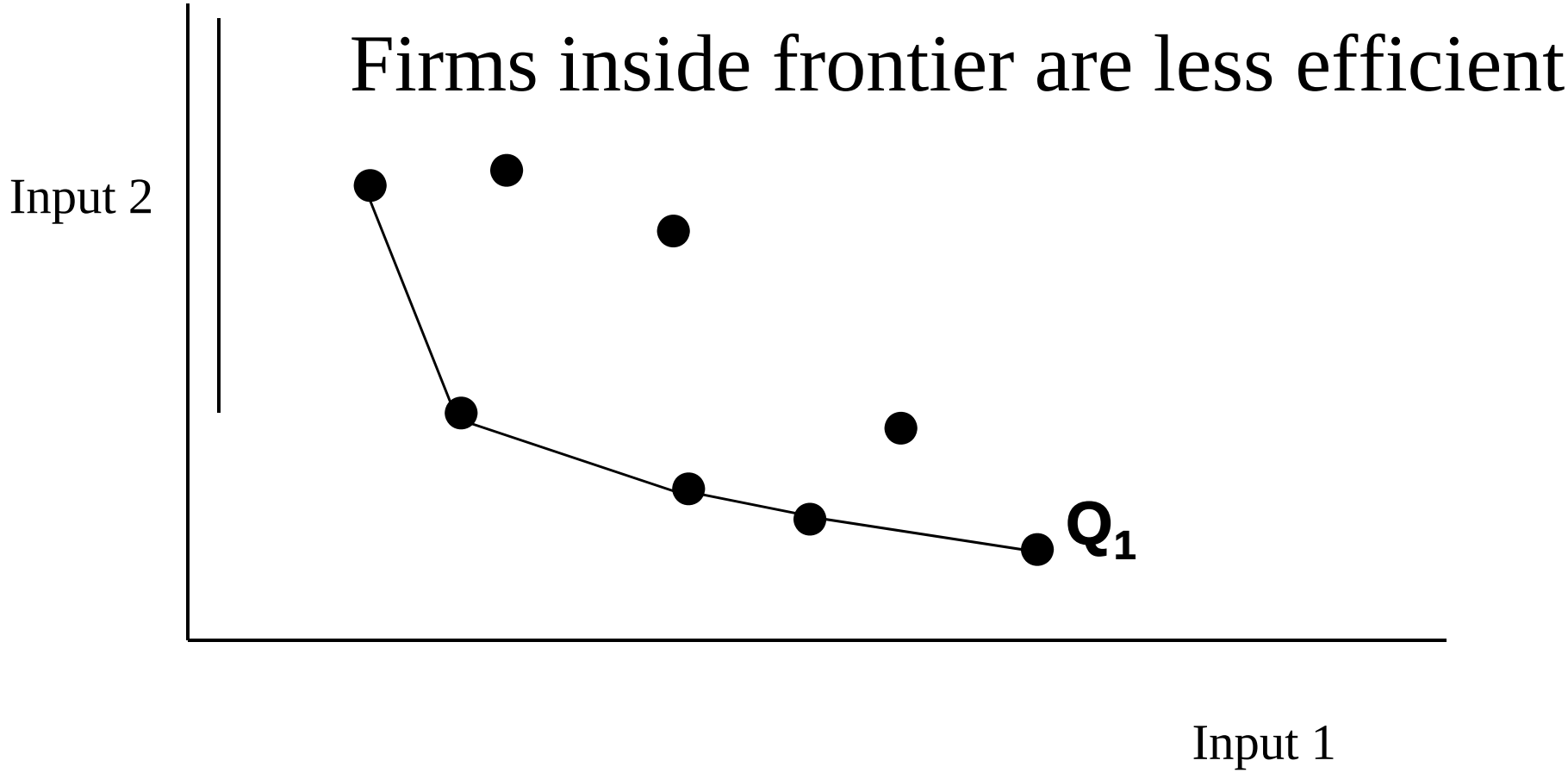
Methods of measuring health care efficiency

- Data Envelope Analysis (DEA)
- Stochastic Frontier Analysis (SFA)
- Population and Episode Groupers
- Small Area Variation Analysis

Data Envelope Analysis

- Production frontier plotted using linear programming
- Each firm is compared to the frontier and assigned an efficiency score

DEA Production Frontier



DEA Methods

- Allow multiple inputs and multiple outputs
- Can use input or output orientation
- Efficiency score can be a dependent variables in subsequent regression analysis
  - Case mix, environment as independent variables

Limitations of DEA

- Assumes no measurement error or random variation
- Sensitive to number of input and output variables
- Production frontier may be incomplete
- Measure of efficiency are relative to members of sample
- Use of efficiency score in a regression may violate statistical assumptions

Stochastic frontier analysis (SFA)

- Allows for measurement error and random variation
- Statistical estimate of production function or cost function
- Interest is in the residuals
- Error term is decomposed into “random noise” and “measure of inefficiency”

SFA Methods

- Cost function is more common
- Cost is dependent variable
- Independent variables:
  - Input prices
  - Outputs
  - Provider characteristics

SFA Methods (continued)

- Must decide whether to use total cost or average cost
- Must choose functional form
- Must assume distribution for error term

SFA Limitations

- Many inputs and outputs relative to number of observations
- Results sensitive to assumptions about functional form, error term decomposition, and choice between total and average cost

Stochastic Frontier Analysis/Data Envelope Analysis

- SFA involves regression and analysis of error term
- DEA uses linear programming, non-parametric

SFA/DEA critique

- Lack of consideration of quality of products
- Inadequate case-mix control
- Need for strong but untestable assumptions
- Too few observations requiring aggregation of inputs and outputs

--Newhouse J Health Econ 13:317-22 (1994)

SFA/DEA critique

- Methods used by academic researchers not by providers or health plans

--Hussey et al 2009

Case-Mix and Episode Groupers

Cost per covered life

- Need to consider variations in severity of illness (case-mix)
- Ambulatory Care Groups/Diagnostic Care Groups
- Developed by Johns Hopkins
- Now a commercial product

Cost per episode

- Claims data are grouped into episodes
- Cost per episode compared

Commercial episode groupers

- Ingenix “Episode Treatment Groups”
- Thomson Reuters “Medical Episode Grouper”
- Prometheus “Evidence Informed Case Rates”
- American Board of Medical Specialties Foundation
- NCQA “relative resource use”
- Cave grouper

Use of episode groupers

- Used by health plans to evaluate & reward providers
- Medicare evaluation
- National Quality Forum evaluation

Case-mix & Episode Groupers limitations

- Lack of validation
- Attribution of care to a provider
- Concerns about consistency

See: Adams et al 2101

Use of efficiency measures

- Pro: can identify high cost provider
- Con: validity and consistency in evaluating providers
- Con: lack of information on quality: is the high-cost provider giving the right amount of care?
- Con: doesn't tell the manager of high cost facility what practices to change

Small Area Variation Analysis

Small area variation

- Identifies rate that procedures/treatments are provided to eligible population
- Compares geographic areas
- Great variation by area, with no difference in health
- Excess use considered inefficiency

See: Fisher & Wennberg 2003

Ways to achieve health care efficiency

Review of Cost Effectiveness Analysis (CEA)

- Standard method for evaluating health care interventions
- Find incremental cost and outcomes relative to standard care
- Outcomes expressed as quality adjusted life year (morbidity adjusted survival)
- Estimates the cost per quality adjusted life year
- Reject interventions that cost more than “threshold”, e.g., in U.S. those that cost more than $100,000/QALY.

Use of Cost-Effectiveness Analysis

- Can be used for coverage decisions, treatment guidelines
- Not widely used in U.S.
- More widely used in other countries
  - National Institute on Clinical Effectiveness (NICE) advises National Health Service
  - Canadian Technology Assessment (CADTH) and Common Drug Review

Disinvestment to achieve efficiency

- Review existing care
- Identify targets for “disinvestment.”
  - Care that is not cost-effective

“Do Not Use” List

- NICE mandate to identify interventions that should not be used

U.S. Efforts to identify ineffective treatment

- Institute of Medicine
- "Knowing what works in health care: a roadmap for the nation"

U.S. Efforts to identify inefficient treatment

- National Priorities Partnership 2008 (convened by NQF)
- Tufts Registry
- Oregon Health Services Commission
- New England Healthcare Institute

Disinvestment

- Pro: gives specific action that managers and providers should take
- Con: hard to change practice
- Con: each effort may have only a small impact

Ethics and new applications

Ethical Considerations

- Application of CEA make assumptions that all QALYs have equal value
- Need to incorporate “public values” when applying CEA
- NICE citizens’ council

Ethical Considerations

- Demonstration that random sample of U.S. citizen can apply CEA to health care (Gold, 2007)
- Ethical reason to support efficiency: Low-value, high cost services crowds out spending on more efficient care

New applications for efficiency measures

- Used by health plans to evaluate & reward providers
- Mandate for Medicare to evaluate efficiency
- National Quality Forum (NQF)
  - call for measures on resource use

NQF consensus panel on “resource measures”

- Phase 1: call for measures
- Phase 2: attention to specific diseases. Five technical advisory panels on 18 conditions.
  - CHF, CAD, AMC, Stroke/TIA, hypertension, diabetes, chronic kidney disease, asthma, COPD
  - Cholecystitis/cholelithiasis, breast cancer, prostate cancer, colorectal cancer, UTI, pneumonia, hip fracture, osteoarthritis, spine/low back pain

References

Adams JL, Mehrotra A, Thomas JW, McGlynn EA. Physician cost profiling--reliability and risk of misclassification. N Engl J Med. 2010 Mar 18;362(11):1014-21.

Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL. The implications of regional variations in Medicare spending. Part 1: the content, quality, and accessibility of care. Ann Intern Med. 2003 Feb 18;138(4):273-87.

Gold MR, Franks P, Siegelberg T, Sofaer S. Does providing cost-effectiveness information change coverage priorities for citizens acting as social decision makers? Health Policy. 2007 Sep;83(1):65-72.

Hussey PS, de Vries H, Romley J, Wang MC, Chen SS, Shekelle PG, McGlynn EA A systematic review of health care efficiency measures. Health Serv Res. 2009 Jun;44(3):784-805.

Newhouse JP. Frontier estimation: how useful a tool for health economics? J Health Econ. 1994 Oct;13(3):317-22.