Market Structure

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Textbook: Varian, Microeconomics a modern approach

PRODUCTION THEORY

Production theory

When a firm makes choices it faces many constraints. These constraints are imposed by its customers, by its competitors, and by **nature (technology)**

Nature imposes the constraint that there are only certain feasible ways to produce outputs from inputs

In other words: **there are only certain kinds of technological choices that are possible**

Production function is a mathematical representation of feasible technological choices that link the input used to the output produced

Production functions

Inputs to production are called factors of production

Factors of production are often classified into broad categories such as land, labor, capital, and raw materials.

The maximum possible output that you can get from a given amount of input is given by **production function**

Cobb-Douglas production function have been widely used in economics model, they take the form $f(x1,x2) = Ax^a_1x^b_2$

Returns to scale

Returns to scale refers to the way that output changes as we change the scale of production

- Constant return to scale: $tf(x_1, x_2) = f(tx_1, tx_2)$
- **Increasing returns to scale**: $tf(x_1, x_2) < f(tx_1, tx_2)$
- Decreasing return to scale: $tf(x_1, x_2) > f(tx_1, tx_2)$

Return to scale

- The Cobb-Douglas production function is given by $f(x_1,x_2) = Ax^a_1x^b_2$. It turns out that the type of returns to scale of this function will depend on the magnitude of a + b. Which values of a + b will be associated with the different kinds of returns to scale?

Return to scale

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Threshold: a+b=1

Cost functions

The technological constraints summarized by the production function lead to economic constraints summarized by the cost functions

The cost is usually a monetary valuation of effort, resources, and time (i.e. of the inputs) forgone in production and delivery of a good or service

- Some of the costs of the firm are independent of the level of output of the firm (**fixed costs**)
- Other costs varies with the output of the firm (**variable costs**)

$$TC(q)=VC(q)+ FC$$

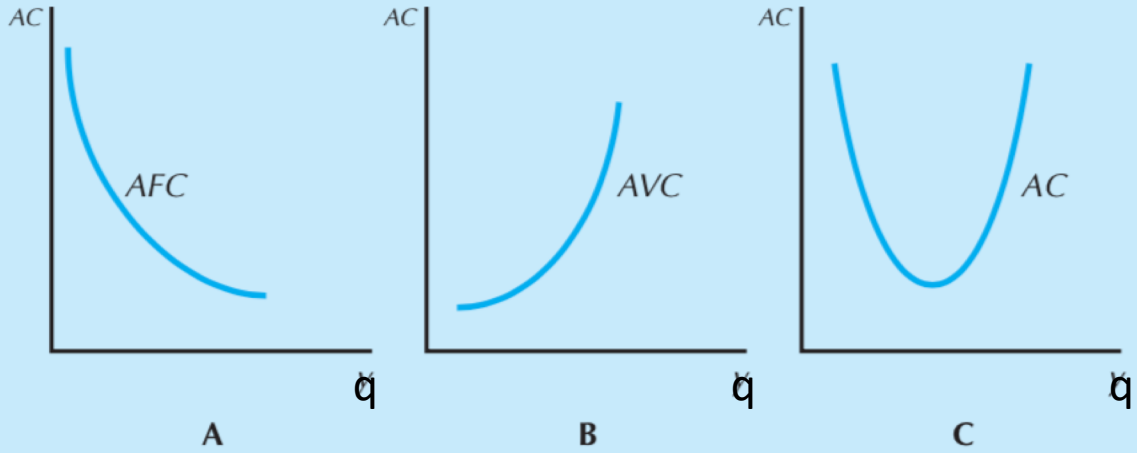
The average cost function

The **average cost** function measures **the cost per unit of output**

The average variable cost function measures the variable costs per unit of output, and the average fixed cost function measures the fixed costs per unit output

$$AC(q) = \frac{TC(q)}{q} = \frac{VC(q)}{q} + \frac{FC}{q} = AVC + AFC$$

The average cost function



Construction of the average cost curve. (A) The average fixed costs decrease as output is increased. (B) The average variable costs eventually increase as output is increased. (C) The combination of these two effects produces a U-shaped average cost curve.

The marginal cost

There is one more cost curve of interest: the **marginal cost curve**

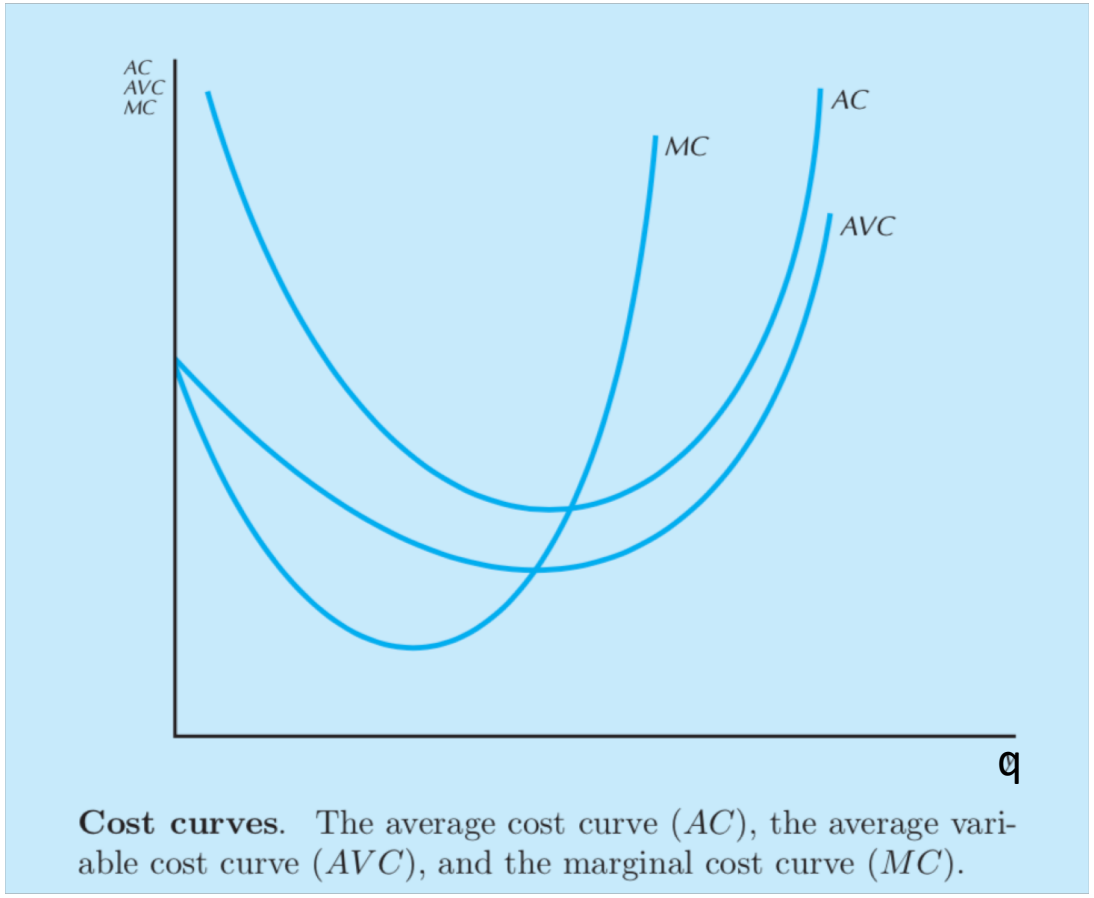
Marginal cost is equal to the change in total cost when output rises or declines by one unit

Since in the short run some costs are fixed, the short-run marginal cost is found as the derivative of the variable costs

Given that in electricity, fuel costs are the main variable cost, marginal costs are found as the derivative of fuel costs with respect to output, i.e. the amount of electricity produced

$$MC(q) = \frac{\Delta TC(q)}{\Delta q} = \frac{TC(q+\Delta q) - TC(q)}{\Delta q} = \frac{VC(q+\Delta q) - VC(q)}{\Delta q}$$

The marginal cost



Cost curves. The average cost curve (AC), the average variable cost curve (AVC), and the marginal cost curve (MC).

Profit maximization

With information about the cost, the firm chooses the amount to produce

The model used is the model of profit maximization: **the firm chooses a production plan so as to maximize its profits**

Profits (π) =revenues-costs

$$\pi = \sum_{i=1}^{n} p_i q_i - \sum_{i=1}^{m} c_i q_i$$

Profit maximization

In the short run some of the inputs are very difficult to adjust, this inputs takes the name of fixed factors in opposition to variable factors

Let's consider the short-run profit-maximization problem when input 2 is fixed at some level $\dot{x}_2$ (e.g. the rent of the production plant). Assumption: 1 output [$f(x_1 x_2)$], two inputs

$$\max_{x_1} \pi = \max_{x_1} pf(x_1, \dot{x}_2) - c_1 x_1 - c_2 \dot{x}_2$$

General rule: The firm produces until it is marginal revenues are equal to the marginal costs

Market conditions

The formula above takes into account the technological constraints, yet it does not consider the **market constraints** (i.e. how much output the market is willing to buy. Warning: it depends on other firms choices and market demand)

Economists try to examine market constraints in a systematic way, by describing the ways that firms respond to each other when they make their pricing and output decisions. We will focus on 2 cases:

- **Pure Competition**
- **Monopoly**

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