

# Econ 463/563: Efficiency and Productivity Analysis

April 4, 2008

## WIC requirements

Your final written project must be at least 2000 words. Combined written assignments must be at least 5000 words.

## Prerequisites

ECON 201 and 202 are required. Intermediate microeconomics (ECON/AREC 311) is STRONGLY recommended.

## Texts

- ▶ OnFront, Reference Manual. (may be downloaded from my Web Page)
- ▶ T.J. Coelli, D.S.P. Rao, C.J. O'Donnell and G.E. Battese, *An Introduction to Efficiency and Productivity Analysis*, second Edition, Springer 2005.
- ▶ Wayne C. Booth, Gregory G. Colomb and Joseph M. Williams, *The Craft of Research*, 2nd edition, The University of Chicago Press, 2003.

# First Assignment

- ▶ OnFront, pp 1-3.
- ▶ Coelli et al, skim Ch 1 and sec 3.1-3.3
- ▶ Colomb et al, skim ch 1-5

# Evaluation of Student Performance

- ▶ Preliminary Reports and Proposal..... 25%
- ▶ Midterm Exam (April 24).....25%
- ▶ Programming Projects..... 10%
- ▶ Written Project (June 12)..... 30%
- ▶ Presentation .....10%

# Project

Your project is the main focus of this course. You will be expected to write up a project proposal, write summaries of papers related to your project (literature review), write up a description of your method, data and results, and finally revise and combine these as a research paper. There will be in-class, hands-on exercises to estimate efficiency/productivity. We will teach you how to use OnFront, software for computing efficiency and productivity, available in the undergraduate computer lab.

Topics for your project should be related to your interests. Typically you do an efficiency study—collect data, compute efficiency and write up and present your results along with related studies. Or you may survey applications in the area of your interest. You may also address computational or conceptual issues related to efficiency and productivity. You may also replicate and extend an existing study you are interested in.

# Assignment Time Table

1. week 1: Thurs., April 3, Library visit, Autzen auditorium
2. week 2: Thurs., April 10, Literature search due
3. week 3: Thurs., April 17, Proposal due
4. week 4: Thurs., April 24, MIDTERM
5. week 5: Thurs., May 1, Paper report due
6. week 7: Tues., May 13, Model description due
7. week 8: Tues., May 20, Data description due
8. week 10: present results
9. Thursday, June 12, final report due

# Finding a topic

From Booth et al, *The Craft of Research*, pp. 37-38

- ▶ What are you most interested in/excited about?
- ▶ Try to find a specific topic related to your interests.
- ▶ Find an interesting question in your specific topic.
- ▶ What kind of evidence do you need?
- ▶ Identify sources (library search).

# Why write?

Booth et al, pp 12-15

- ▶ Write to remember.

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- ▶ Write to gain perspective (writing as thinking).

# Ch. 1, Coelli et al, Introduction to Efficiency and Productivity Analysis

We will be concerned with measuring performance, which can cover among others

- ▶ Firms

These are generally referred to as Decision Making Units (DMUs). Here we will measure their performance using data envelopment analysis (DEA).

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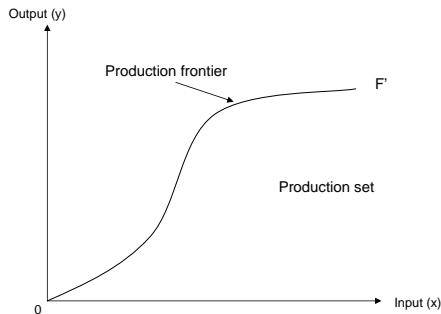
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- ▶ Analyzing the efficiency of the no child left behind act

# Some informal definitions

- ▶ feasible production set (technology)
- ▶ technical efficiency
- ▶ productivity
- ▶ total factor productivity (TFP)
- ▶ technical change

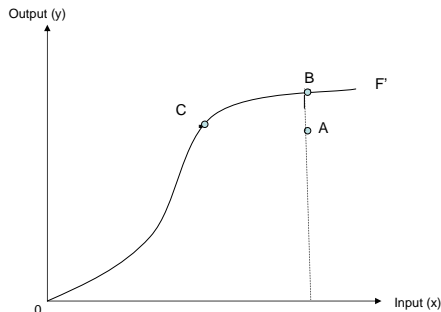
# Feasible technology: single input and output

**feasible technology set:**  $0F'$  and area underneath  
**production frontier:**  $0F'$



# Technical Efficiency

A firm (DMU) is **technically efficient** if it operates on the frontier of technology. A DMU is **technically inefficient** if it operates beneath the frontier. Which DMUs are technically efficient?

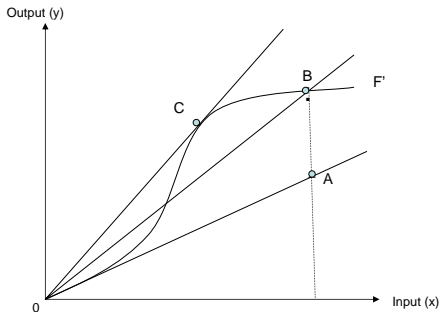


The **productivity** of a firm (DMU) is the ratio of output(s) to input(s) it uses:

$$productivity = output / input \quad (1)$$

**Total factor productivity (TFP)** is the ratio of *all* outputs produced to *all* inputs employed.

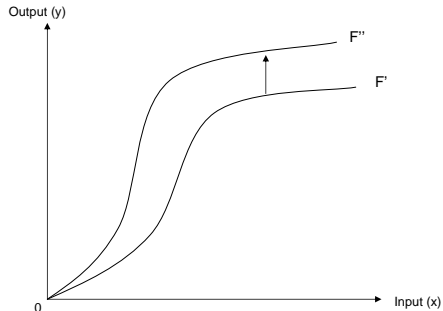
With many outputs and many inputs we need to aggregate inputs and outputs to obtain a ratio of productivity.



Which DMU has the highest productivity? Is it technically efficient?

# Productivity over time

**Technical change** occurs when the production frontier shifts out over time.



# Course outline

1. Review of Production Theory
2. DEA/efficiency
3. DEA/productivity
4. Traditional index numbers

# Biographical sketch

1. name
2. major
3. year (class)
4. econ classes
5. career goals
6. special interests
7. Have you written a research paper before?

## Practice Exercise: DEA and baseball

	At Bats	Singles	Homeruns
	input	output 1	output 2
Tim	100	40	0
Rolf	100	20	5
Trent	100	10	20

How do we compare performance?

construct best practice frontier

output tech effic =  $\max \text{ outputs} / \text{observed outputs}$

Are all three players efficient?

# Group Exercise

Suppose you are asked to undertake a study of the technical efficiency of universities in Oregon. Your first task is to specify the data you would need. It would be useful to start with thinking about what a university is trying to do. Then think about measures of 'outputs' and 'inputs' that would account for the goals as well as the resources used to achieve those goals.