

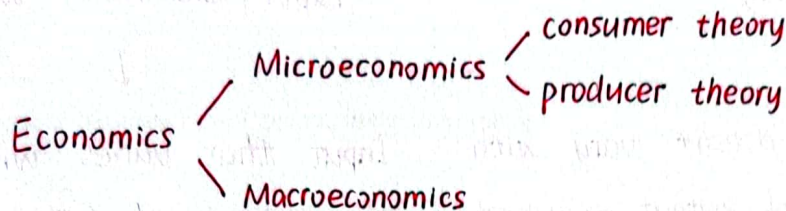
Principles of Economics (Spring 2024)

Lecture 8

Production

Part I

Big Map of Economics



- Microeconomics

Analyze choices made
by households and
firms, as well as how they
interact
in markets.

Usually from the perspective of an
individual.
⇒ A market for
specific goods
and services.

- Macroeconomics

Analyze the overall
performance
of an economy, i.e.,
the economy-wide
phenomena.

Usually from the perspective of a
country.
⇒ The economy as a
whole, i.e., the sum
of the activities of
all decision makers
in all markets.

- o The goal of macroeconomics is to explain the economic changes
that affects many households, firms, and markets
simultaneously.

Part II

Production – A process of using labor and capital to make goods and services.

- Fixed Input vs. Variable Input

land, building, machine



Input that doesn't vary with the quantity of output produced



Fixed Input



time long enough

variable input (maybe)

example: buy another land, construct another building, ...

labor, electricity, water



Input that varies with the quantity of output produced



Variable Input

short/long has nothing to do with actual length of time. only cares about if at least one input is fixed

- Time Frame

- Short-Run – Period of time during which at least one input is fixed.
- Long-Run – Period of time during which all inputs are variable.
- There is more flexibility in the long-run than in the short-run to vary production.

Exercise 1

D The short-run is a period of production

- A. of 1 month or less.
- B. of 1 year or less.
- C. that is too short for the firm to change its output.
- D. in which some inputs cannot be varied.

Exercise 2

B An input that changes with output, in the short-run, is

- A. fixed.
- B. variable.
- C. marginal.
- D. imputed.

- Measures of Production

- Total Product (TP) – The total amount of output of output produced.
- Marginal Product (MP) – The actual output produced from one more unit of a particular input, when all other inputs are fixed.
- Average Product (AP) – total product ^{divided} by the units of a particular input used.
 - AP is a measure of productivity, i.e., how productive is the factor of production.
 - ❖ ↑ AP ⇒ ↑ productivity of the input
Productive

Exercise 3

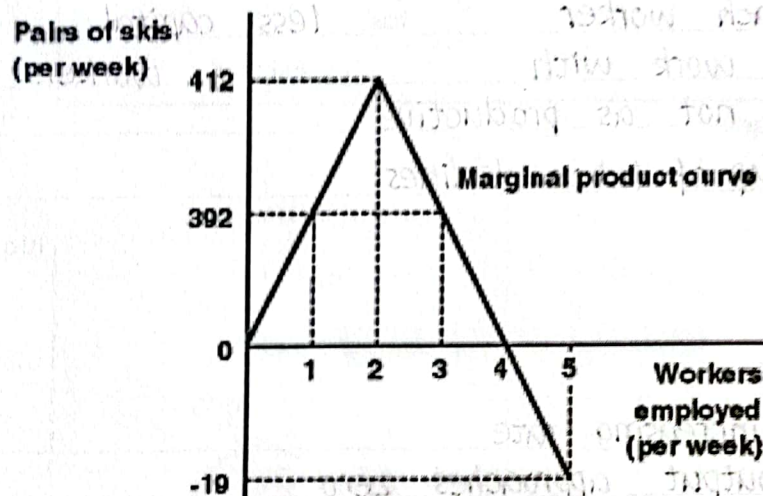
B Suppose the first four units of a variable input generate corresponding total outputs of 200, 350, 450 and 500. The marginal product of the third unit of input is

- A. 50
- B. 100
- C. 150
- D. 200
- E. 350

$$MP = 450 - 350 = 100$$

Exercise 4

Refer to the figure.



B The figure above shows the marginal product of labor curve for a ski manufacturer. Assuming 2 workers are hired, what is the average weekly product of labor?

- A. 202 pairs of skis.
- B. 402 pairs of skis.
- C. 412 pairs of skis.
- D. 804 pairs of skis.

$$MP \text{ of the first worker} = 392$$

$$\Rightarrow TP \text{ of 1 worker} = 392$$

$$MP \text{ of the second worker} = 412$$

$$\Rightarrow TP \text{ of 2 workers} = 392 + 412 = 804$$

$$AP = \frac{804}{2} = 402$$

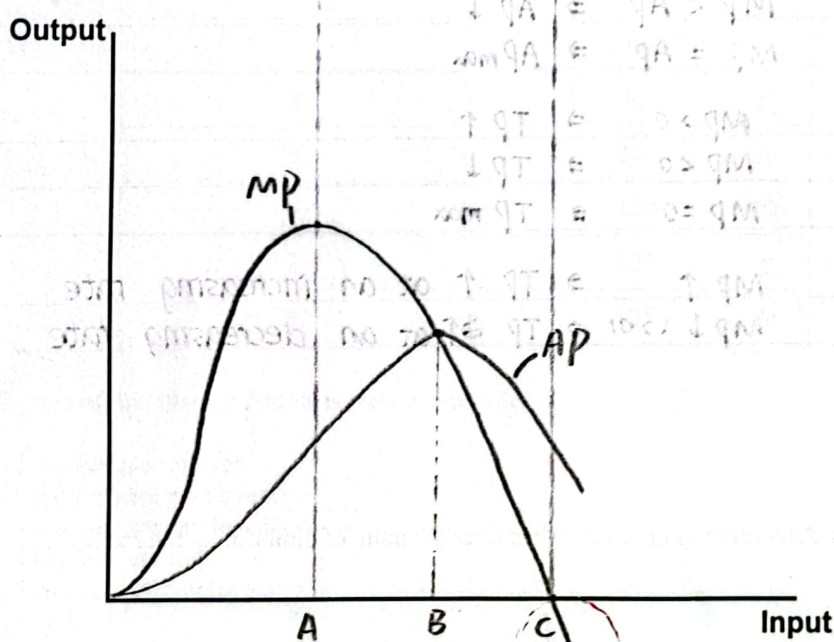
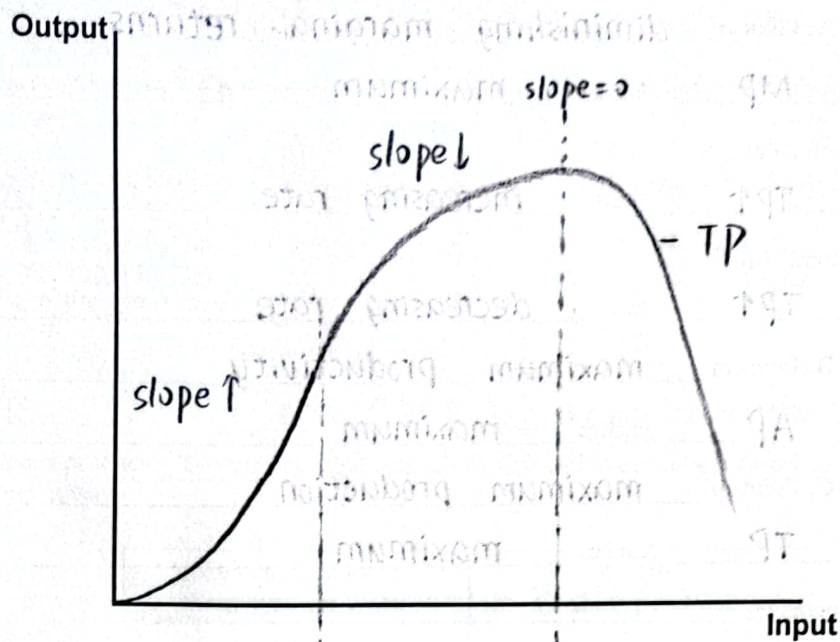
- Law of Diminishing Marginal Returns (also called the Law of Diminishing Returns, the Law of Diminishing MP) – The MP of a variable input will first increase and then decrease, and eventually approaches 0 (zero) as more is used in the short-run.

➤ Note: This rule applies only in the short-run!

Because this rule refers to a situation where some inputs are fixed. In this case, adding one worker to the production process without increasing the amount of capital means each worker has less capital to work with, and thus, workers are not as productive.
 ⇒ MP of labor declines

Implications:

- ① The increasing rate of output approaches zero, so that there is a limit to the output that can be obtained by using more of a variable input when some inputs are fixed.
- ② The AP of a variable input will also increase at first and then decrease.



A

→ this portion is only of theoretical interest, it doesn't exist in reality.

In real life, MP will infinitely approaches 0 as amount of variable increases but MP will never exceed this point.

- Point A: Point of diminishing marginal returns
 - MP reaches maximum
 - Before Point A
TP↑ at an increasing rate
 - After Point A
TP↑ at a decreasing rate
- Point B: Point of maximum productivity
 - AP reaches maximum
- Point C: Point of maximum production
 - TP reaches maximum
- To generalize:
 - $MP > AP \Rightarrow AP \uparrow$
 - $MP < AP \Rightarrow AP \downarrow$
 - $MP = AP \Rightarrow AP_{max}$
 - $MP > 0 \Rightarrow TP \uparrow$
 - $MP < 0 \Rightarrow TP \downarrow$
 - $MP = 0 \Rightarrow TP_{max}$
 - $MP \uparrow \Rightarrow TP \uparrow$ at an increasing rate
 - $MP \downarrow (> 0) \Rightarrow TP \uparrow$ at a decreasing rate

Exercise 5

Fill in the chat. According to the chart, when does the point of diminishing returns occur?

| Number of Workers | Total Product | Marginal Product | Average Product |
|-------------------|---------------|------------------|-----------------|
| 0 | 0 | \ | \ |
| 1 | 5 | 5 | 5 |
| 2 | 14 | 9 | 7 |
| 3 | 30 | 16 | 10 |
| 4 | 44 | 14 | 11 |
| 5 | 50 | 6 | 10 |

8 The third worker is
the diminishing marginal return

Exercise 6

E Diminishing marginal returns for the first four units of a variable input is exhibited by the total product sequence

- A. 50, 50, 50, 50
 B. 50, 40, 30, 20
 C. 50, 110, 180, 260
 D. 50, 100, 150, 200
 E. 50, 90, 120, 140

For A:
 $MP = 50 - 50 = 0$
 \Rightarrow No return

For B:
 $MP = -10$
 \Rightarrow No return

For C:
 $MP: 60, 70, 80$
 \Rightarrow have increasing marginal returns

For D:
 $MP: 50, 50, 50$
 \Rightarrow constant marginal returns

For E:
 $MP: 40, 30, 20$
 \Rightarrow have diminishing marginal returns

Exercise 7

D A plant producing T-shirts finds that output will vary with the number of workers employed per week in the following way.

C

| Number of Workers Employed per Week | Output (T-shirts per Week) |
|-------------------------------------|----------------------------|
| 1 | 14 |
| 2 | 36 |
| 3 | 66 |
| 4 | 92 |
| 5 | 110 |
| 6 | 120 |
| 7 | 125 |
| 8 | 125 |

The point of diminishing returns is reached just after

- A. 1 worker is employed.
 B. 2 workers are employed.
 C. 3 workers are employed.
 D. 4 workers are employed.
 E. 5 workers are employed.

Exercise 8

D At current levels of operation, the marginal product of labor in a factory exceeds the average product of workers. If another worker is employed,

- A. there will be no change in the marginal product of labor. \
 B. there will be no change in the average product of labor. \
 C. the average product of labor will decrease.
 D. the average product of labor will increase.

Part III

Broad Definition of Short-Run and Long-Run

| | Short-Run | Long-Run |
|-----------------|---|---|
| Consumer Theory | <p>Decision <u>Short-Run</u> is <u>Decision</u> made at the scene.</p> <p>No time to adjust for the price change.</p> | <p>Enough time is allowed for consumers or producers to adjust (for, fully) to the price change.</p> <p>↑</p> <p>People are able to develop and identify substitutes.</p> |
| Producer Theory | <p>Period of time during which <u>at least one input</u> is <u>fixed</u>.</p> | <p>Period of time during which <u>all inputs</u> are <u>variable</u>.</p> |