UWTSD MBA (Nov 2018 intake)
SBMA7133 Managerial Economics

(3-1)

The Production Process and Costs

Che Cheong POON
27 January 2019; 10:00 am to 1:30 pm

Lecture Agenda：

- Introduction
- Methods to Acquire Productive Inputs and Transaction Costs
- Production Function
- Cost Functions
- Long-run Average Cost Curve and its Applications

Introduction

Theoretical basis for business decisions

- Have an insight into the product market, and decide the price and quantity supplied to achieve the goal of profit maximization；
- Have an insight into the factor market, and decide the price and quantity demanded to achieve the goal of profit maximization；and
- Understand the relationship between inputs and outputs in the production process.

Revision

- Quantity supplied refers to the willingness and ability of the producer to offer a given quantity of a commodity to the market.
- Law of supply refers to the direct relationship between changes in commodity prices and changes is quantity demanded, ceteris paribus.

$$Q_s \uparrow = f\,(P \uparrow \;;\; S_1 \downarrow \;,\; S_2 \uparrow \;,\; S_3 \downarrow \uparrow \;,\; S_4 \uparrow)$$

Where： Q_s represents quantity supplied

P represents market price. It is the endogenous variable in the supply function, and its variation cause changes in the quantity supplied.

S_1 represents input prices (or costs)

S_2 represents technology

S_3 represents sellers' expectation of future price movements:

Short run ↓; Long run ↑ (we generally do not look at long run.)

S_4 represents the number of sellers in the market.

S_1 , S_2 , S_3 and S_4 are exogenous variable, their variations cause changes in supply.

Firm objective

The objective of a firm is profit maximization：

Accounting profit	=	Total revenue	-	Explicit costs
Economic profit	=	Total revenue	-	Opportunity costs

The concept of cost

- Explicit Cost：

  Refers to those accounting expenses that is based on objective criteria. For example, wage payment.

- Implicit Cost：

  Refers to all those costs that can not be identified in an objective accounting standards. For example, the capital owned by the firm.

- The opportunity cost (economic costs) of a resource used for a specific purpose is the value of the next-highest-valued alternative use of that resource. The opportunity cost of a particular behavior is the total opportunity cost of the resources they use. When we analyze market mechanism, we use opportunity cost.

Opportunity cost = Explicit cost + implicit cost = Cost

Methods to Acquire Productive Inputs and Transaction Costs

Three ways to acquire inputs

1. Enterprises purchase inputs through spot transactions.
2. Enterprises sign contracts with suppliers for the supply of inputs.
3. Enterprises produce the inputs by themselves (Vertical Integration)

1. Purchase inputs through spot transactions

- Inputs transaction does not involve any subordinate or contractual relationship between buyers and sellers. After the transaction, there is no longer any relationship between them.

- Buyers and sellers are basically anonymous.

- Inputs are usually standardized, which means that enterprises only choose among from all the market suppliers to purchase the amount of inputs.

- The advantage is that both buyers and sellers of inputs can focus on the production of its production (i.e., the sellers are focusing on production of the inputs, and the buyers are focusing on the transformation of inputs into outputs).

2. Enterprises sign contracts with suppliers for the supply of inputs

- Buyers and sellers are bound by the terms which have been set forth by the contracts to conduct the transaction.
- Buyers and sellers have established a long-term transaction relationship
- Not only the transaction risk is lower than purchasing inputs by spot transaction, but it also allows buyers and sellers to focus on their production.
- However, the transaction costs for making contracts is higher than that incurred in the spot purchase.

3. Enterprises produce the inputs by themselves

- Enterprises produce their own required inputs, i.e., vertical integration.
- They do not need to rely on other firms to provide inputs.
- Completely avoid investment risks and transaction costs in the factor market.
- However, enterprises will lose the benefits of specialization, there may even be the case of diseconomies of scale.

Definition of transaction costs

The cost of acquiring a production factor = Costs paid to the factors of production + Transaction costs

Example：

The total labor cost of a project = Wages paid to the workers + The transaction costs of recruiting this group of workers (such as recruitment advertising expense, salaries to the persons who are responsible for the recruitment, and costs of writing labor contracts)

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- Transaction costs is an economics concept referring to the costs other than the money price that are incurred in trading goods or services.

- The paper “The Nature of the Firm” by Coase in 1937 is thought of as the original economic document of the transaction costs theory.

- Any opportunity costs which do not involve in direct production are transaction costs (Steven Cheung).

Categories of transaction costs

- Searching costs are the costs of looking for the supplier of the required goods.
- Negotiating costs are the costs of negotiating inputs price. For example, the opportunity cost of the time spent in the negotiation.
- Contracting costs are the costs of signing a contract when the two parties of an exchange have reached an agreement. For example, the attorney fees.
- Monitoring costs are the costs of monitoring whether the other party is obligated to the contract.
- Enforcement costs are the costs of making sure the other party sticks to the terms of the contract and taking appropriate action if this turns out not to be the case.

Production Function

$$TP = f(L; \overline{K})$$

A production function relates physical output of a production process to physical inputs or factors of production.

The production function: Relationship between input and output in the short run

While fixed factors of production are those factors that their quantity cannot be changed in the short run, variable factors of production are those factors that their quantity can be changed in the short run.

Where: labor (L) is variable cost, capital (K) is fixed cost or sunk cost

$$AP_L = \frac{TP}{L} = \frac{Q}{L}$$

$$MP_L = \frac{\Delta TP}{\Delta L} = \frac{\Delta Q}{\Delta L}$$

The law of diminishing marginal productivity / returns

In the short run and a given state of technology, the addition of a variable factor of production, keeping the other factors of production fixed, will yield increasing marginal productivity /returns per unit of the variable factor added until an input point (the inflection point) is reached beyond which further additions of the variable factor will yield diminishing marginal productivity/returns per unit of the variable factor added.

An example of production function

$$Q = f(L; \overline{K})$$

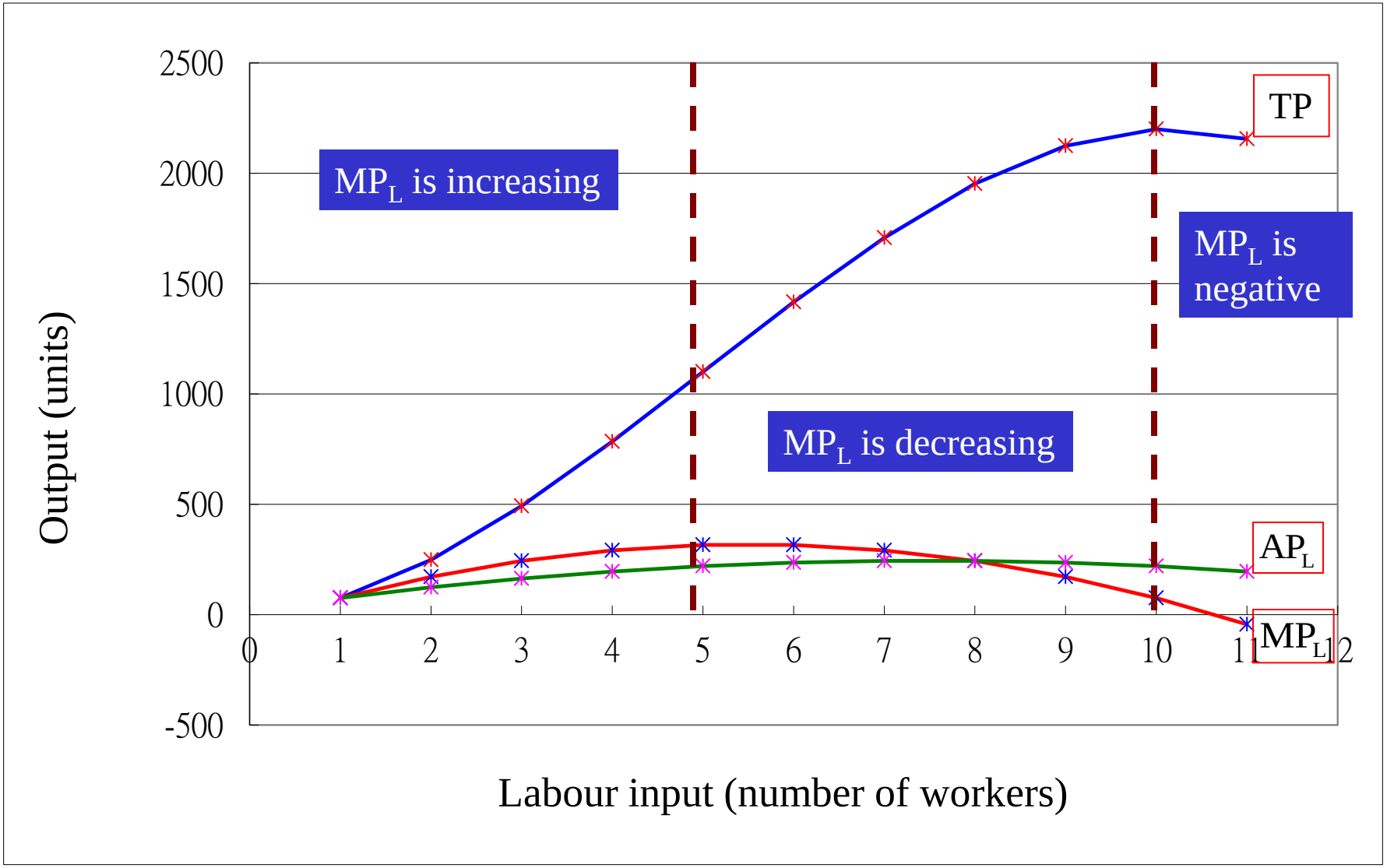
$$MP_L = \frac{\Delta Q}{\Delta L} \qquad AP_L = \frac{Q}{L}$$

Obs	K	L	ΔL	Q	ΔQ	MP_L	AP_L
--	2	0	--	0	--	--	--
1	2	1	1	76	76	76	76
2	2	2	1	248	172	172	124
3	2	3	1	492	244	244	164
4	2	4	1	784	292	292	196
5	2	5	1	1100	316	316	220
6	2	6	1	1416	316	316	236
7	2	7	1	1708	292	292	244
8	2	8	1	1952	244	244	244
9	2	9	1	2124	172	172	236
10	2	10	1	2200	76	76	220
11	2	11	1	2156	-44	-44	196

Max

0

Increasing, diminishing, and negative marginal returns

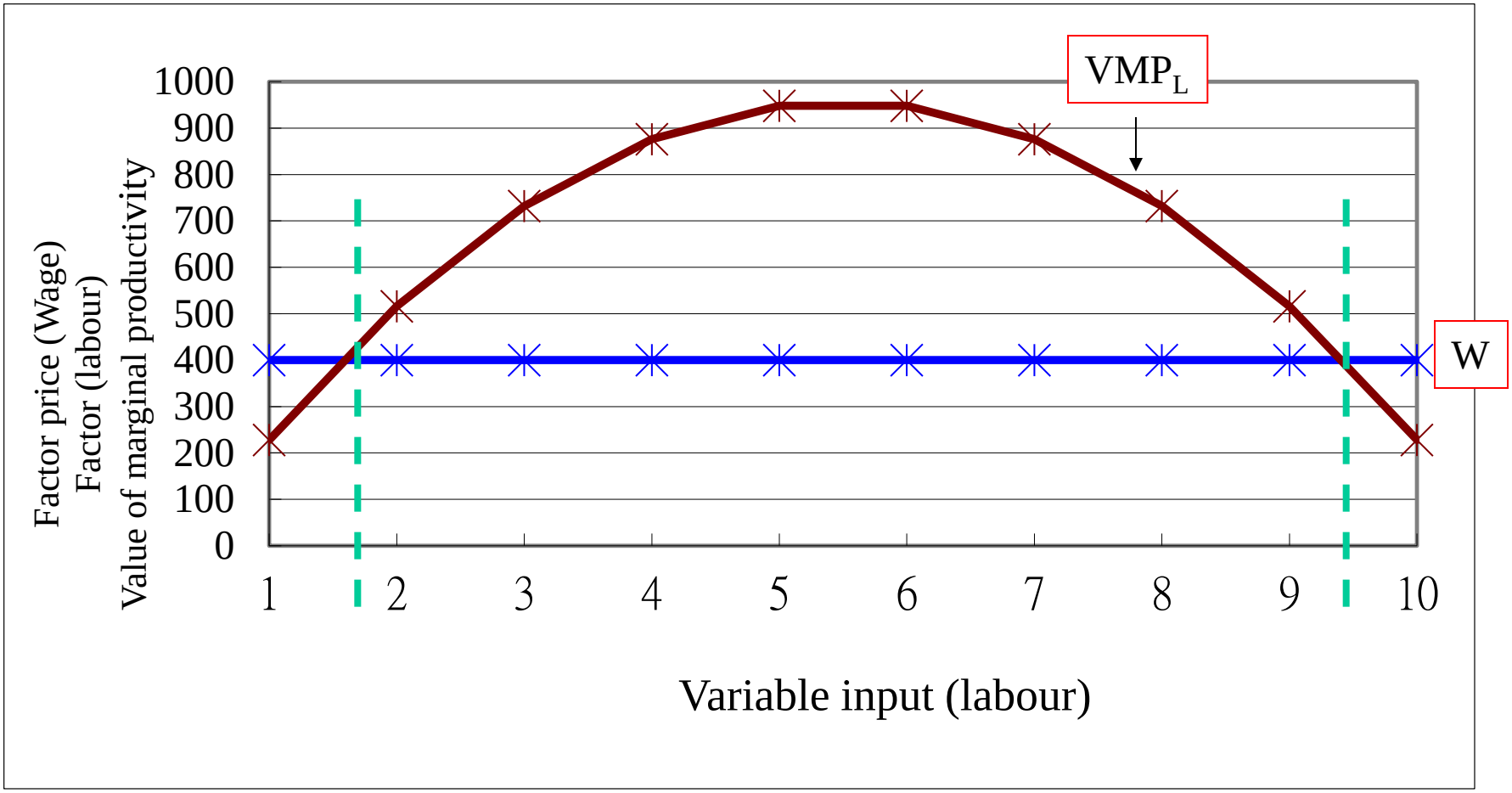


- Stage I： Fixed input grossly underutilized, specialization and teamwork cause average product (AP) to increase when additional labor input is used.

- Stage II: Specialization and teamwork continue to result in greater output when additional labor input is used, and the fixed input is being properly utilized.

- Stage III: Fixed input capacity is reached, and thus additional labor input causes output to fall.

The optimal quantity of a factor input (Labor)



$VMP_L = P \times MP_L$

W = The market price of labour

The firm's marginal benefit)

The firm's marginal cost)

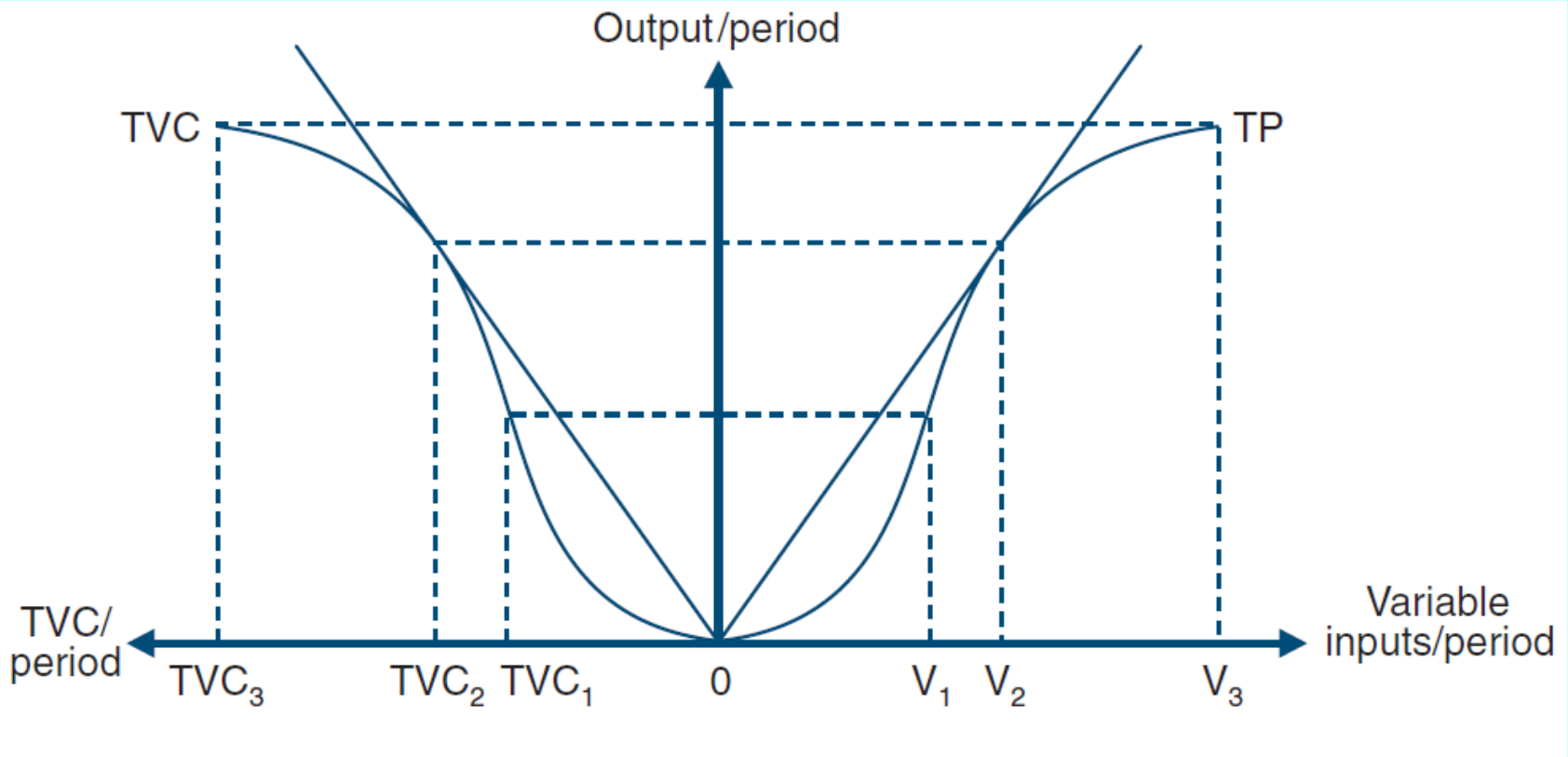
Cost function

A cost function is a mathematical formula used to present the relationship between the cost and the level of output.

Assuming that there are only two factors of production, labor and capital, used in the production of one good X. Further assume that the firm purchases both factors in perfectly competitive markets at given factor prices, P_K and P_L. Total cost is then defined to be:

$$TC = P_K \times Q_K + P_L \times Q_L$$

Graphical Derivation of the TVC curve from the TP curve



Plotting TP and TVC illustrates that they are mirror images of each other.

TC=TFC+TVC

$P_L = \$400$ $VMP_L = P \times MP_L$ $P_K = \$2000$

Obs	Labour L	(P_L x L) TVC	Q	Price ($) P	MP_L	VMP_L	K	(P_K x K) TFC	(TFC+TVC) TC
--	0	--	0	3	--	--	2	--	--
1	1	400	76	3	76	228	2	4000	4400
2	2	800	248	3	172	516	2	4000	4800
3	3	1200	492	3	244	732	2	4000	5200
4	4	1600	784	3	292	876	2	4000	5600
5	5	2000	1100	3	316	948	2	4000	6000
6	6	2400	1416	3	316	948	2	4000	6400
7	7	2800	1708	3	292	876	2	4000	6800
8	8	3200	1952	3	244	732	2	4000	7200
9	9	3600	2124	3	172	516	2	4000	7600
10	10	4000	2200	3	76	228	2	4000	8000

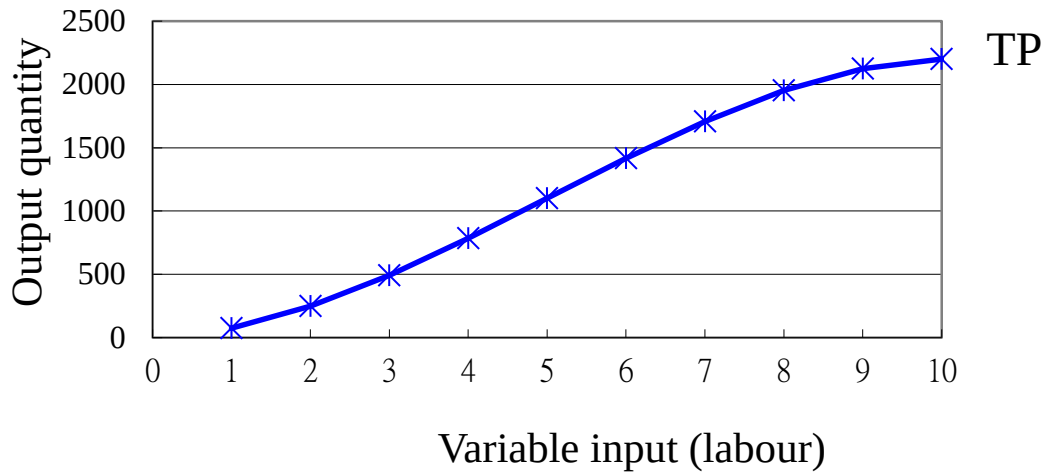
Y axis X axis

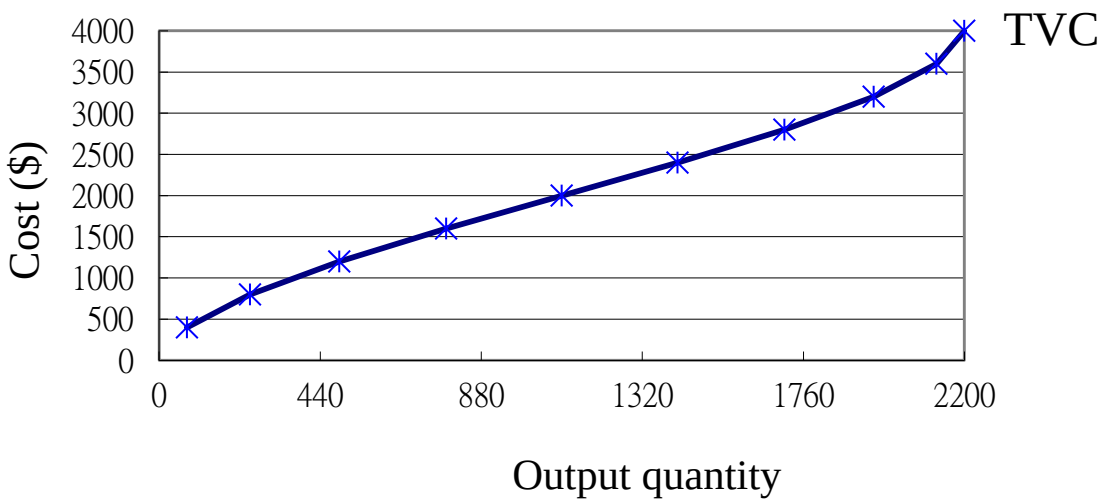
TVC curve

X axis Y axis

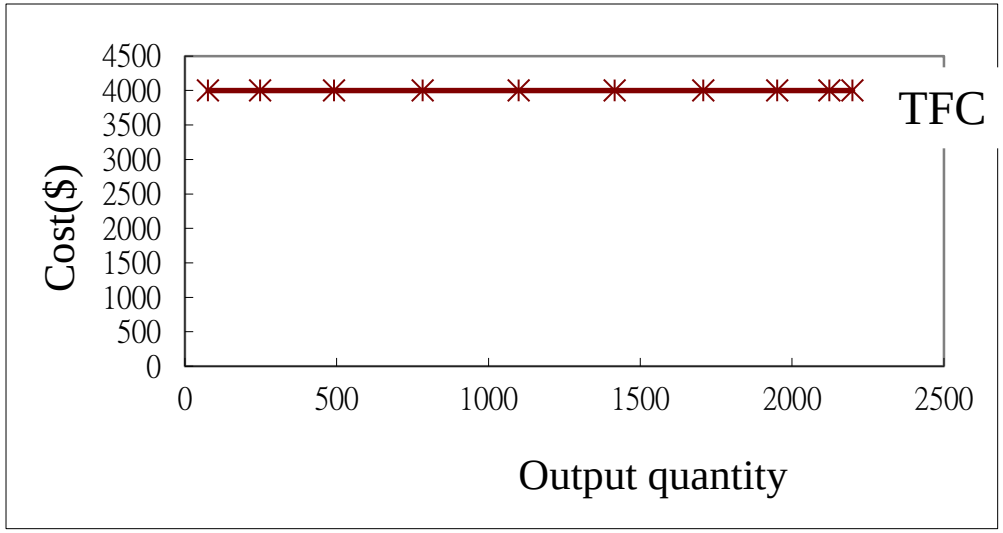
TP curve

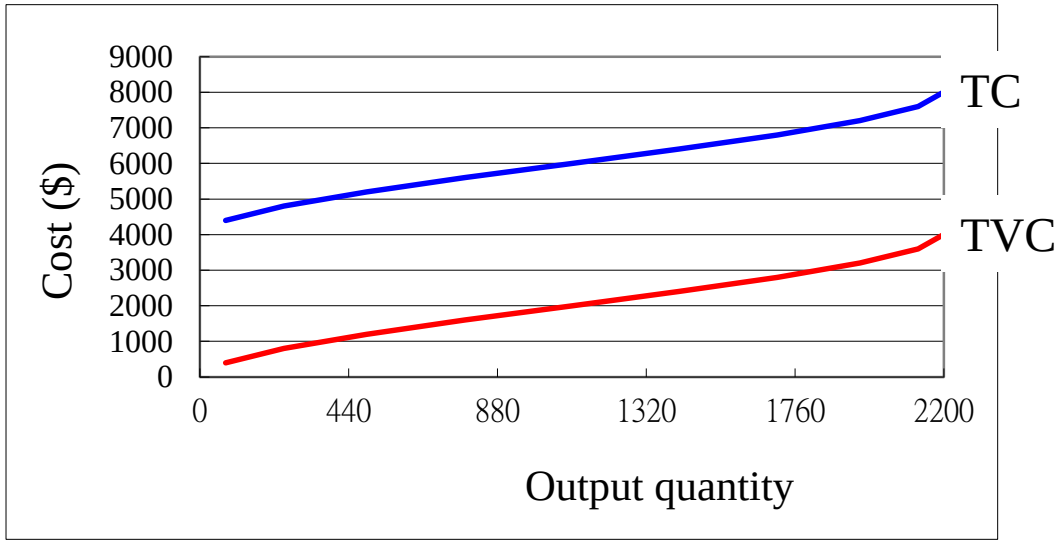
Total product curve and total variable cost curve



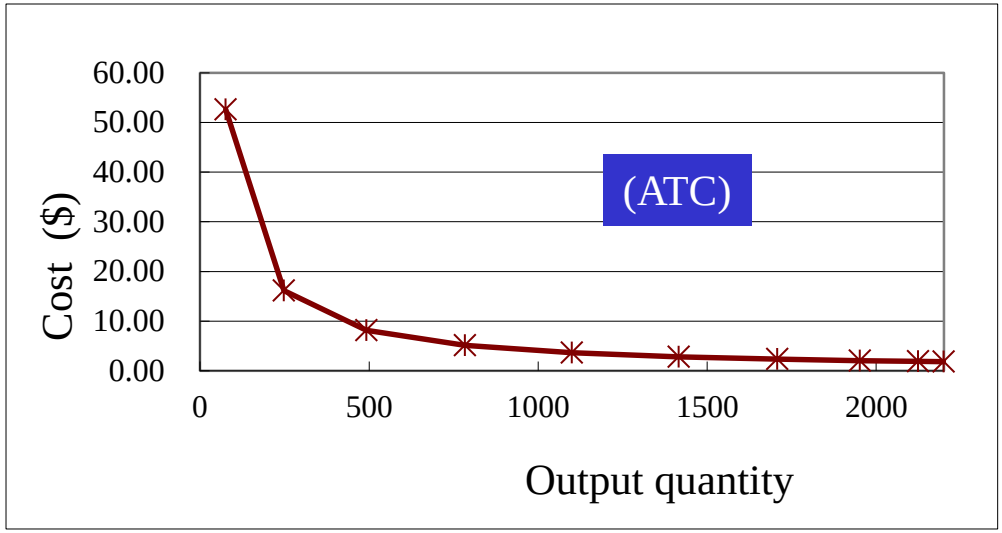


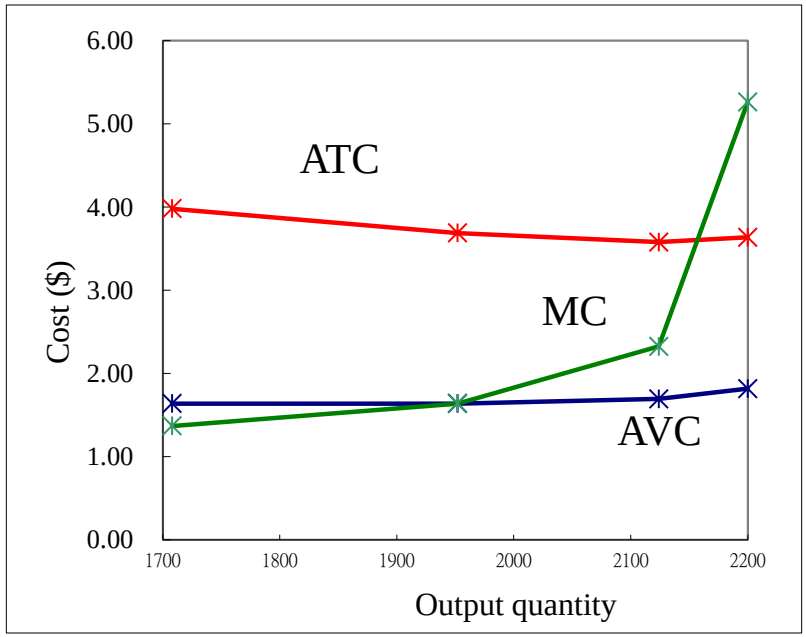
Total variable cost curve, total fixed costs, and the total cost curve



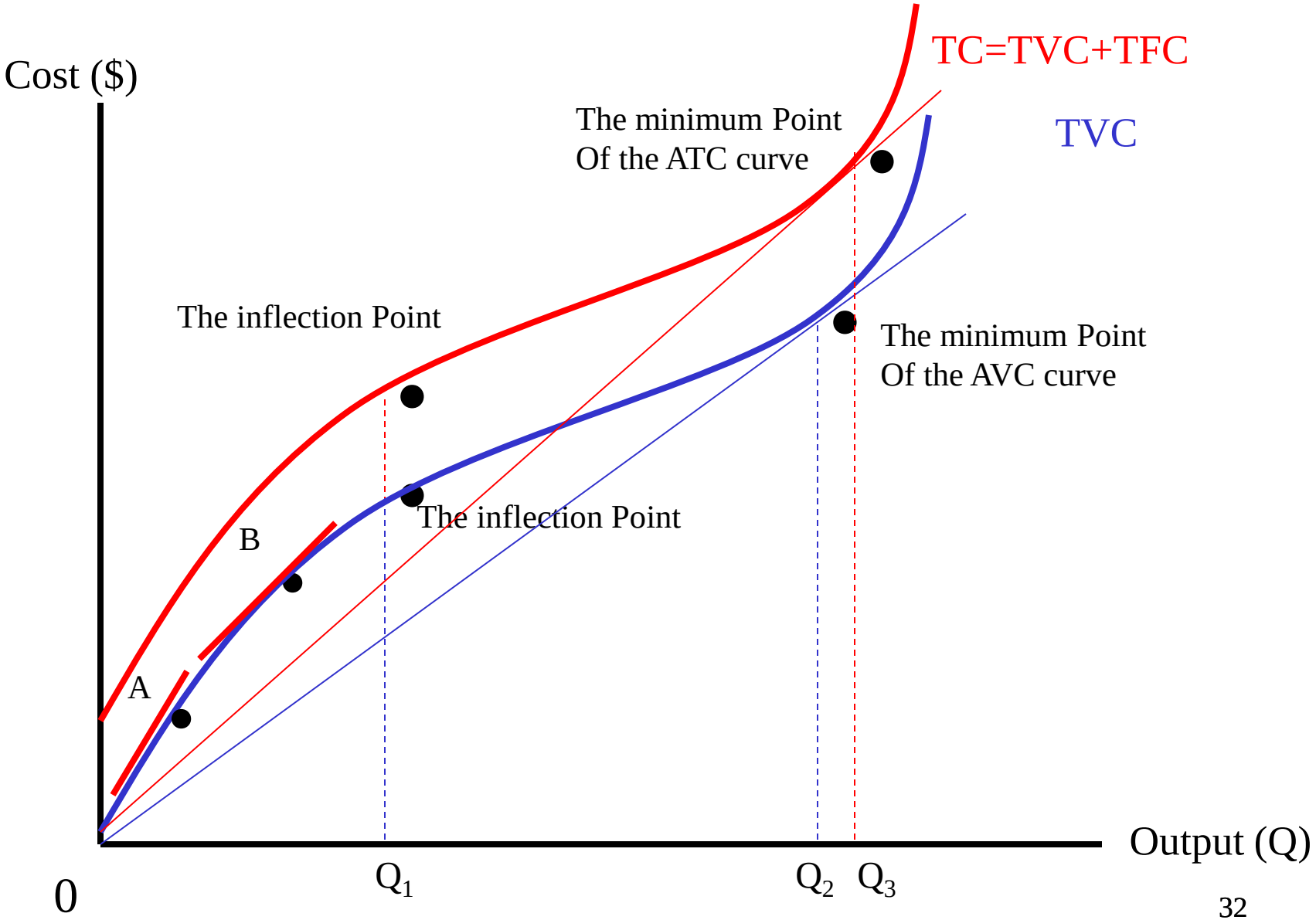


Average variable cost, average fixed cost, average total cost, and the marginal cost curve



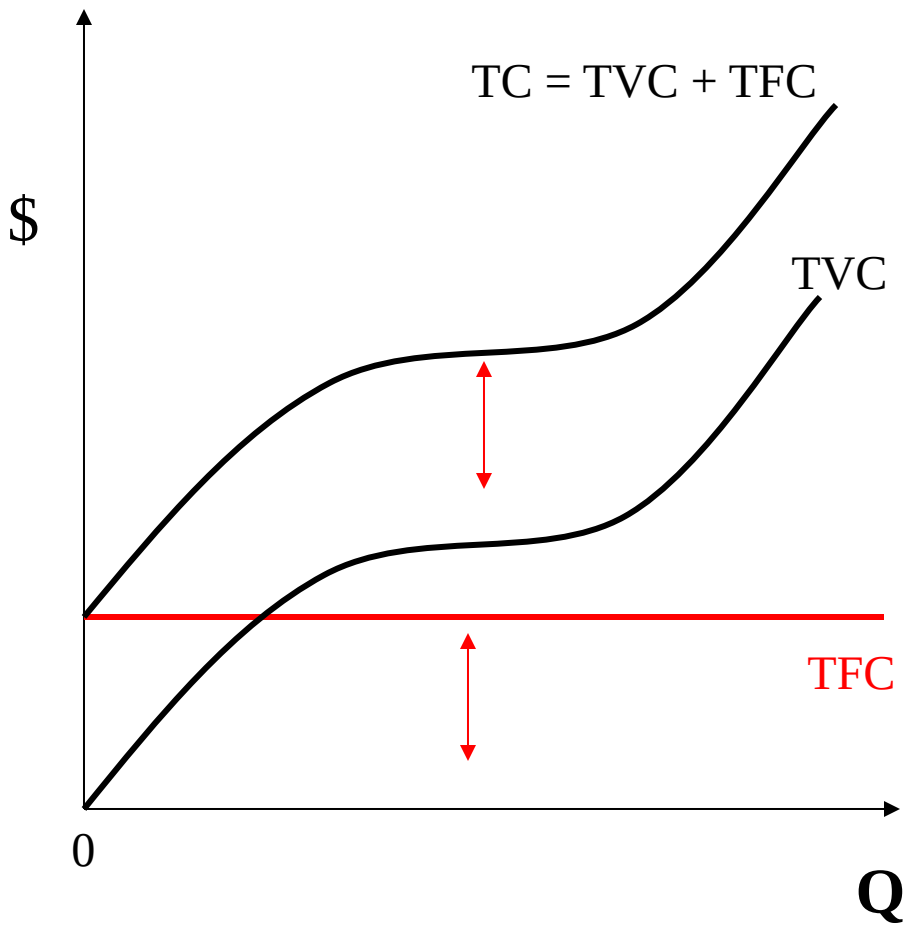


Typical total cost curves

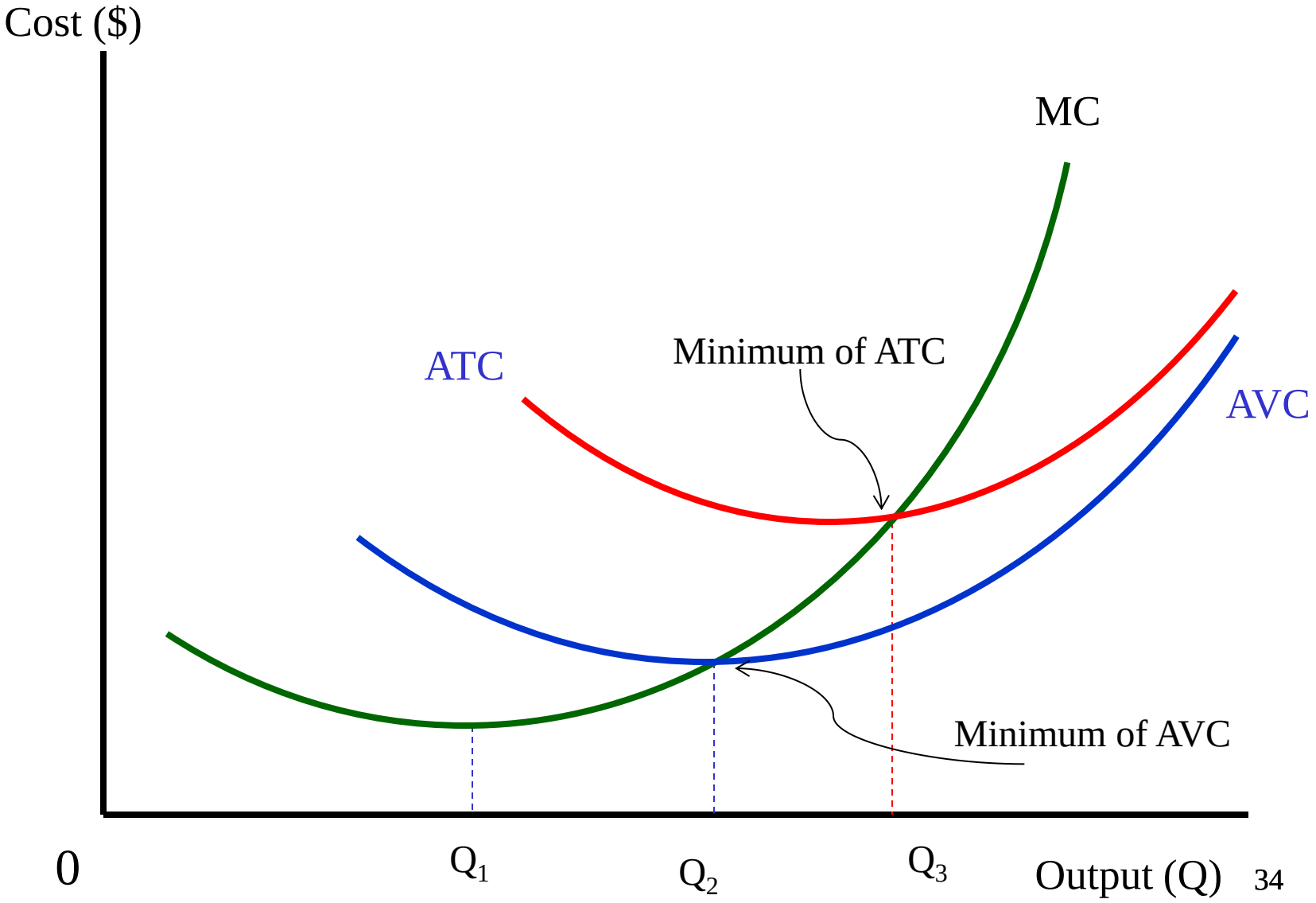


TFC does not change as output changes.

Question:
Sunk Cost: A cost that is forever lost after it has been paid. Why decision makers should ignore sunk costs to maximize profit or minimize losses?



Typical average cost curves



Marginal cost (MC) is the cost of producing an additional unit of output, that is, the change in cost attributable to the last unit of output.

$$MC = \frac{\Delta TC}{\Delta Q}$$

MC can also be expressed as the change in TVC associated with a change in output.

$$MC = \frac{\Delta TC}{\Delta Q} = \frac{\Delta(TFC + TVC)}{\Delta Q} = \frac{\Delta TFC}{\Delta Q} + \frac{\Delta TVC}{\Delta Q} = 0 + \frac{\Delta TVC}{\Delta Q}$$

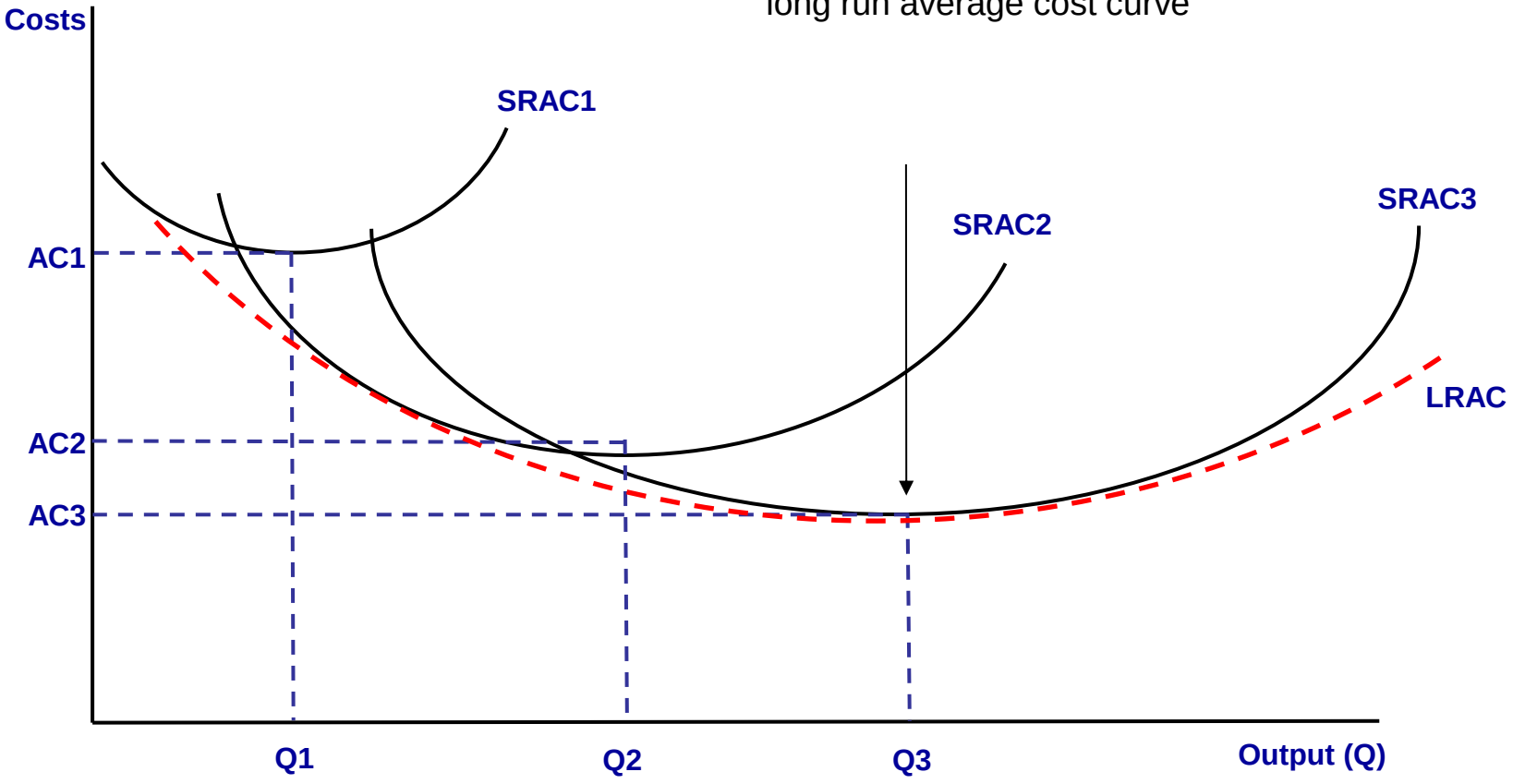
Long-run Average Cost Curve and its Applications

The nature of the LRAC curve

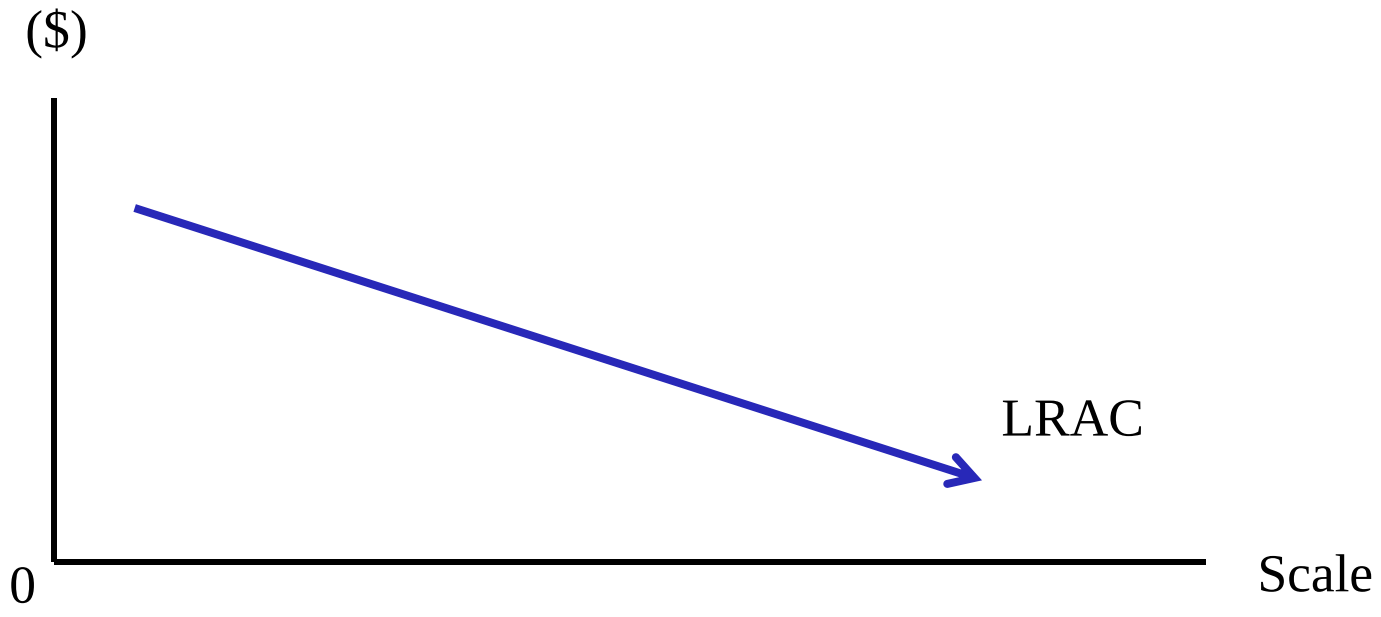
- It is a curve that defines the minimum average cost of producing alternative levels of output, allowing for optimal selection of both fixed and variable factors of production.
- It can only be tangent to the minimum point of the lowest short-run ATC curve corresponding to a given output level.
- It is the lower envelope of all the short-run average cost curves.

The long-run average cost curve

Productive efficiency in the long run is achieved when output is produced at the bottom of the long run average cost curve

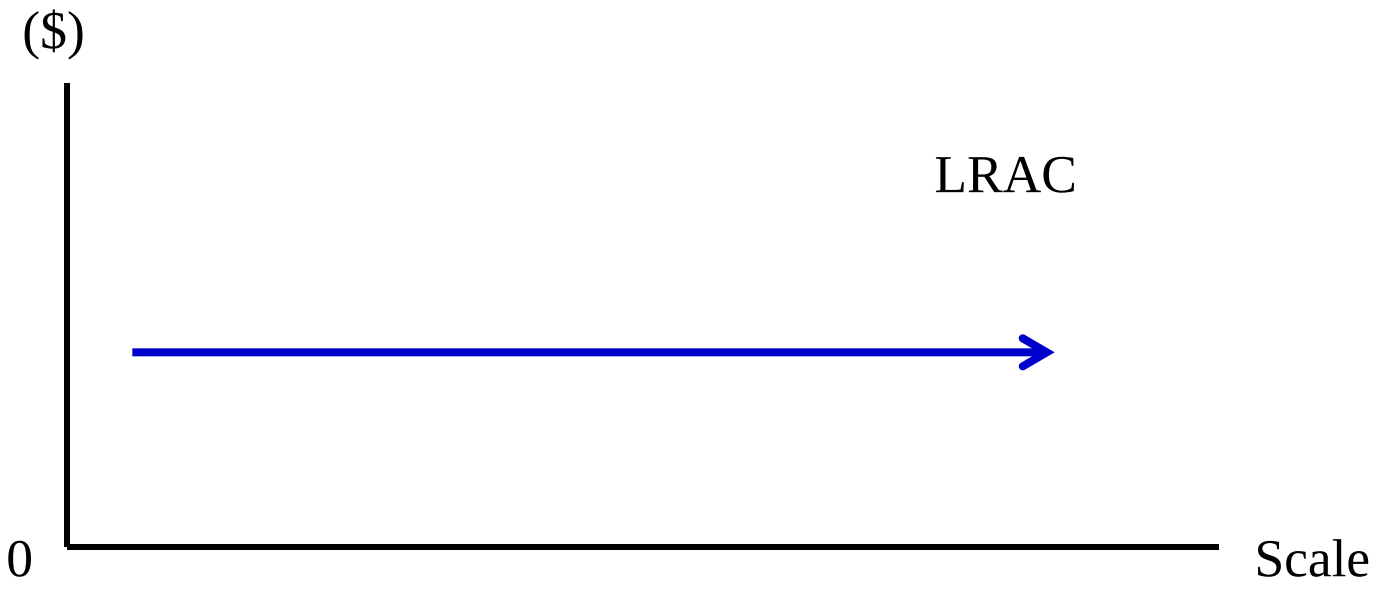


Three typical LRAC curve



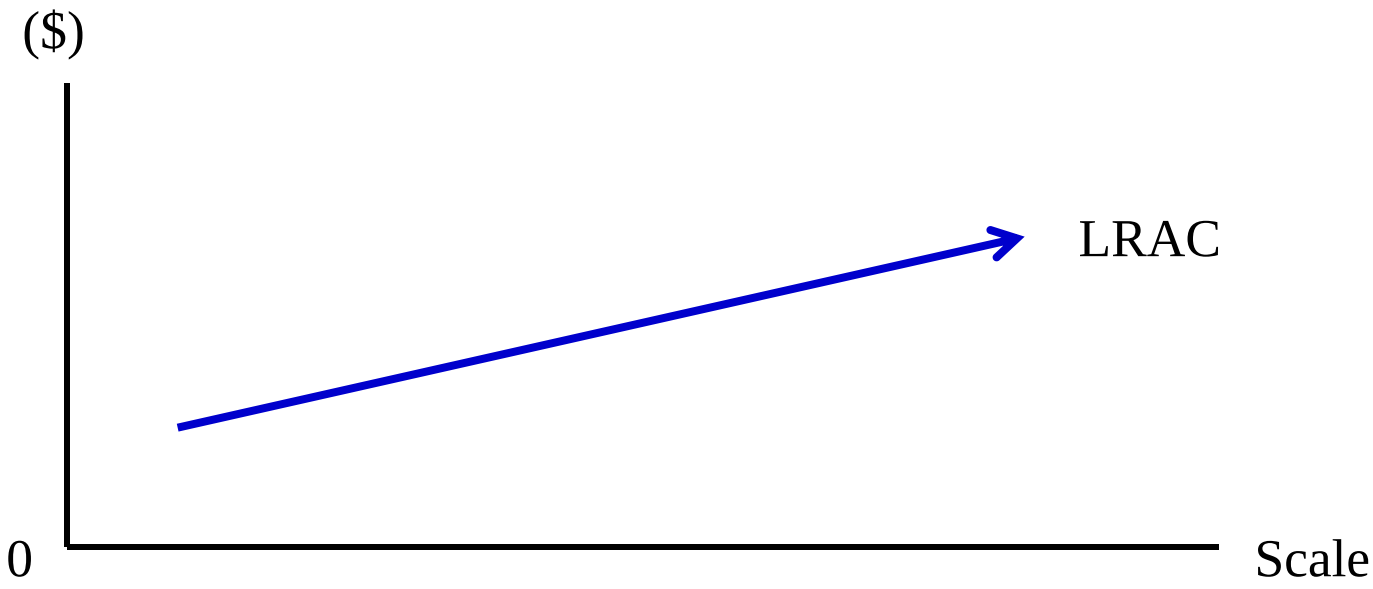
Economies of scale Exist when long run average costs decline as output is increased.

Examples are the automobile and publishing industries.



Constant returns to scale Exist when long run average costs remain constant as output is increased.

Examples are the food processing and appliance industries.



Diseconomies of scale Exist when long run average costs rise as output is increased.

Examples are the retailing and tourism industries.

Thank you
for your attention!