

PART II:

MICROECONOMICS

CHAPTER II: DEMAND AND SUPPLY

I. THEORY OF THE DEMAND

- **Quantity demanded** is the amount of a good that buyers are willing and able to purchase at various prices in a given period of time, other things remaining unchanged (*Ceteris Paribus*).
- **Demand** is a full description of how the quantity demanded changes as the price of the good changes.
- A ***demand schedule*** is a tabular listing that shows how much of a given product a household would be willing to buy at d/t prices in a given period of time.

Demand ... cont'd

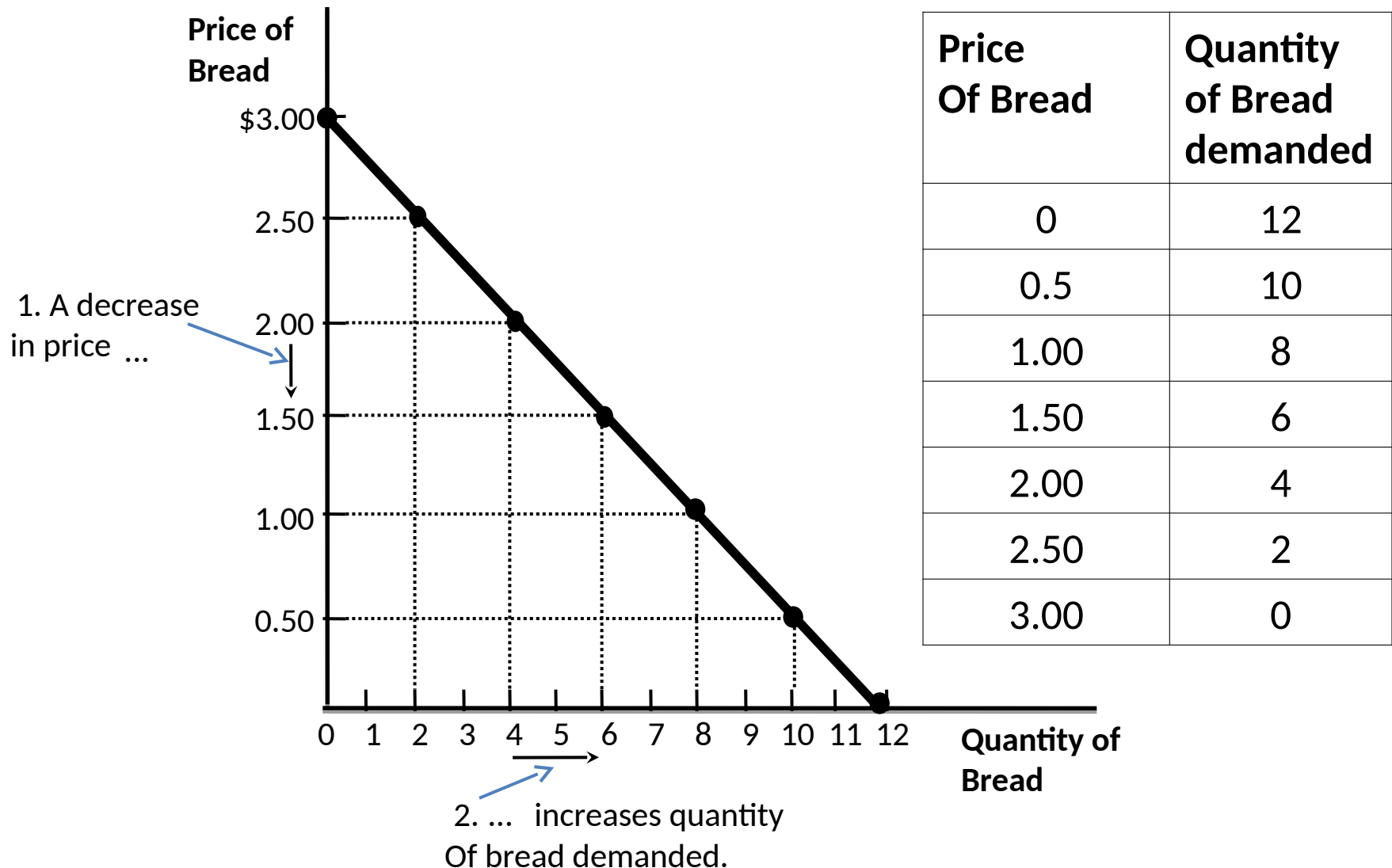
- The ***demand curve*** is a graph illustrating how much of a given product a household would be willing to buy at various prices in a given period of time, ceteris paribus.
- Individual demand can also be expressed in the form of mathematical equation (demand function).

$Q_d = f(P)$ is direct demand function

$P = f(Q_d)$ is inverse demand function

- Where Q_d is quantity demanded and P is the price

Mr. X's Demand Schedule and Demand Curve



Law of Demand

- The law of demand states that
 - **the quantity demanded of a good falls when the price of the good rises**, and vice versa, provided all other factors that affect buyers' decisions are unchanged;
 - Hence, The ***law of demand*** states that there is a negative or inverse relationship b/n the quantity of a good demanded and its price.
- ⇒ quantity demanded of a good is inversely related to its price, *provided* all other factors are unchanged.

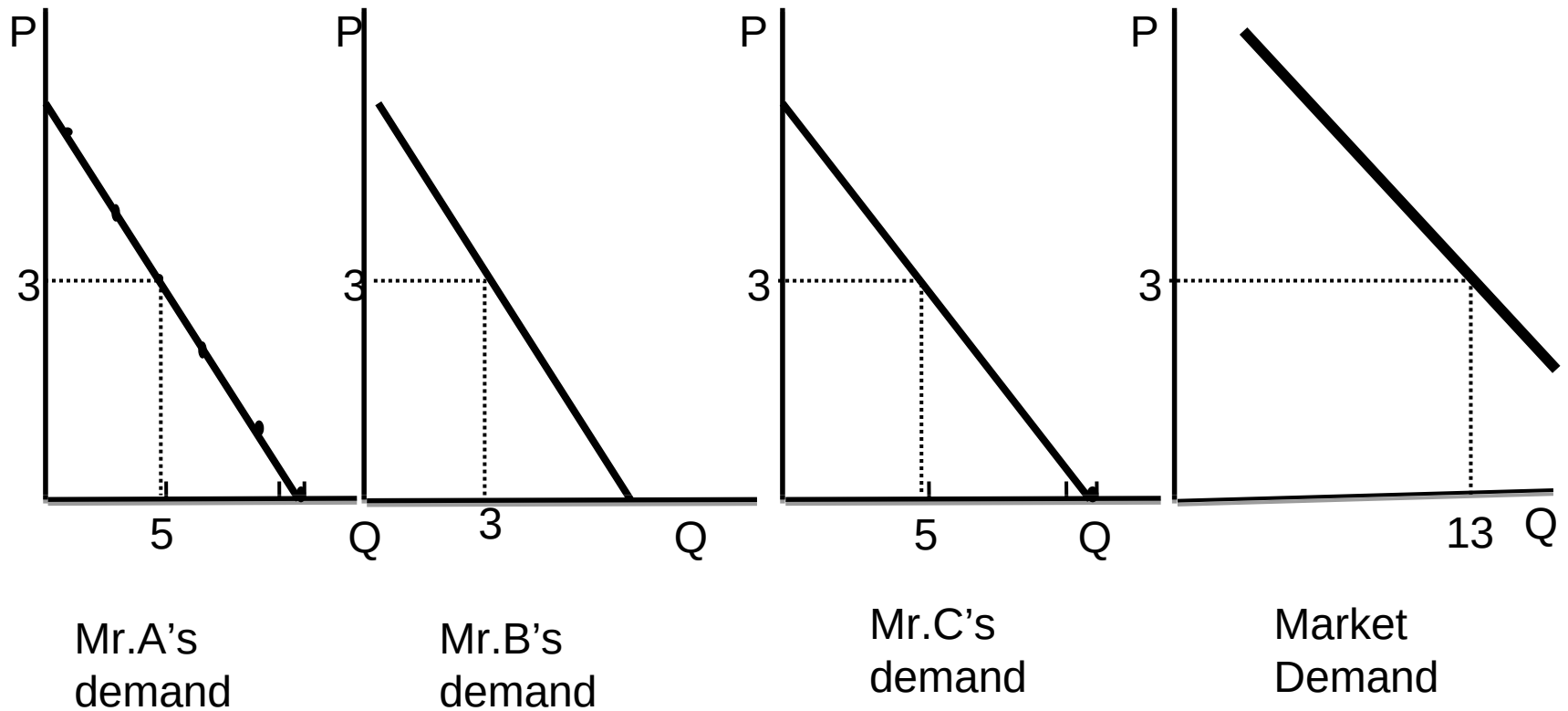
Individual and market Demand

- Demand for a good or service can be defined for an *individual household*, or for a group of households that make up a *market*;
- *Market demand* is the sum of all the quantities of a good or service demanded per period by all the households buying in the market for that good or service.

Market demand

	Quantity Demanded/week			Market Demand/week
Price	Mr.A	Mr.B	Mr.C	
6	2	0.5	1.5	4
5	3	1.5	2.5	7
4	4	2	4	10
3	5	3	5	13
2	6	4.5	5.5	16
1	7	6	7	20

Market demand graphically:



Determinants of Demand

The demand for a product is determined or influenced by:

- **Price** of a product (goods & services);
- Taste or preference of consumers;
- **Consumer Income & wealth:**
 - as income increases the demand for a ***normal good*** will increase;
 - as income increases the demand for an ***inferior good*** will decrease.

Determinants of Demand ... cont'd

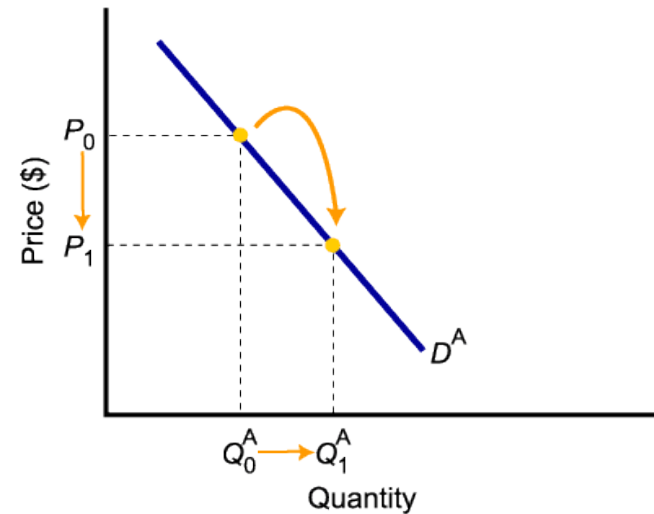
- Prices of related goods & services:
 - When a fall in the price of one good reduces the demand for another good, the two goods are called ***substitutes***;
 - When a fall in the price of one good increases the demand for another good, the two goods are called ***complements***.
- Consumer expectations of future income or price;
- Number of buyers (population size); and
- Others (religion, weather, ...).

A change in Demand V_s a change in Quantity Demanded

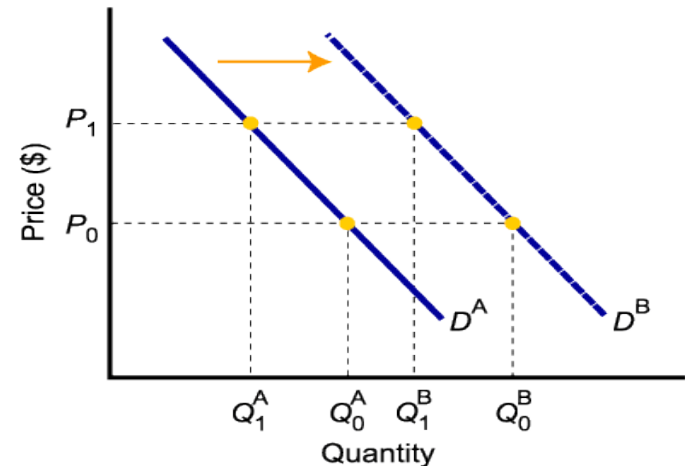
- A change in ***demand*** is not the same as a change in ***quantity demanded***;
- A higher price causes lower ***quantity demanded*** and a move along the demand curve;
- Changes in the determinants of demand, other than price, cause a change in ***demand***, or a ***shift*** of the entire demand curve.

Graphically: A Change in Demand Versus a Change in Quantity Demanded

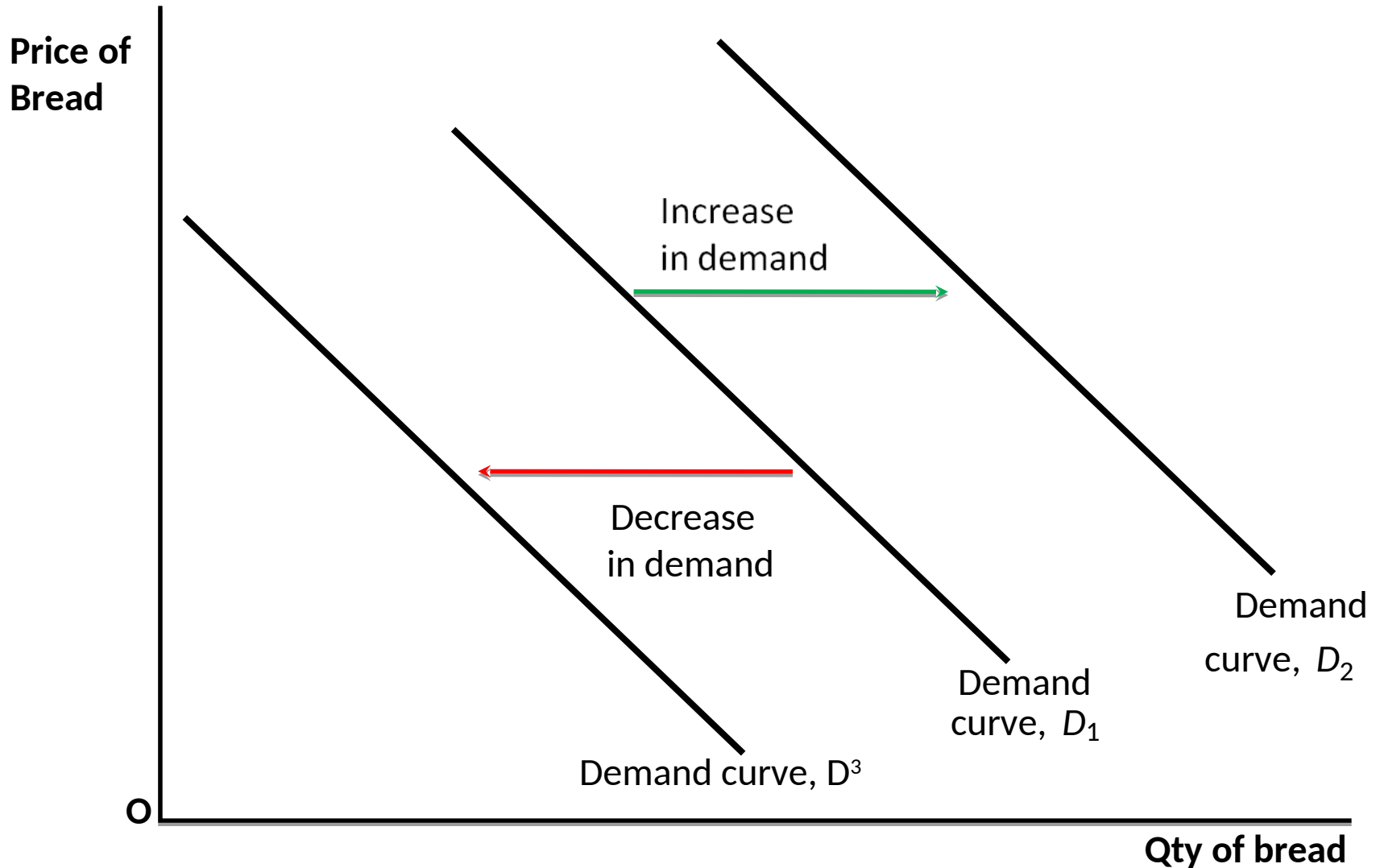
Change in price of a good or service leads to Change in *quantity demanded* (**Movement along the curve**).



Change in income, preferences, or prices of other goods or services leads to Change in demand (**Shift of the curve**).



Shifts of the Demand Curve



II. ***THEORY OF SUPPLY***

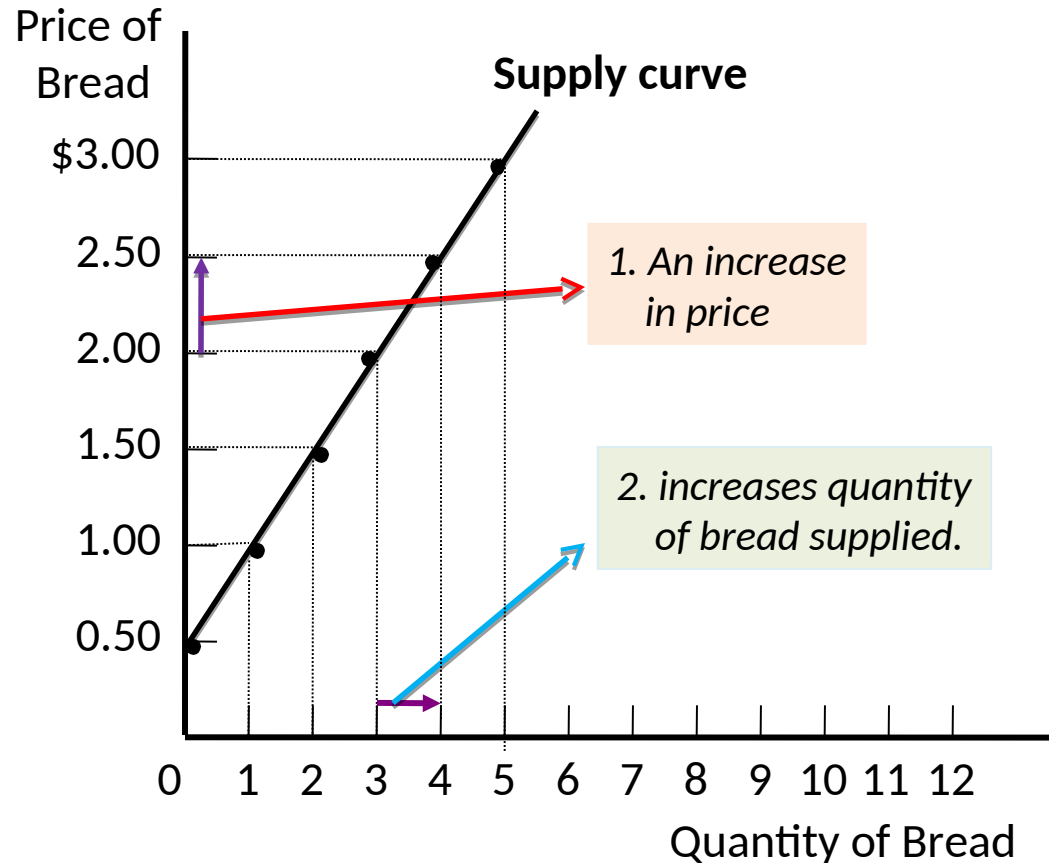
- **Supply** indicates the various quantities of a product that sellers (producers) are willing and able to provide at each of a series of possible prices in a given period of time, other things remain unchanged;
- ***Supply*** is a full description of how the quantity supplied of a commodity responds to changes in its price (**After all, we use SS as short spell of supply*);
- A ***supply schedule*** is a table showing how much of a given product a firm would be willing to sell at different prices in a given period of time.

Supply... cont'd

- The ***supply curve*** is a graph illustrating how much of a given product a firm would be willing to sell at different prices in a given period of time;
- Supply curve can also be expressed in the form of mathematical equation, which is called supply function.

Mr.X's supply schedule and supply curve

Price of Bread	Quantity of Bread supplied
\$0.00	0 cones
0.50	0
1.00	1
1.50	2
2.00	3
2.50	4
3.00	5



Hypothetical SS schedule: Quantity of SS increase as Price rises

Law of Supply

- The *law of supply* states that, **the quantity supplied of a good rises when the price of the good rises**, as long as all other factors that affect suppliers' decisions are unchanged.

Individual Supply and Market Supply

- The supply of a good or service can be defined for an individual firm, or for a group of firms that make up a market or an industry;
- ***Market supply*** is the sum of all the quantities of a good or service supplied per period by all the firms selling in the market for that good or service;
- ***Market supply*** is the horizontal summation of individual firms' supply curves.

Market supply

	Quantity supplied/week			Market supply/week
<i>Price</i>	<i>Seller A</i>	<i>Seller B</i>	<i>Seller C</i>	
6	9	7	8	24
5	7.5	6	6	19.5
4	6	5	5	16
3	4.5	4	4.5	13
2	3	3	3	9
1	1.5	2	2.5	6

Market supply graphically:

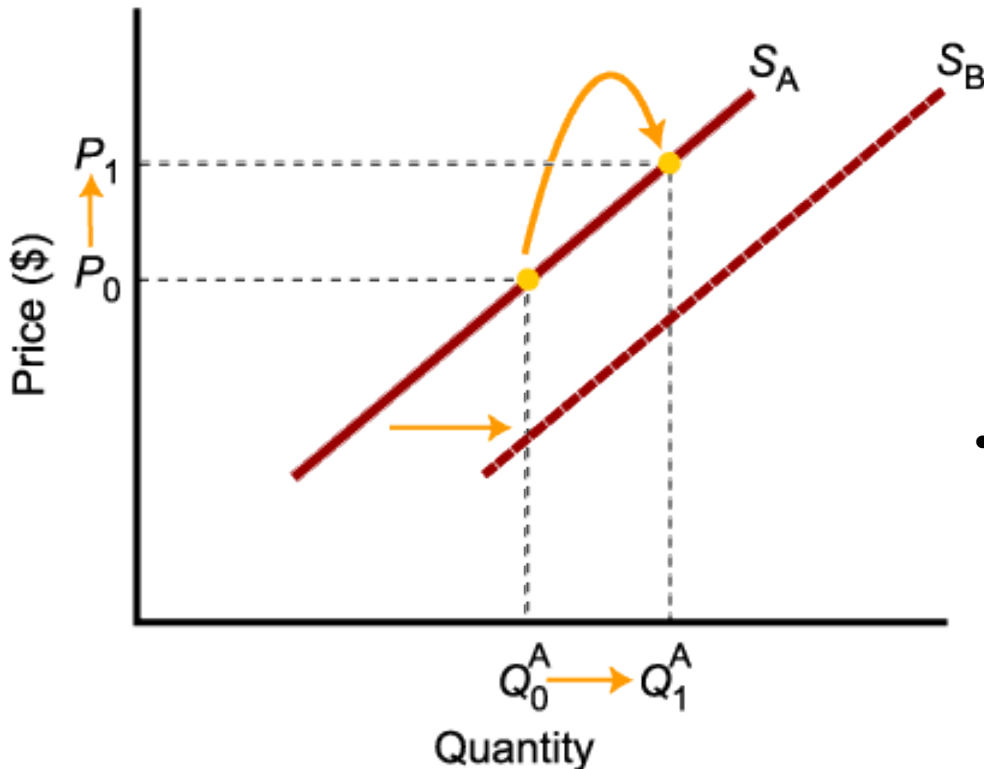


Determinants of Supply

The supply of a product is determined/influenced by:

- 🍷 Price of the product;
- 🍷 Input prices(cost of inputs);
- 🍷 Technology;
- 🍷 Sellers expectation of price of the product;
- 🍷 Number of sellers (short run);
- 🍷 Taxes and subsidies; and
- 🍷 Weather

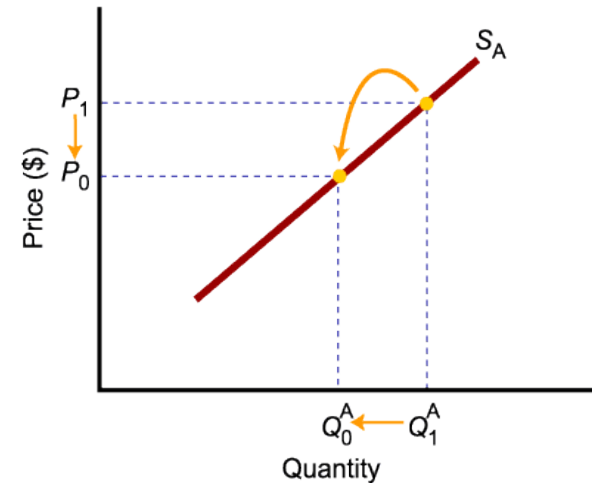
Change in quantity supplied and change in supply



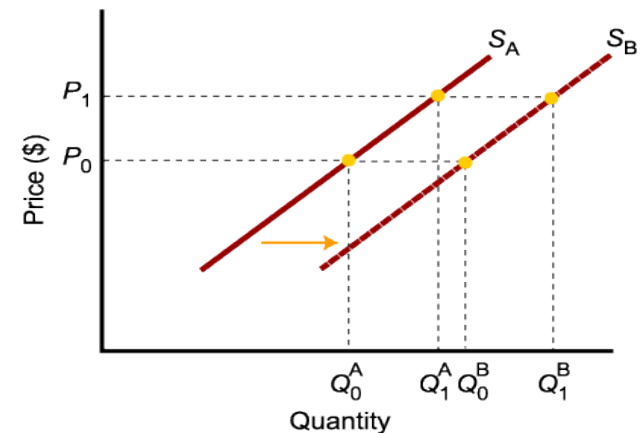
- A higher price causes **higher quantity supplied**, and a **move along** the SS curve.
- A change in determinants of SS other than price causes an **increase in SS**, or a **shift** of the entire supply curve, from S_A to S_B .

Shift of supply Versus movement along a supply curve

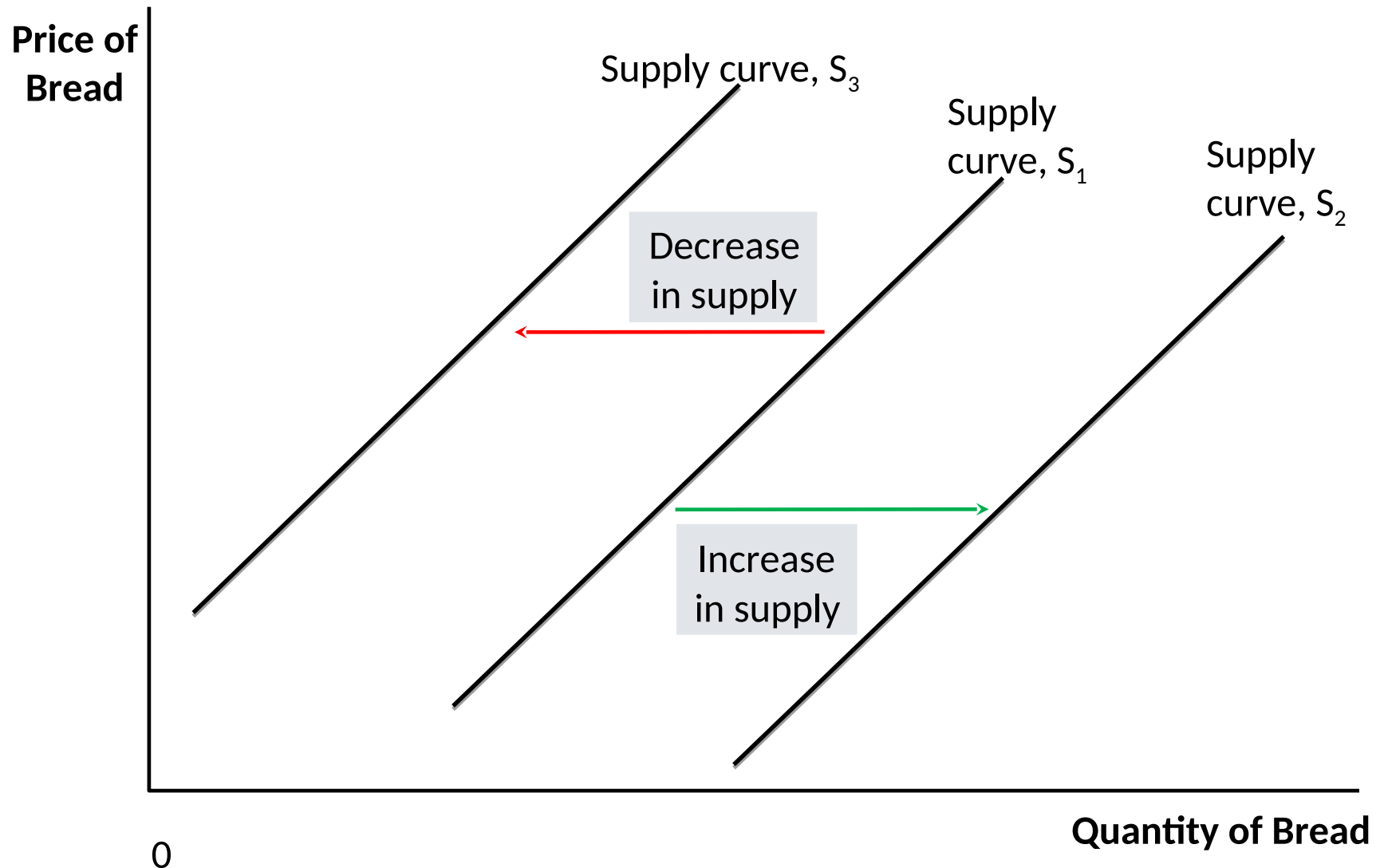
Change in price of a good or service leads to Change in *quantity supplied* (**Movement along the curve**).



Change in costs, input prices, technology, or prices of related goods and services leads to Change in supply (**Shift of curve**).



Shifts in the Supply Curve: What causes them?

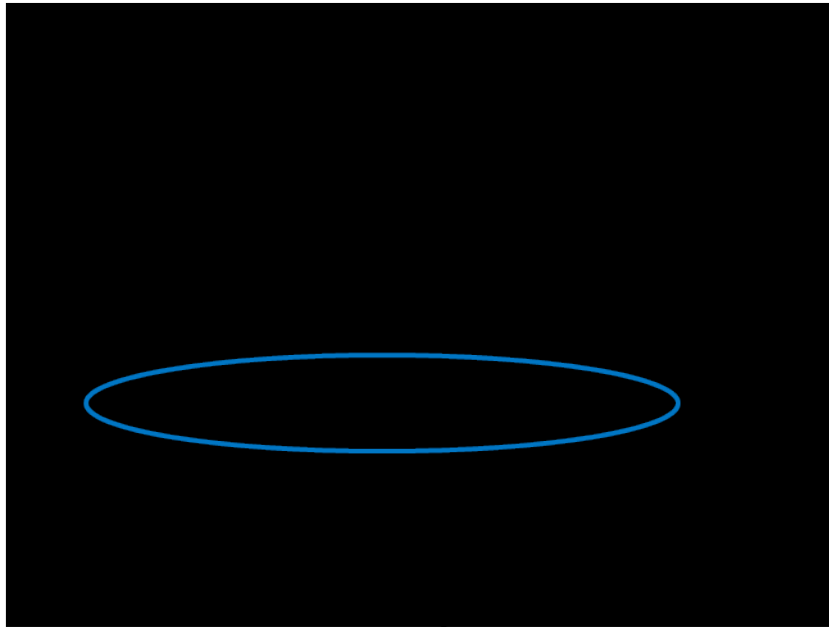


III. MARKET EQUILIBRIUM

- We assume that the price will automatically reach a level at which the quantity demanded equals the quantity supplied;
- The operation of the market depends on the interaction between buyers and sellers;
- An ***equilibrium*** is the condition that exists when quantity supplied and quantity demanded are equal;
- At equilibrium, there is no tendency for the market price to change.

Mkt Equilibrium ... cont'd

Demand Schedule

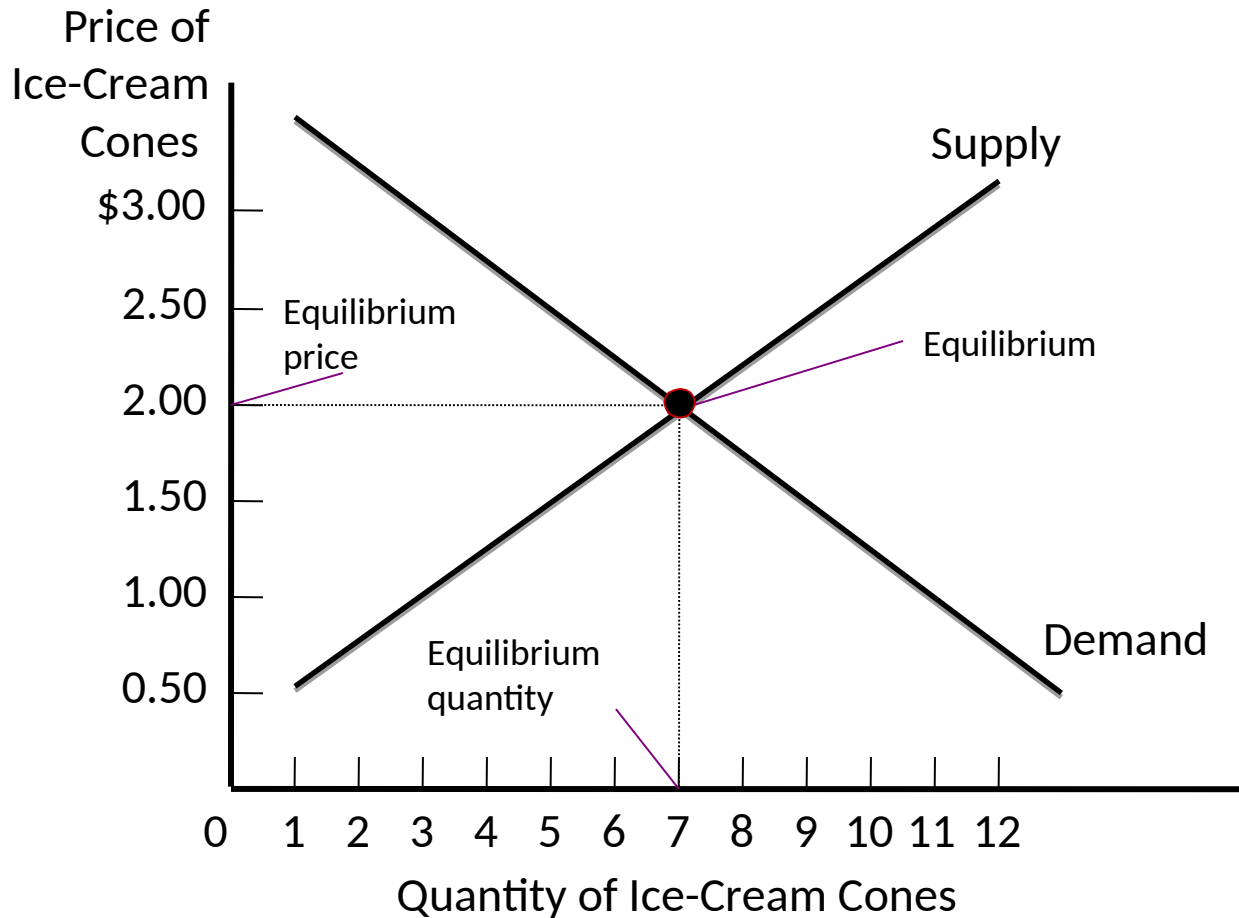


Supply Schedule

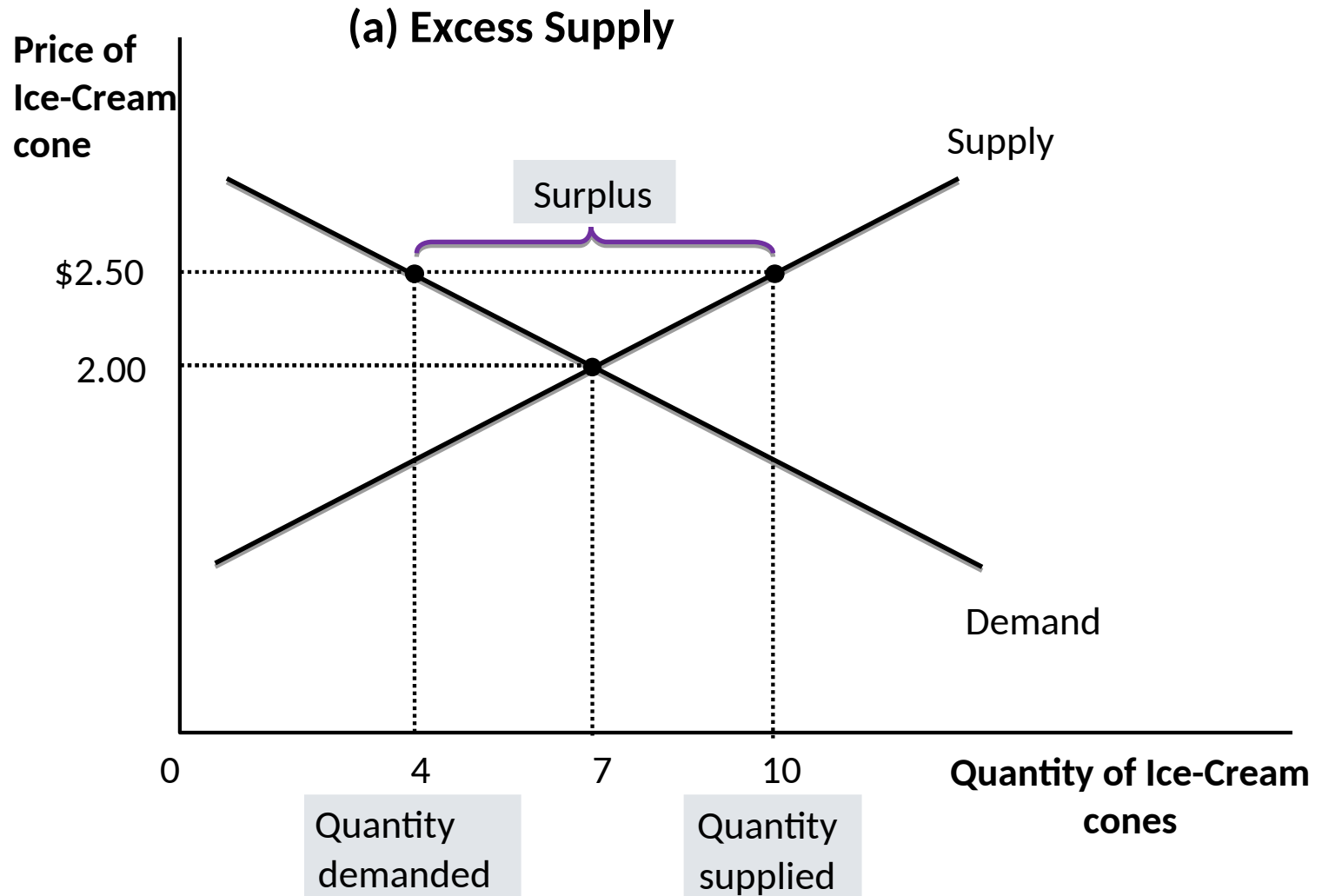
Price of Ice-Cream Cone	Market
\$0.00	0
0.50	0
1.00	1
1.50	4
2.00	7
2.50	10
3.00	13

At \$2.00, the quantity demanded is equal to the quantity supplied!

Mkt Equilibrium ... cont'd



Markets Not in Equilibrium



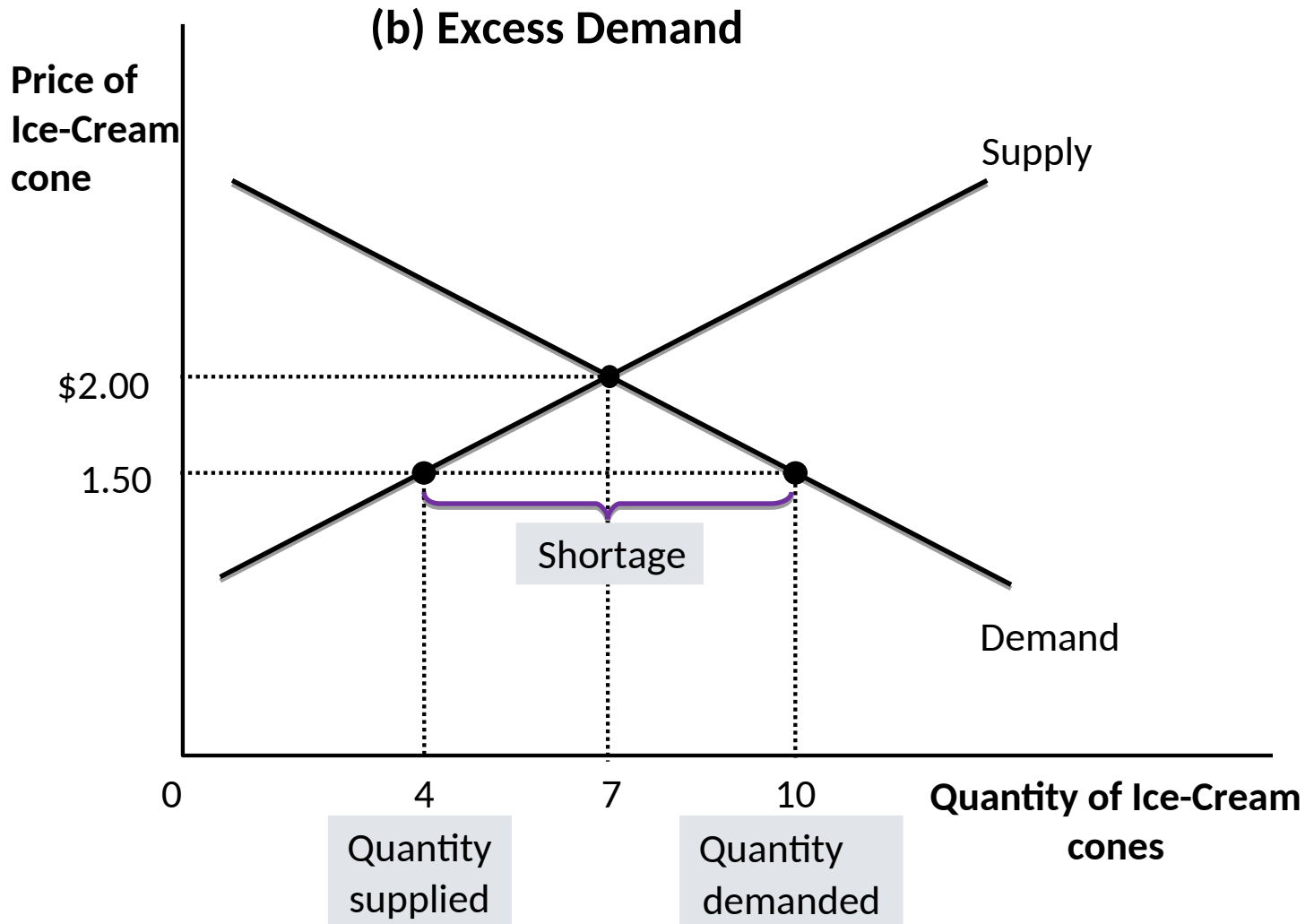
Mkts not in Equilibrium ... cont'd

- ***Surplus***

- When price exceeds equilibrium price, then quantity supplied is greater than quantity demanded:

- There is excess supply or a surplus;
 - Suppliers will lower the price to increase sales, thereby moving toward equilibrium;
 - ***Excess supply***, or surplus, is the condition that exists when quantity supplied exceeds quantity demanded at the current price.

Mkts not in Equilibrium ... cont'd

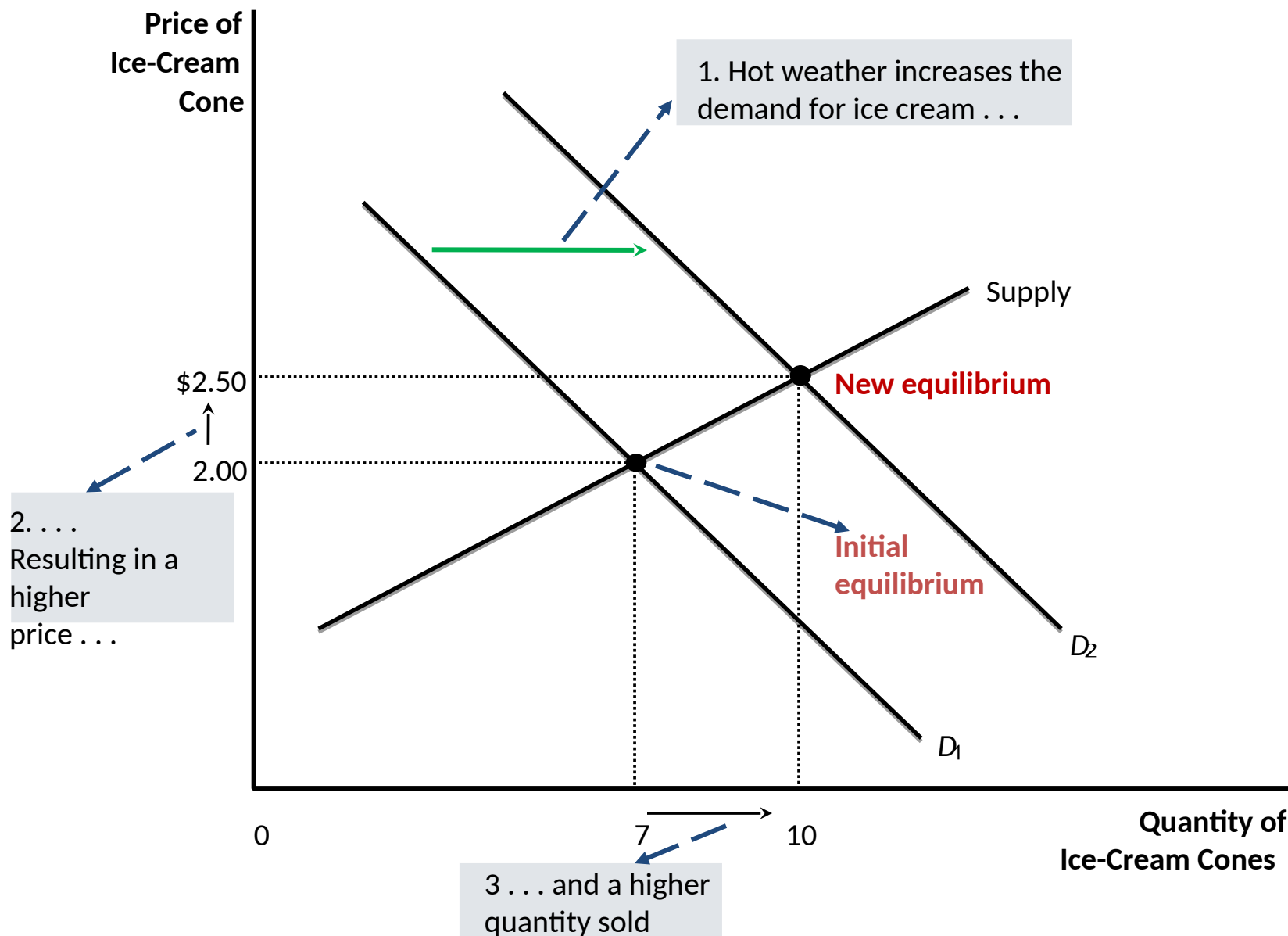


Mkts not in Equilibrium ... cont'd

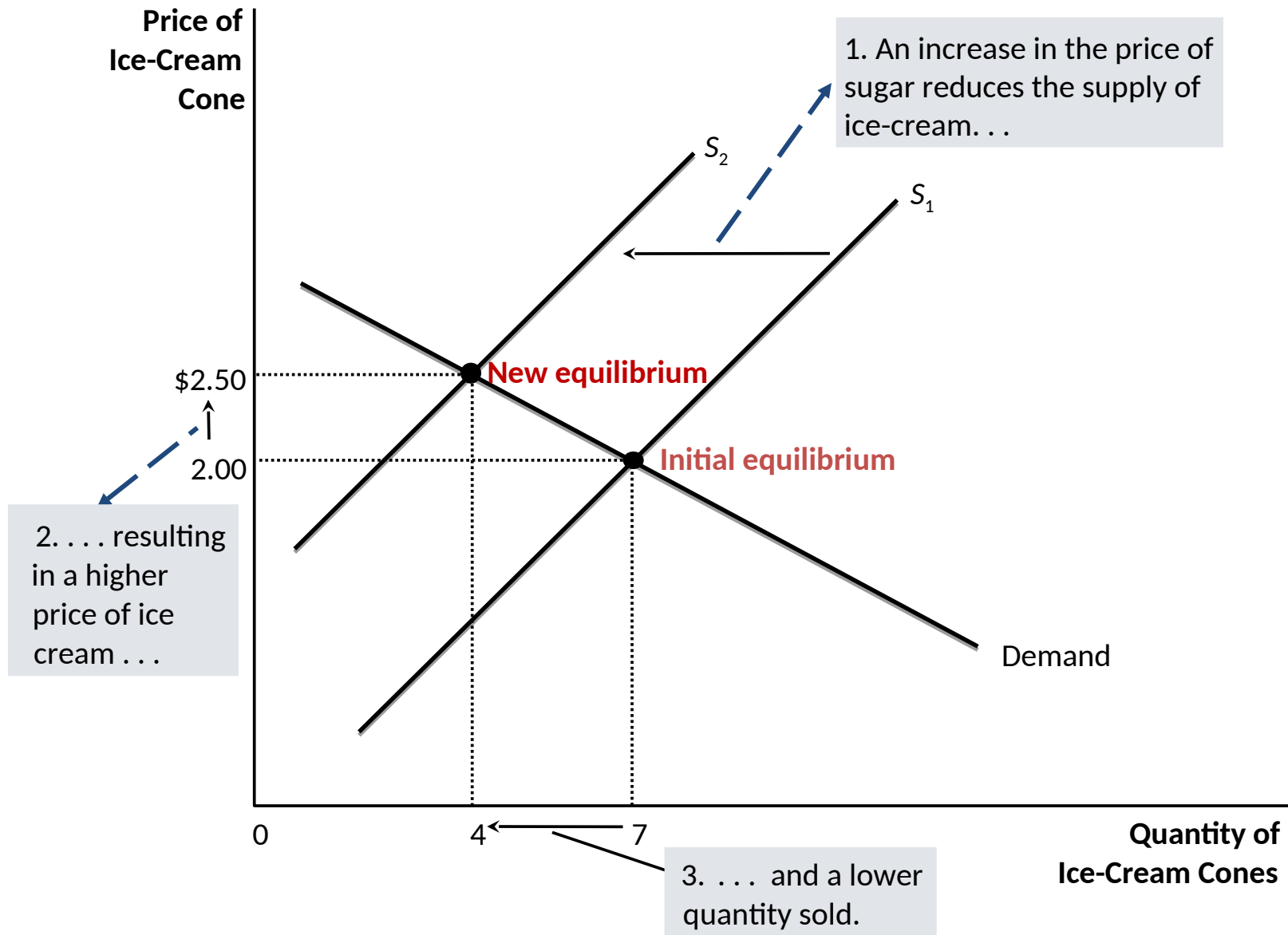
- **Shortage**

- When price is less than equilibrium price, then quantity demanded exceeds the quantity supplied:
 - There is excess demand or a shortage;
 - Suppliers will raise the price due to too many buyers chasing too few goods, thereby moving toward equilibrium;
 - **Excess demand**, or shortage, is the condition that exists when quantity demanded exceeds quantity supplied at the current price.

How an increase in demand affects the equilibrium



How an increase in demand affects the equilibrium

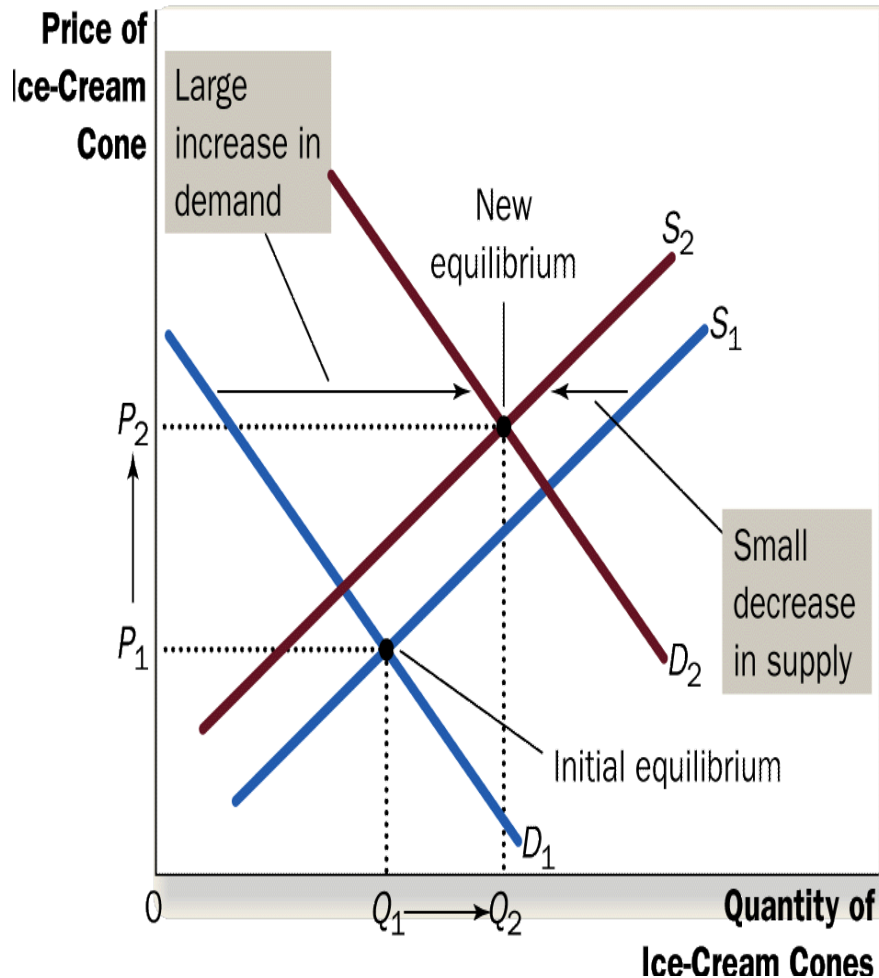


Home work

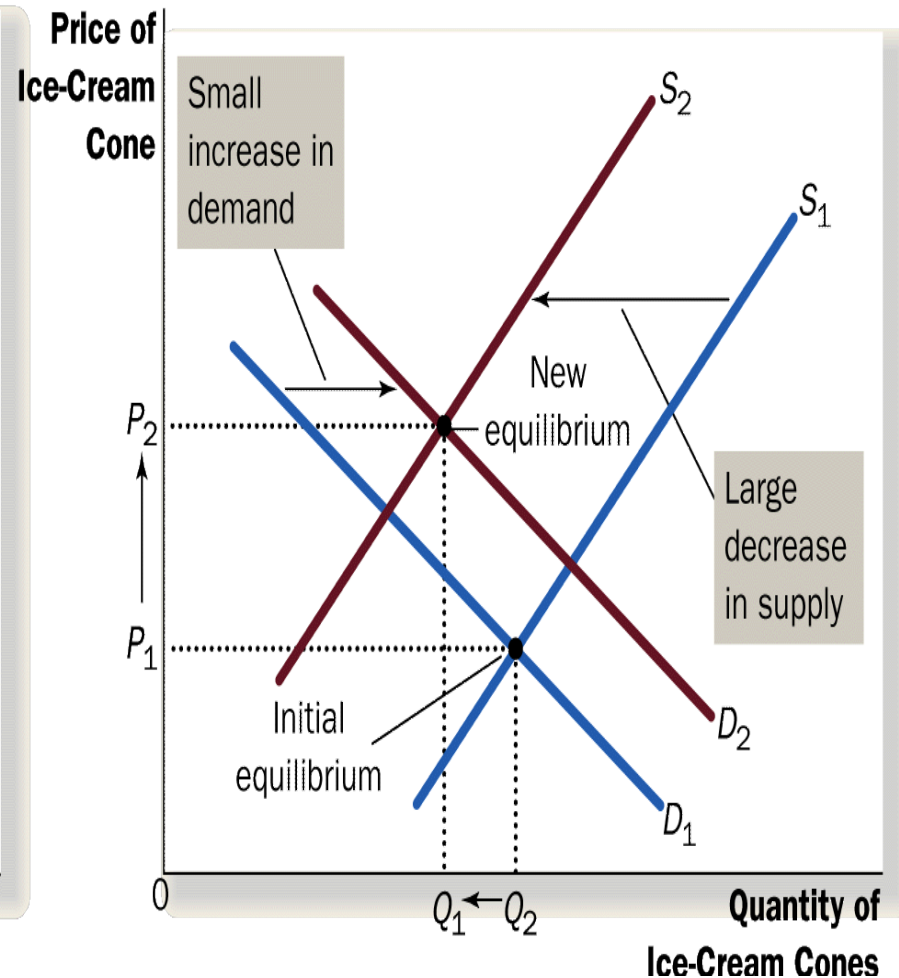
- Suppose the demand functions of two markets, A and B are given as: $Q_d^A = 100 - 2P$ and $Q_d^B = 130 - 2P$. If the two markets have the same supply condition and the supply functions shift from $Q_s = 10 + 4P$ to $Q_s = 40 + P$, compare the resulting effects on the equilibrium price and quantity demanded in the two markets.

When both Supply and Demand Shift

(a) Price Rises, Quantity Rises



(b) Price Rises, Quantity Falls



Summary: A Shift in *Both* Supply and Demand

		Event	Effect on Price(P^*)	Effect on Quantity(Q^*)	Net effect on P^* & Q^*
DD & SS shift in the same direction	→	Demand increases Supply increases	Up Down	Up UP	P^* Indeterminate Q^* Up
	→	Demand decreases Supply decreases	Down Up	Down Down	P^* indeterminate Q^* Down
DD & SS shift in opposite direction	→	Demand increases Supply decreases	Up Up	Up Down	P^* Up Q^* indeterminate
	→	Demand decreases Supply increases	Down Down	Down Up	P^* Down Q^* indeterminate

CHAPTER III: ELASTICITY

The Concept:

- The responsiveness of one variable to changes in another variable;
- When price rises, what happens to quantity demand?
- Demand falls BUT; how much does demand fall?
- An elasticity is a unit-free measure.
- If price rises by 10% - what happens to demand?

We know demand will fall.



Elasticity ... cont'd

- By more than 10%?
- By 10 %?
- By less than 10%?
- **Elasticity measures the extent to which demand will change;**
- Measurement of the percentage change in one variable that results from a 1% change in another variable.

Types Of elasticity

Four basic types are used:

- **Price elasticity of demand**
- **Income elasticity of demand**
- **Cross elasticity**
- **Price elasticity of supply**

a) Price Elasticity of Demand (PED)

- The responsiveness of demand to changes in price;
- Where % change in quantity demand is greater than % change in price – **elastic**;
- Where % change in quantity demand is less than % change in price – **inelastic**;

$$\text{Elasticity} = \frac{\text{Percentage } \Delta \text{ in Qty Demanded}}{\text{Percentage } \Delta \text{ in Price}}$$

PED ... cont'd

- When the price of gasoline rises by 1% the quantity demanded falls by 0.2%, so gasoline demand is not very price sensitive.
 - Price elasticity of demand is -0.2 .
- When the price of gold jewelry rises by 1% the quantity demanded falls by 2.6%, so jewelry demand is very price sensitive.
 - Price elasticity of demand is -2.6 .

PED ... cont'd

- When an elasticity is small (between 0 and 1 in absolute value), we call the relation that it describes inelastic:
 - Inelastic demand means that the quantity demanded is not very sensitive to the price;
- **Unit elastic:** own price elasticity equal to 1;
- **Inelastic:** own price elasticity less than 1;
- **Elastic:** own price elasticity greater than 1.

PED ... cont'd

- The own price elasticity of demand is generally negative, but the absolute value should be considered to show the effect in magnitude .
- Economists usually refer to the own price elasticity of demand by its absolute value (ignore the negative sign).
- So, even though the formula says that the own price elasticity of demand is negative, we would say the elasticity of demand is 1.5 in the first example and 0.67 in the second.
- *Two approaches of elasticity measurement: **Arc price elasticity** and **point price elasticity** of demand.*

Arc Price Elasticity of Demand - General

- Although the exact formula for calculating an elasticity is useful for theory, in practice economists usually calculate an approximation called the *arc* elasticity.
- It is approximation of the elasticity between two points.
- Need two geometric points to perform the calculation.

Arc Formula for Own PED

- Consider two points P^A and X^A , and point P^B and X^B from the demand relationship:

$$\text{Elasticity} = \frac{(X^A - X^B) / (X^A + X^B)}{(P^A - P^B) / (P^A + P^B)}$$

- Note:** we'll take absolute value.

Point Formula for Own PED

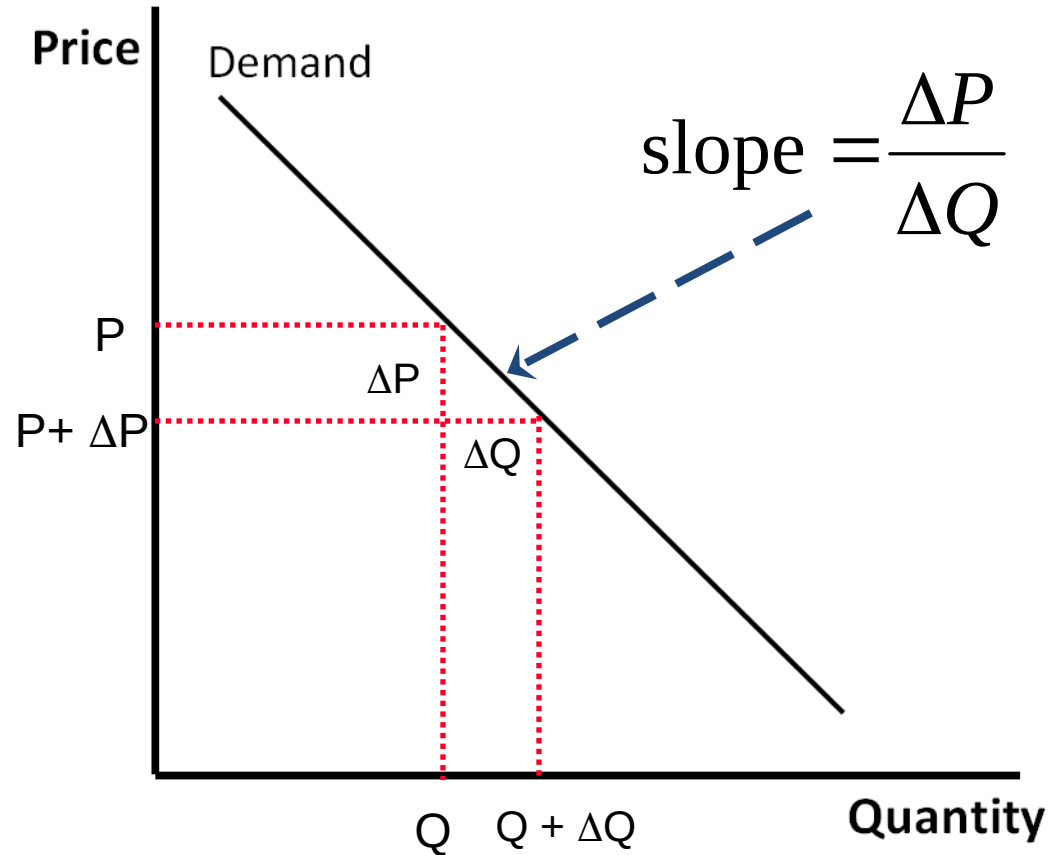
- The exact formula for calculating an elasticity at the point A on the demand curve:

$$\begin{aligned} \text{Elasticity} &= \left(\frac{\% \Delta Q_d}{\% \Delta P} \right) \\ &= \left(\frac{\Delta Q_d}{\Delta P} \right) \left(\frac{P}{Q} \right), \text{ at point A} \end{aligned}$$

- Note:** we'll take absolute value.

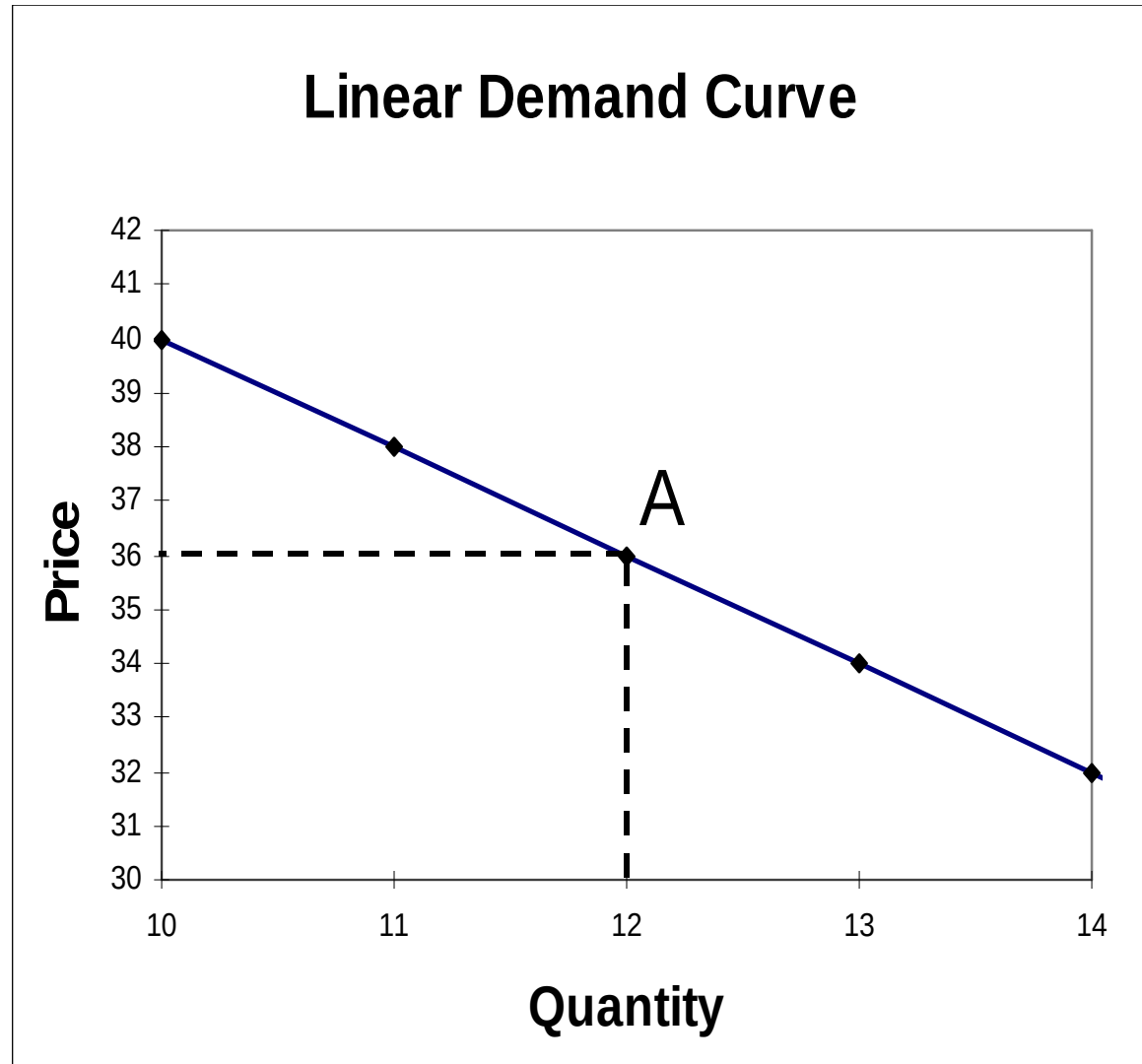
Slope of the Demand Curve

- ΔP is the change in price. ($\Delta P < 0$)
- ΔQ is the change in quantity.
- $\text{slope} = \Delta P / \Delta Q$
- $1/\text{slope} = \Delta Q / \Delta P$



Example: Elasticity Calculation at point A

- Slope = $(40-36)/(10-12) = -2$
- $1/\text{slope} = -1/2$
- $P/Q = 36/12 = 3$ at point A
- $\{P/Q \times 1/\text{slope}\} = -1.5$
- Elasticity of demand = -1.5
- Absolute value of the elasticity = 1.5



Exercise – Point Elasticity

Point	Quantity	Price
A	10	40
B	11	38
C	12	36
D	13	34
E	14	32
F	15	30
G	16	28
H	17	26
I	18	24
J	19	22

- Compute the elasticity at the point I,D,H

✓ Slope = -2

✓ $1/\text{Slope} = -1/2$

✓ $P/Q = 24/18 = 4/3$

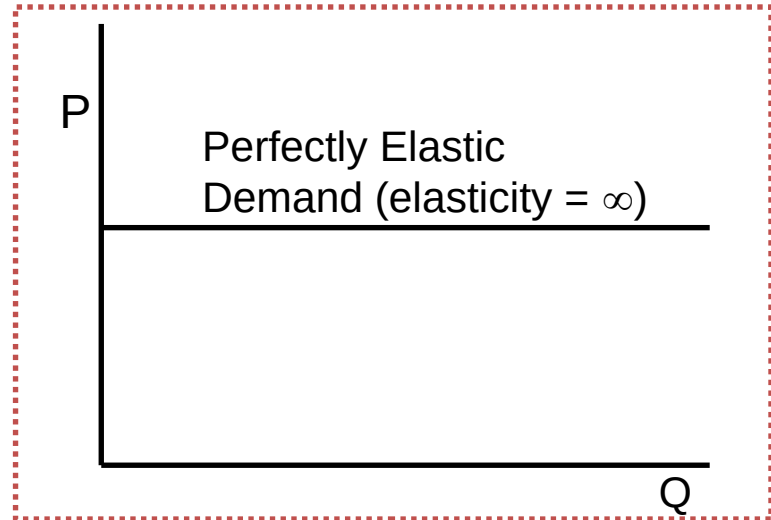
✓ Elasticity = $-2/3$

Special cases of elasticity

- Economists use the terms “perfectly elastic” and “perfectly inelastic” to describe extreme values of price elasticities.
- Perfectly elastic means the quantity demanded is as price sensitive as possible.
- Perfectly inelastic means that the quantity demanded has no price sensitivity at all.

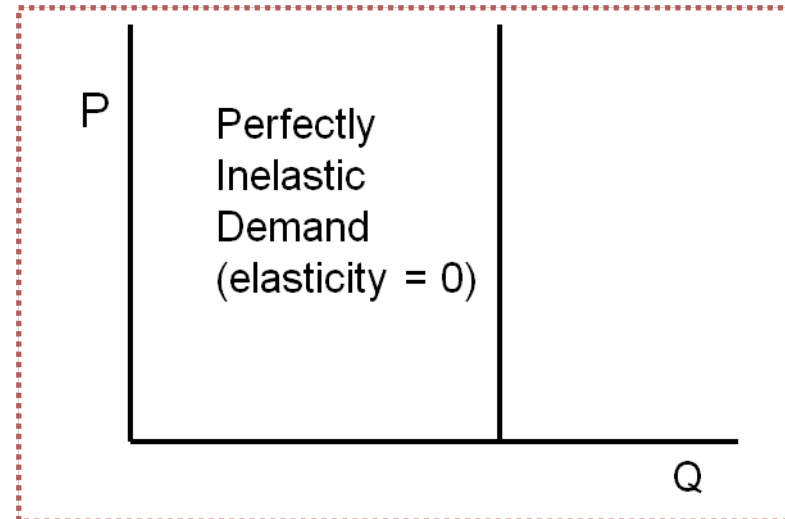
Perfectly Elastic Demand

- Demand is perfectly elastic when a 1% change in the price would result in an infinite change in quantity demanded.

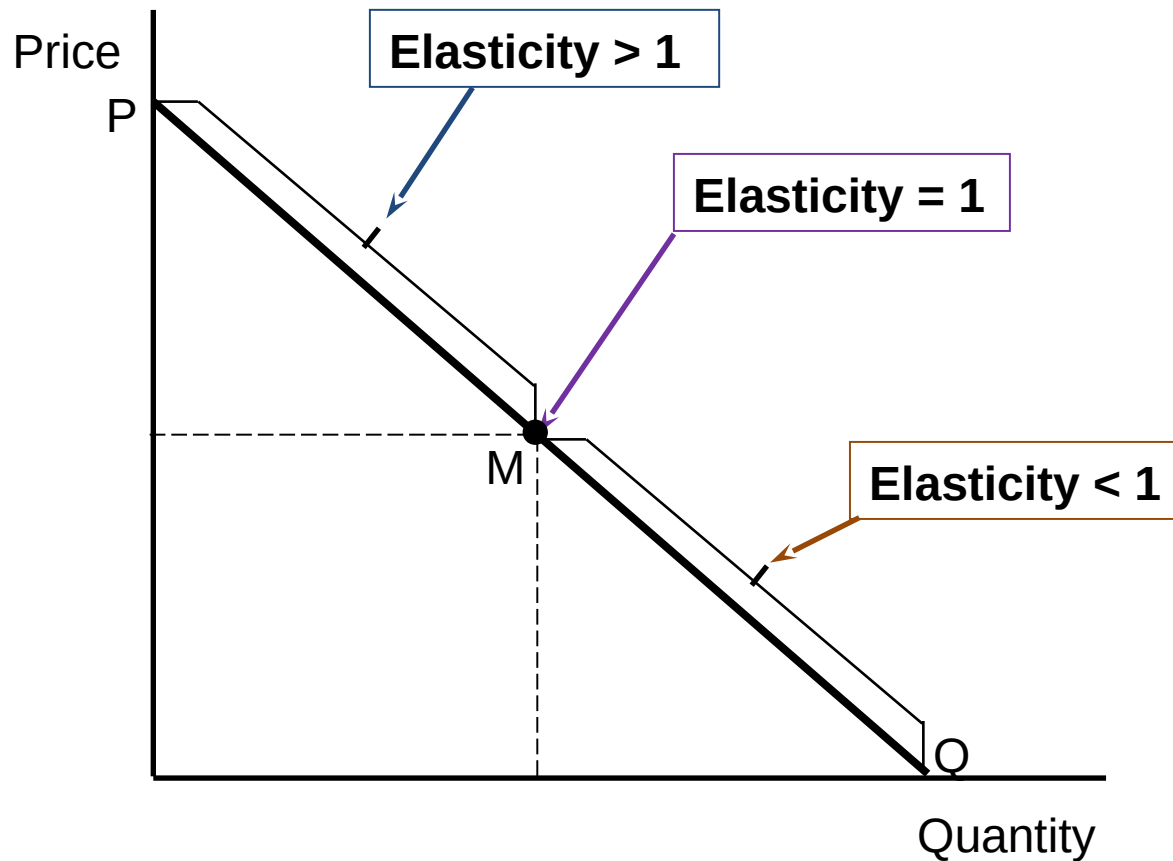


Perfectly Inelastic Demand

- Demand is perfectly inelastic when a 1% change in the price would result in no change in quantity demanded.



A linear demand curve and PED



PED and Total Revenue

- If demand is price elastic:

✓ Increasing price would **reduce** TR

$$(\% \Delta Q_d > \% \Delta P)$$

✓ Reducing price would increase TR

$$(\% \Delta Q_d > \% \Delta P)$$

- If demand is price inelastic:

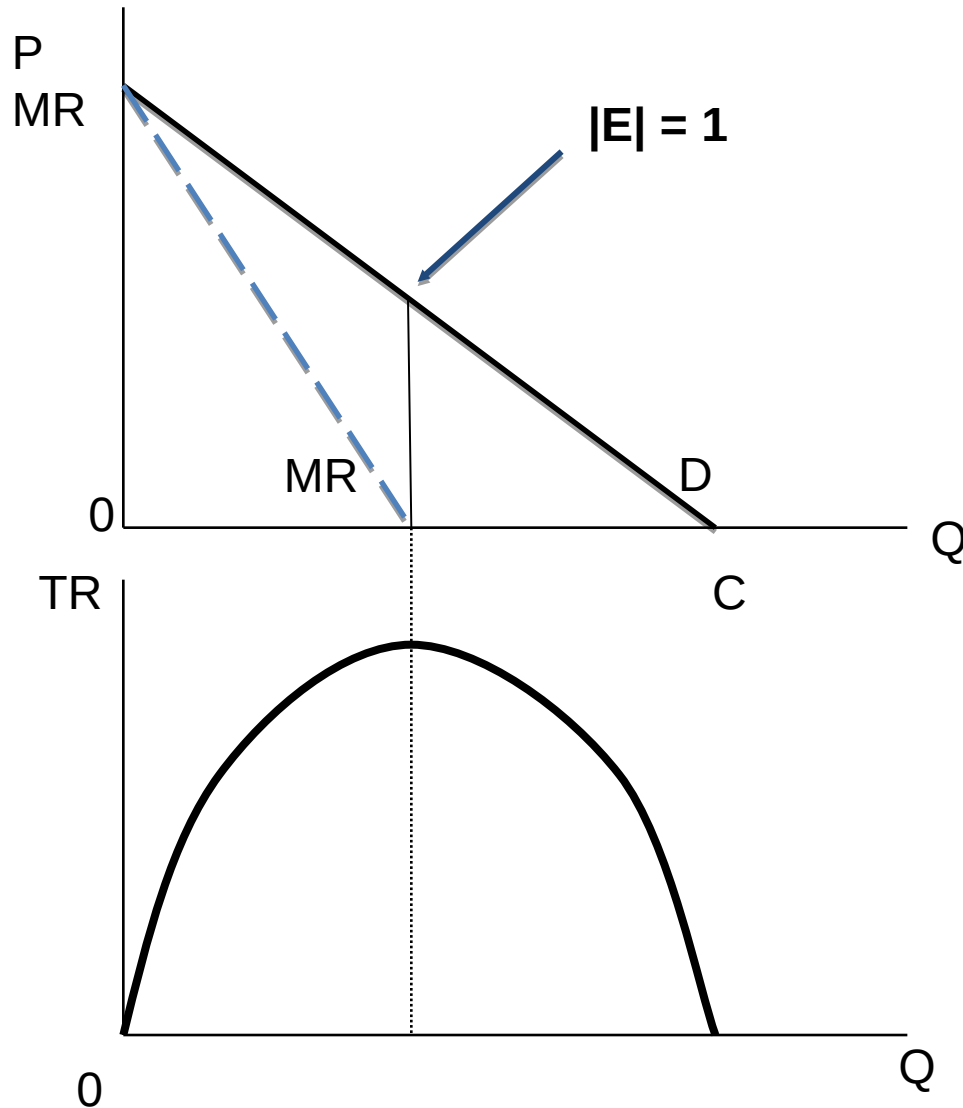
✓ Increasing price would **increase** TR

$$(\% \Delta Q_d < \% \Delta P)$$

✓ Reducing price would reduce TR

$$(\% \Delta Q_d < \% \Delta P)$$

PED and Total Revenue



PED, Price and Total Revenue

TR = P.Q , where TR is total revenue, P is price and Q is quantity:

Direction of price change	When /Ed/ > 1	When /Ed/ < 1	When /Ed/ = 1
When price increases	Total revenue decrease	Total revenue increases	Total revenue unchanged
When price decreases	Total revenue increases	Total revenue decrease	Total revenue unchanged

Determinants of Price Elasticity of Demand:

- The major determinants of price elasticity of demand are
 1. **The extent /number & closeness of substitutes;**
 2. **Generality and specificity of goods:** lower elasticity coefficient for general group commodities than the specific commodities. **E.g.** dd for detergent Vs dd for soap in general;
 3. **Time horizon/period:** the longer the time under consideration the more elastic a good is likely to be.
 4. **The nature of the need (Luxury Vs Necessity good):** example: addictive drugs, salt,; &
 5. **The proportion of income spent on the particular commodity:** - if the proportion of income taken up by the product is smaller, then the more inelastic & vice versa.

b) Cross-Price Elasticity of Demand (C_pED)

- Used to measure the sensitivity of consumer purchase of one good to changes in the price of a Substitute and complementary goods
- i. Elasticity of demand with respect to the price of a complementary good (cross-price elasticity)
 - This elasticity is negative because as the price of a complementary good rises, the quantity demanded of the good itself falls.
 - **Example:** software is complementary with computers. When the price of software rises the quantity demanded of computers falls.
 - Cross-price elasticity quantifies this effect.

C_pED ... cont'd

- ii. Elasticity of demand with respect to the price of a substitute good (also a cross-price elasticity)
 - This elasticity is positive because as the price of a substitute good rises, the quantity demanded of the good itself rises.
 - **Example:** hockey is substitute for basketball. When the price of hockey tickets rises the quantity demanded of basketball tickets rises.
 - Cross-price elasticity quantifies this effect.

C_pED ... cont'd

- **C_pED:** The responsiveness of demand of one good to changes in the price of a related good – either a substitute or a complement,

$$E_{X,Y} = \left(\frac{\% \Delta Q_x}{\% \Delta P_y} \right)$$

$$E_{X,Y} = \left(\frac{\Delta Q_x}{\Delta P_y} \right) \left(\frac{P_y}{Q_x} \right)$$

- **Goods which are:**
complements: – Cross Elasticity will have negative sign (inverse relationship b/n the two).
- **Goods which are substitutes:**
– Cross Elasticity will have a positive sign (positive relationship b/n the two).
- **For unrelated goods:** – Cross Elasticity is zero

c) Income Elasticity of Demand (YED)

- The elasticity of demand with respect to a consumer's income is called the income elasticity.
 - When the income elasticity of demand is positive (normal good), consumers increase their purchases of the good as their incomes rise (e.g. automobiles, clothing).
 - When the income elasticity of demand is greater than 1 (**luxury good**), consumers increase their purchases of the good more than proportionate to the income increase (e.g. ski vacations). But, for **necessity goods** YED is less than one and positive.
 - When the income elasticity of demand is negative (inferior good), consumers reduce their purchases of the good as their incomes rise (e.g. potatoes).

YED ... cont'd

- **Income Elasticity of Demand:** The responsiveness of demand to changes in incomes

$$E_y = \left(\frac{\% \Delta Q_d}{\% \Delta Y} \right) = \left(\frac{\Delta Q_d}{\Delta Y} \right) \left(\frac{Y}{Q_d} \right)$$

- **Normal Good:** – demand rises as income(Y) rises and vice versa $\Rightarrow$ A positive sign YED denotes a normal good.
- **Inferior Good:** – demand falls as income(Y) rises and vice versa $\Rightarrow$ A negative sign YED denotes an inferior good.

YED ... cont'd

- **For example:**

- **$YED = - 0.6$:** Good is an **inferior good** but **inelastic** – a rise in income of 3% would lead to demand falling by 1.8%
- **$YED = + 0.4$:** Good is a **normal good** but **inelastic** – a rise in incomes of 3% would lead to demand rising by 1.2%
- **$YED = + 1.6$:** Good is a **normal good** and **elastic** – a rise in incomes of 3% would lead to demand rising by 4.8%
- **$YED = - 2.1$:** Good is an **inferior good** and **elastic** – a rise in incomes of 3% would lead to a fall in demand of 6.3%

d) Price Elasticity of Supply

- **Price Elasticity of Supply (PES):**
 - The responsiveness of supply to changes (Δ ges) in price
 - If PES is **inelastic** - it will be difficult for suppliers to react swiftly to Δ ges in price
 - If PES is **elastic** - supply can react quickly to Δ ges in price

$$PES = \frac{\% \Delta \text{ in Quantity Supplied}}{\% \Delta \text{ in Price}}$$

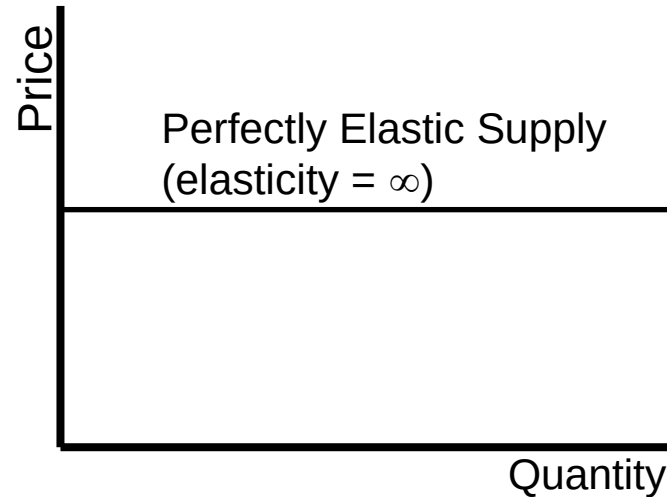
- If $PES > 1$, Supply is elastic;
- If $PES = 1$, Supply is unit elastic;
- If $PES < 1$, Supply is inelastic.

Examples: of Own Price Supply Elasticities

- When the price of Davinci paintings increases by 1% the quantity supplied doesn't change at all, so the quantity supplied of Davinci paintings is completely insensitive to the price.
 - Price elasticity of supply is 0.
- When the price of beef increases by 1% the quantity supplied increases by 5%, so beef supply is very price sensitive.
 - Price elasticity of supply is 5.

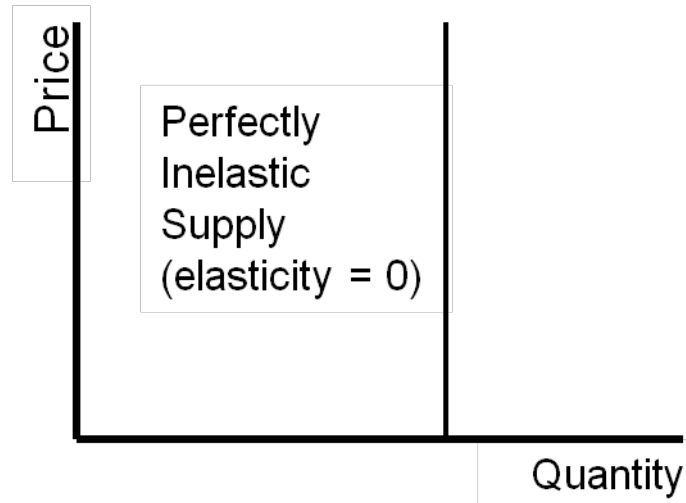
Perfectly Elastic Supply

- Supply is perfectly elastic when a 1% change in the price would result in an infinite change in quantity supplied.



Perfectly Inelastic Supply

- Supply is perfectly inelastic when a 1% change in the price would result in no change in quantity supplied.



Determinants of Price Elasticity of Supply

1. How costs behave as output is varied;
2. Factor substitution;
3. Possibility of switching production to other products;
4. Number of firms/sellers serving the market;
5. Longevity of time involvement; and
6. Excess capacity and Unsold stocks.

CHAPTER IV: THEORY OF CONSUMER BEHAVIOR

Contents :

- The meaning of Utility
- Theories of utility
 - The cardinal theory
 - The law of diminishing marginal utility
 - Maximizing total utility
 - The ordinal theory (indifference curve approach)
 - Characteristics of indifference curve
 - Marginal rate of substitution
 - Budget line
 - Maximizing total utility

Utility

- The value a consumer places on a unit of a good or service depends on the pleasure or satisfaction he/she expects to derive from consumption.
- In economics the satisfaction or pleasure consumers derive from the consumption of consumer goods is called “utility”.
- It indicates numerical score representing the satisfaction that a consumer gets from a market basket.
- Consumers, however, cannot have every thing they wish to have. Consumers’ choices are constrained by their incomes.
- Within the limits of their incomes, consumers make their consumption choices by evaluating and comparing consumer goods with regard to their “utilities.”

4.1 Measurement of Utility: *Cardinality*

How? Measuring utility in “utils” (**Cardinal Approach**):

- Assumes that we can assign values for utility, (Jevons, Walras, and Marshall).

E.g.: derive 100 utils from eating a slice of pizza, 10 utils from eating banana

- Under certain assumptions, utility measurement in absolute terms is possible (***Cardinalists***)

⇒ utility is additively separable & summed to give the total.

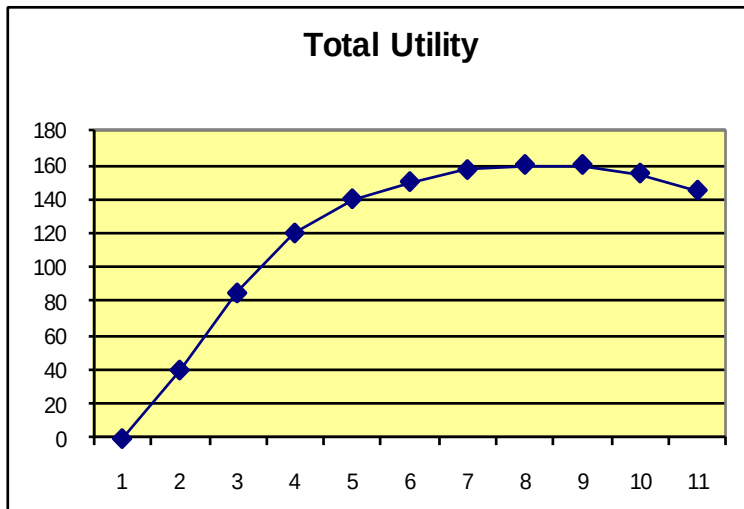
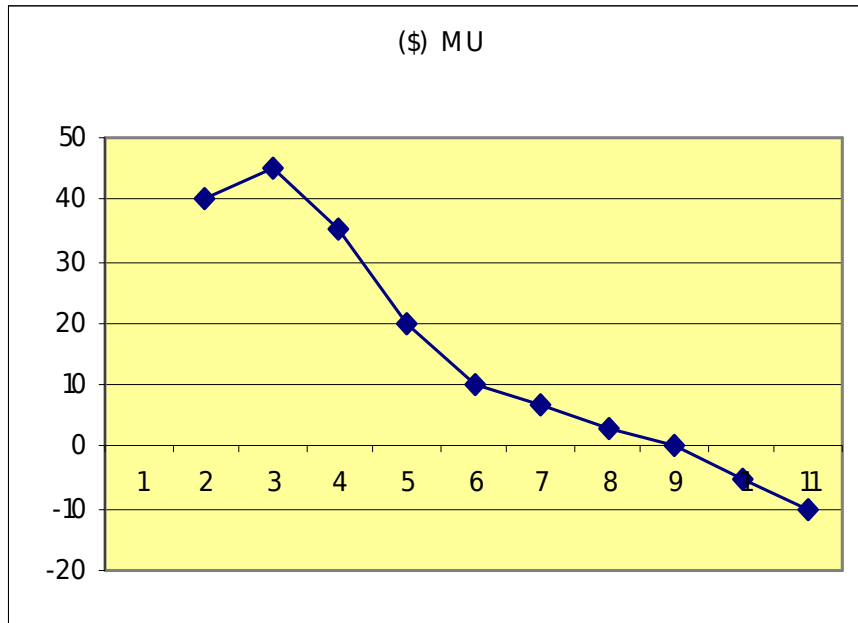
Total Utility Vs Marginal Utility

- **Marginal utility (MU)** is the utility a consumer derives from the last unit of a consumer good she or he consumes (during a given consumption period), *ceteris paribus*;
- *Additional satisfaction* that an individual derives from consuming an *additional unit* of a good or service.
- **Total utility (TU)** is the utility a consumer derives from the consumption of all of the units of a good or a combination of goods over a given consumption period, *ceteris paribus*;
⇒ the overall level of satisfaction derived from consuming a good or service.

Total utility = Sum of marginal utilities

Total and Marginal Utility for Bread

Q	(birr) TU	(birr) MU
0	0	
1	40	40
2	85	45
3	120	35
4	140	20
5	150	10
6	157	7
7	160	3
8	160	0
9	155	-5
10	145	-10
		145



Q	(\$) TU	(\$) MU
0	0	-
1	40	40
2	85	45
3	120	35
4	140	20
5	150	10
6	157	7
7	160	3
8	160	0
9	155	-5
10	145	-10

If TU increase, then $MU > 0$
 If TU decrease, then $MU < 0$
 If TU maxima, then $MU = 0$

The Law of Diminishing MU (LDMU)

- Over a given consumption period, the more of a good a consumer consumed, the less an additional unit, MU, it contributes to his or her overall satisfaction (TU);
 - Alternatively, we could say: over a given consumption period, as more and more of a good is consumed by a consumer, beyond a certain point, the MU of additional units begins to fall.
- ⇒ Consuming successive units of a product over a period gives less and less marginal utilities.

Utility Maximizing Rule

- The consumer's money income should be allocated so that the last dollar (birr) spent on each product yields the same(equal) amount of extra (marginal) utility.
- A rational consumer would buy an additional unit of a good as long as the perceived dollar(birr) value of the utility of one additional unit of that good [say, its marginal dollar(birr) utility] is greater than its market price.

a) Utility Maximization: *Single Good Rule*

- In the single commodity case, a consumer is at equilibrium (eqbm) when he/she maximizes his/her utility from the consumption level of a good for a given price;
- He/she is faced with the choice of either spending income on the purchase of the commodity or retaining(saving) his/her income;
- **Decision Criteria:** the eqbm quantity of consumption is at the equality of the additional utility (MU) of the commodity and the marginal utility of money (MU_m = which is constant).
- **E.g.** Suppose that the price of commodity X is, $P_x=7$; and then, the eqbm is achieved when $MU_x = P_x = 7$, OR $MU_x/P_x = 1$.

b) Two or More commodity (general) Case

- In reality, a consumer consumes a larger no of goods; MU schedules of various goods thus may not be the same; some yield higher utility & some lower, while MU of some goods decreases rapidly than that of others as consumption rises.
- A rational utility maximizing consumer consumes commodities in the order of their utilities; he/she picks up the commodity yielding the highest utility followed by the commodity which yields the second highest, and so on.
- Given $P_x = P_y$, the consumer will choose to consume that combⁿ of X & Y at which $MU_x = MU_y$; but when $P_x \neq P_y$, the consumer switches his/her expenditures from one good to the other in accordance with their MU until MU/P of the two goods are equal.

Some simplifying assumptions:

- Consumer's objective: to maximize his/her utility subject to income constraint;
- Two goods (X, Y);
- Prices P_x , P_y are fixed; thus
 - Consumer's income (M) or *Budget equation* is given by

$$P_x \bullet Q_x + P_y \bullet Q_y = I$$

Mathematically: The Two-Good Rule

- Optimizing (maximization) condition of maximum satisfaction satisfied iff:

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$$

If
$$\frac{MU_X}{P_X} > \frac{MU_Y}{P_Y}$$

⇒ spend more on good X and less of Y

What if:
 $(MU_x/P_x) < (MU_y/P_y)?$

Answer: In order to make the two sides of the above inequality equal again, given that P_x and P_y could not be changed, we would have to increase MU_x and decrease MU_y . Recalling the law of diminishing MU, we can increase MU_x by reducing X and decrease MU_y by increasing Y.

Example: the table below shows combination of two goods, good A and good B, between which a consumer is indifferent.

Combination	Units of good A	Units of good B
A	24	4
B	12	8
C	8	12
D	6	16
E	5	20



If the price of the goods, A and B, are $P_A=4$ and $P_B=6$ dollars then the eqbm consumption is at point C where 8 units of A and 12 units of B consumed respectively.

Utility Maximization under Income constraint

- Consumers' spending on consumer goods is constrained by their incomes:

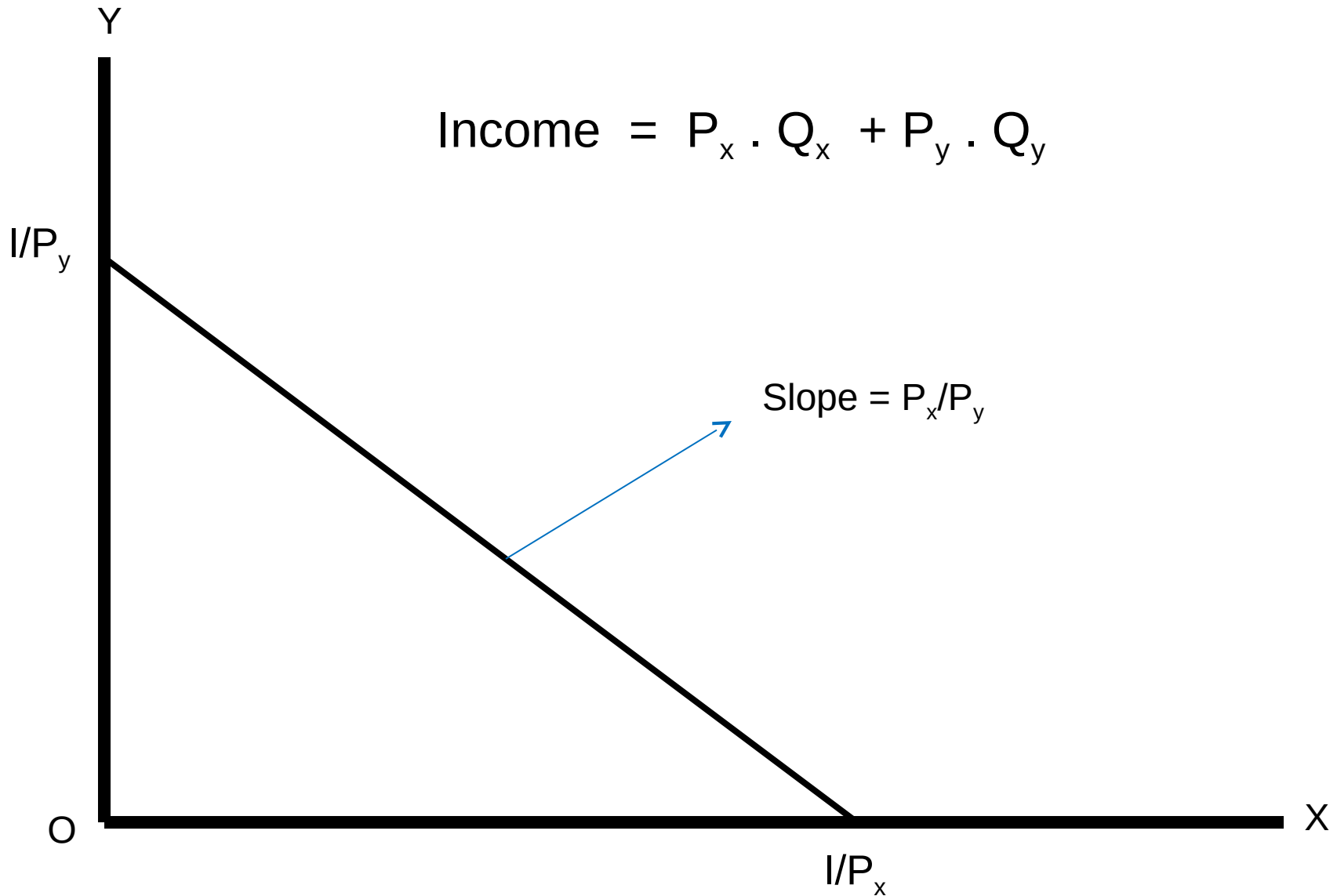
$$Income = P_x Q_x + P_y Q_y + P_w Q_w + + P_z Q_z$$

- While the consumer tries to equalize MU_x/P_x , MU_y/P_y , MU_w/P_w , ... and MU_z/P_z , to maximize his/her utility, his/her total spending cannot exceed the income.

Example: with an income of birr 86, Abebe is trying to decide how much ice cream and how much pizza he should buy.

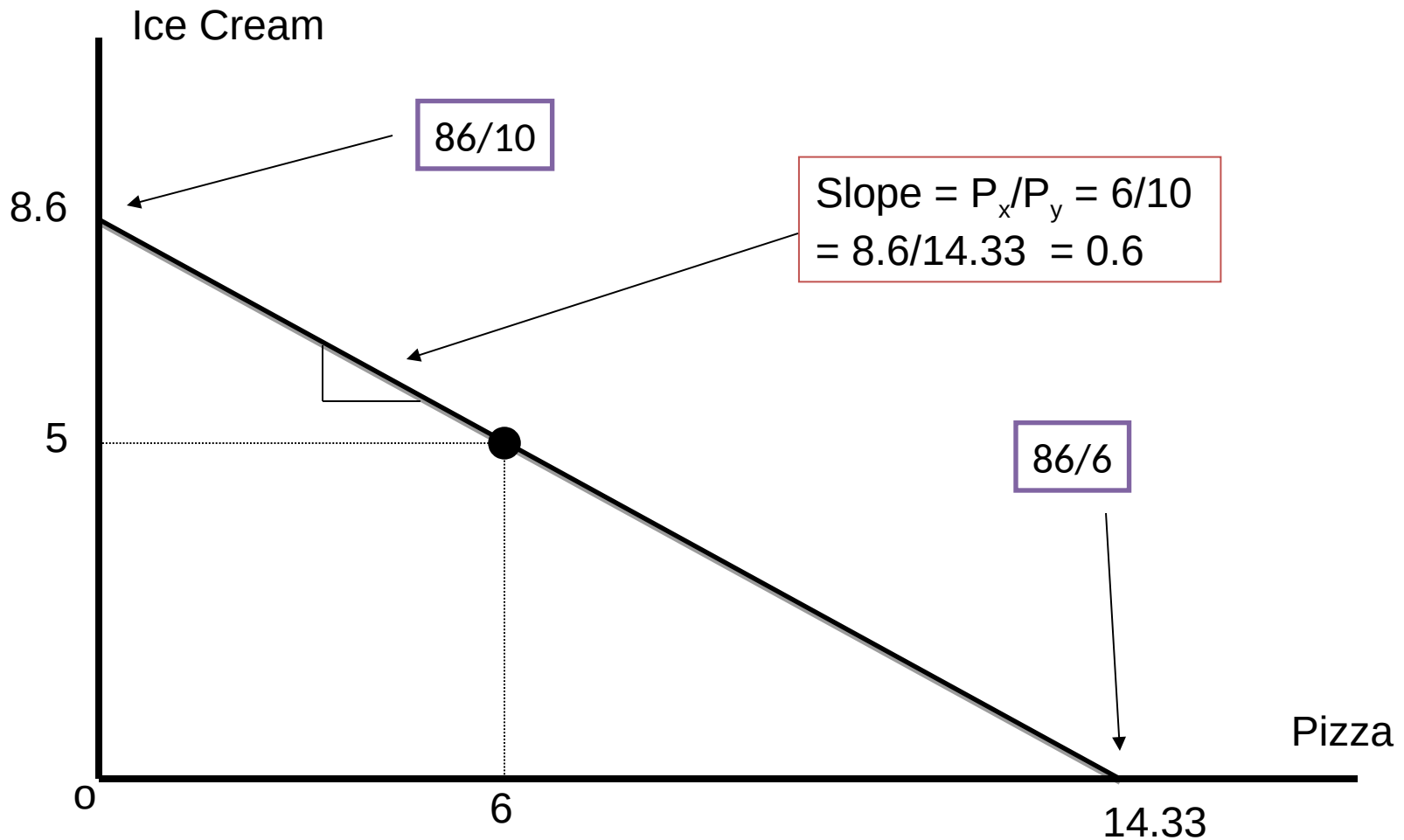
$$Abeb's\ income = 6 * 6 + 5 * 10 = 86$$

Budget Line



The Budget Line

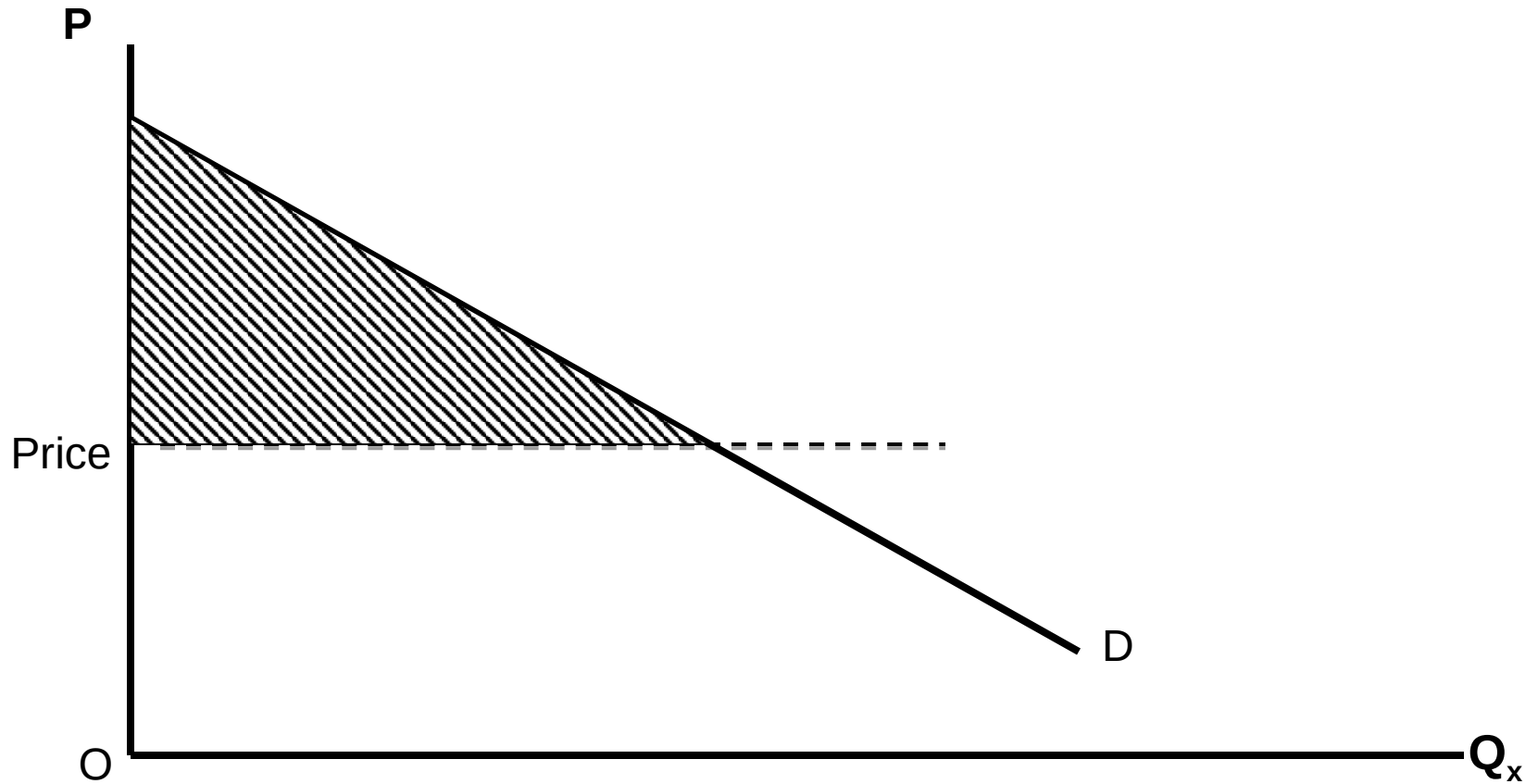
$$\text{Income} = Q_x \cdot P_x + Q_y \cdot P_y = (6 \times 6) + (5 \times 10) = 86$$



Consumer Surplus

- The difference between what a consumer is willing to pay for an additional unit of a good and the market price that he/she actually pays is referred to as “consumer surplus”.
- The area between the demand curve and the price (line) measures the total consumer surplus.

Consumer Surplus



4.2 Measuring Utility by Comparison: Ordinal/Indifference Curve Approach

- It does not assign values, instead works with a ranking of preferences.

E.g. Abebe prefers a bread to a slice of pizza and a slice of pizza to a banana.

- Often consumers are able to be more precise in expressing their preferences.

For example, we could say: - *Ababe is willing to trade two burgers for 4 pizza but he will give up only 2 bananas for a slice of pizza.*

- We can infer that to Abebe, a burger has twice as much utility as a slice of pizza, and a slice of pizza has twice as much utility as a banana.

The Ordinal Utility Theory ... cont'd

- Utility is not measured in absolute magnitude, but ranking is enough;
- Preferences of market baskets are ranked b/c consumers are rational (preference ranking- Indifference curve analysis);
- **Indifference Curve (IC)** is a curve showing all combinations of market baskets (bundles) each representing d/t combinations of goods that provide/yield the consumer the same Utility or level of satisfaction so that the consumer is indifferent in b/n each combinations;
- The assumption is that the consumer can make a complete ranking of his/her preferences.

Indifference curve ... cont'd

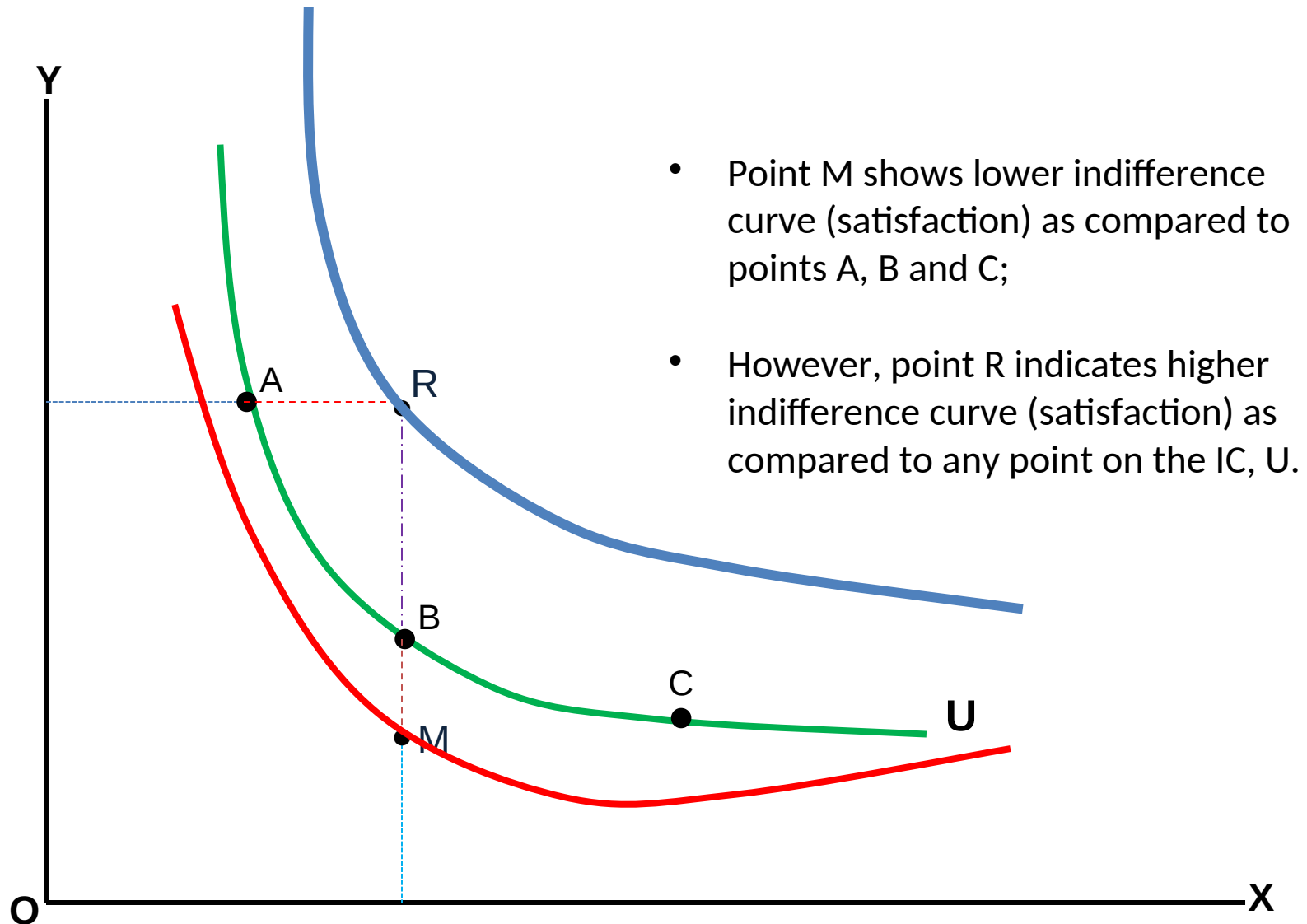
Indifference curve (IC)

- An indifference curve is a line drawn in a two-dimensional space showing different combinations of two goods from which the consumer draws the same amount of utility and therefore he/she is “indifferent” about.

Budget line

- A budget line is a line drawn in a two-dimensional space representing a certain level of income with which the consumer can purchase various combinations of two goods at given prices.

Indifference Curve ... cont'd



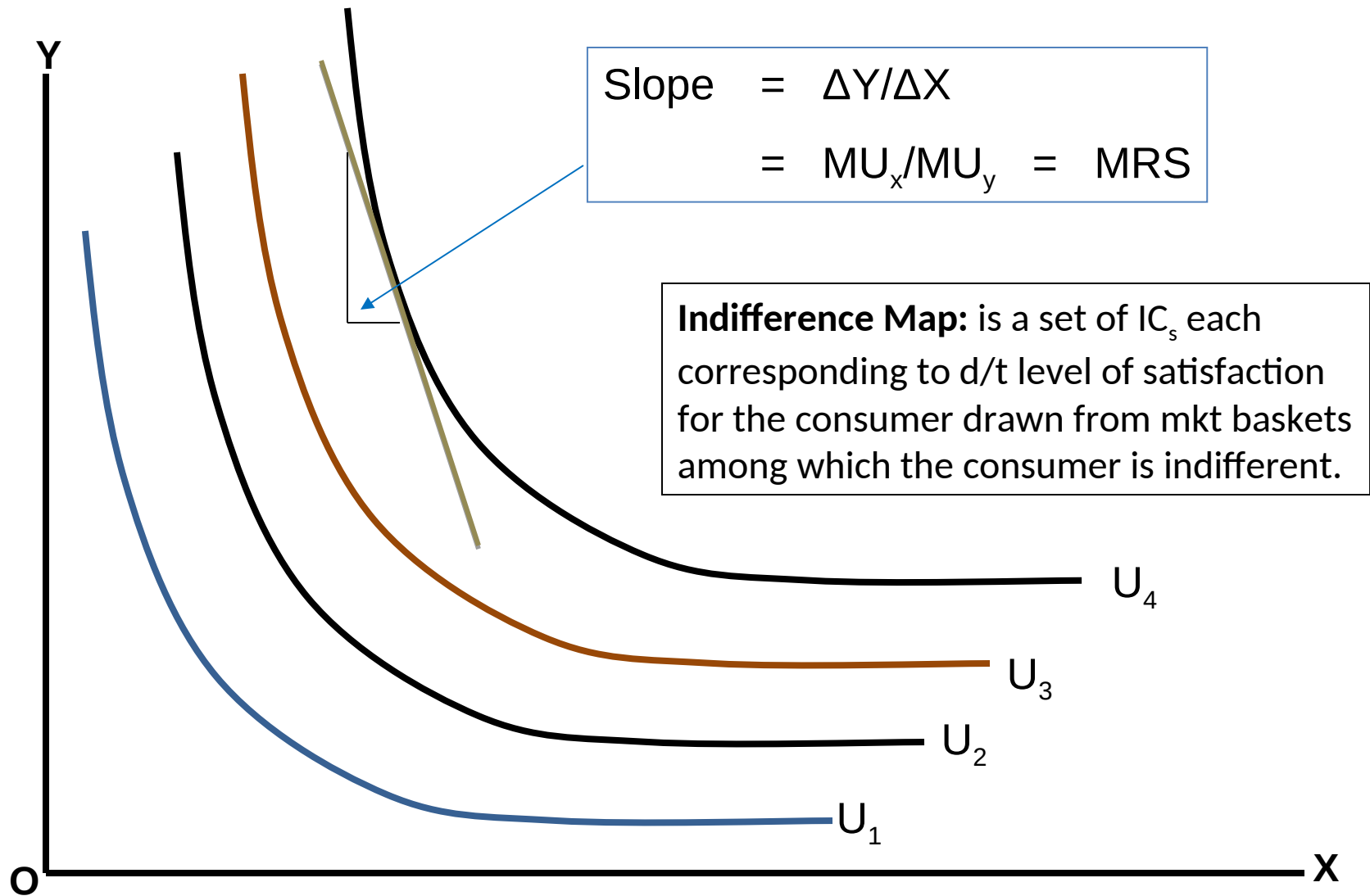
Marginal Rate of Substitution (MRS):

- It shows the rate at which consumers are willing to substitute one commodity for the other in the consumption pattern and maintain the same level of utility(the same indifference curve).
- The rate at which the consumer substitutes one good for the other so as to remain equally satisfied is the slope of the indifference curve. It is known as the marginal rate of substitution. When two goods are in trade-off:

$$MRS_{x,y} = - \frac{\Delta Q_y}{\Delta Q_x} \rightarrow \text{Marginal rate of substitution of } x \text{ for } y.$$

- MRS diminishes as more & more of a good is used in place of the other.

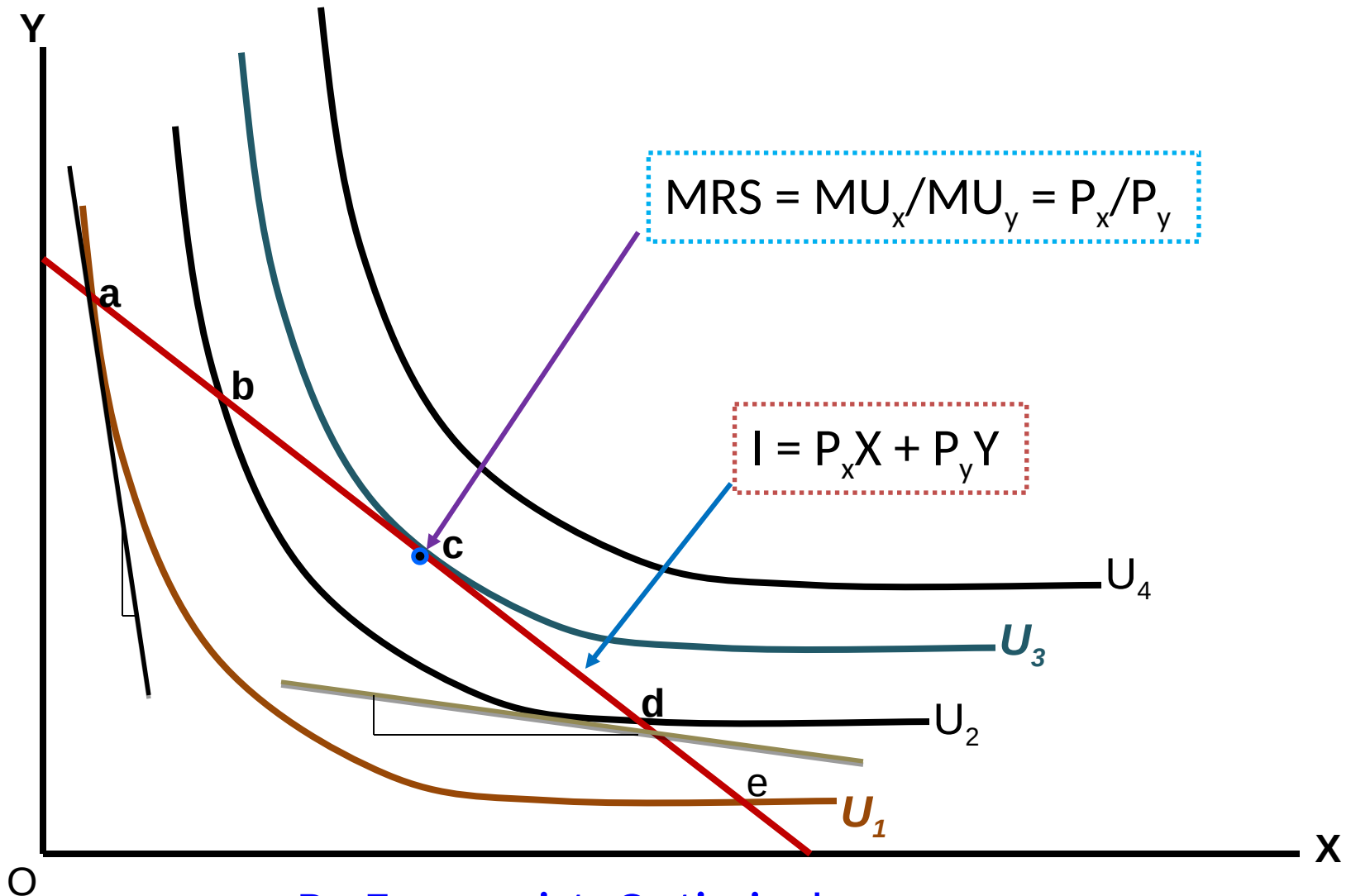
Indifference Curves (IC_s) & Indifference Map



Properties of Indifference curves:

1. IC_s for two “goods” are generally negatively sloped;
2. Higher indifference curves represent higher utilities
3. IC_s are generally convex to the origin, reflecting the principle of diminishing returns;
4. IC_s never cross (intersect each other);
5. The further an IC lies from the origin the higher level(s) of utility it denotes.

The Indifference Curves (Map) & Consumer Eqbm



Be Economist; Optimize!

CHAPTER V: THEORY OF PRODUCTION AND COST

Contents

- **The structure of production**
 - The Production Function
 - Production in the Short Run
 - Production in the Long Run
 - Returns to Scale
- **Analysis of cost of production**
 - Basic terms and concepts
 - Short run costs of production
 - Long run average cost

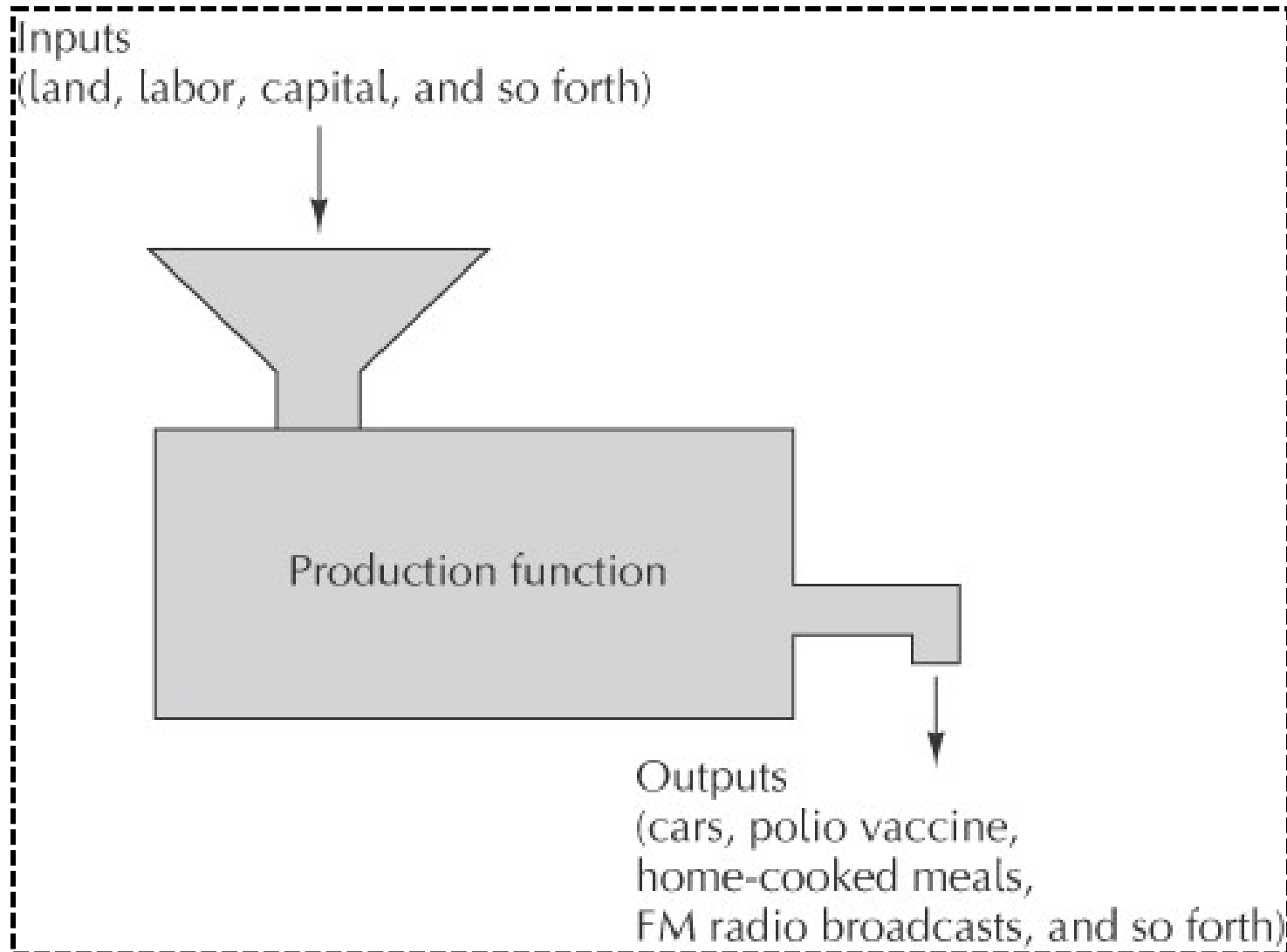
CHAPRET V: Theory of Production & Costs

- Firms are buyers of factors of production (or resources) and sellers of goods & services.
- Firms buy factors of production & transform them into goods & services; and this process is called ***Production***.
- Theory of production thus shows how economic resources are combined to produce commodities/products.

The Production Function

- **Production function** refers to the physical relationship b/n the inputs or resources of a firm and their output of goods and services at a given period of time, *ceteris paribus*.
- It defines the technical relationship b/n inputs and the output that can be produced within a given time period and technology.
- Thus, it shows the best technology available for a given level of output in the production process (inferior combinations of factors, involving more of all inputs, are ignored).
- Mathematically, the production function can be expressed as:
 $Q = f(K, L)$, where
Q = is the level of output, K = units of capital, L = units of labour, and $f()$ represents the production technology

Diagrammatic: The Production Function



Definition of Terms: Inputs & production period

- **Inputs** are any thing that can be used in the production of goods and services. *E.g. labor, land, capital & entrepreneurship.*
- Two time horizons: ***Short run and long run:***
- The **short-run (SR) production function** describes the maximum quantity of good or service that can be produced by a set of inputs, *assuming that at least one of the inputs is fixed at some level.*
- The **long-run (LR) production function** describes the maximum quantity of good or service that can be produced by a set of inputs, *assuming that the firm is free to adjust the level of all inputs*

Production function with One Variable Input

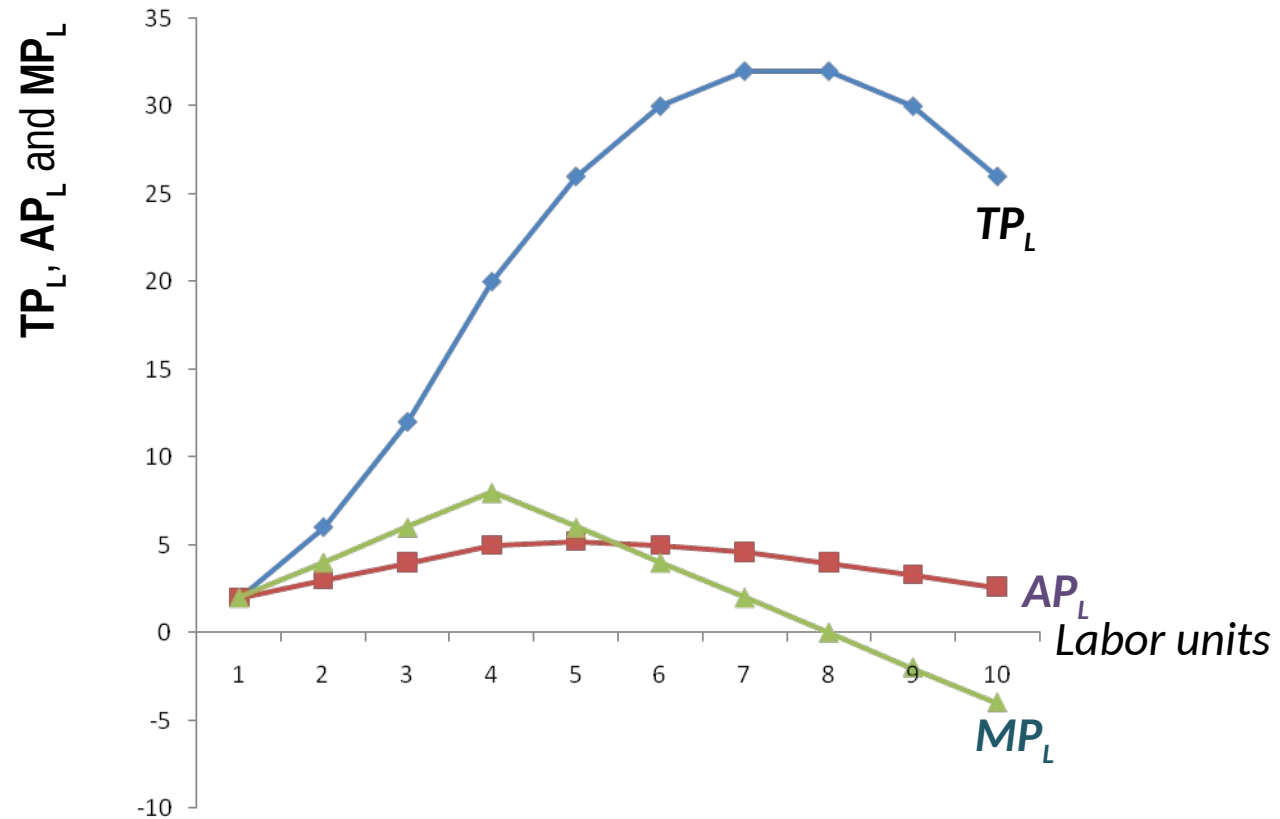
- **Total product (TP):** is the total amount of output produced in physical units (where units refer to: kilograms of sugar, sacks of rice produced, etc)
 - ⇒ It is total amount of output produced at different levels of the variable input (take the variable input, labor).
- **Average product(AP):** is the total product per unit of variable input, **AP = TP/L**.
- **The marginal product (MP):** refers to the rate of change in output as an input is changed by one unit, holding all other inputs constant. *E.g. TP for a unit change in labor emp't is*

$$MP_L = \frac{\Delta TP_L}{\Delta L}$$

Production Function of a Rice Farmer

<i>Units of Labor(L)</i>	<i>Total Product of labor(TP_L)</i>	<i>Average Product of labor (AP_L)</i>	<i>Marginal Product of labor (MP_L)</i>
0	0	-	-
1	2	2	2
2	6	3	4
3	12	4	6
4	20	5	8
5	26	5.2	6
6	30	5	4
7	32	4.6	2
8	32	4	0
9	30	3.3	-2
10	26	2.6	-4

Total, Average and Marginal Products



Law of Diminishing Marginal Returns

- As more and more of an input is added (combined with a fixed amount of other inputs), total output initially largely increase but eventually smaller increments; and then the additions to total output will tend to diminish;
- This phenomenon is referred as the *Principle of Diminishing Marginal Returns* (also called the *law of Variable Proportion*). It is SR phenomenon b/c it is defined with at least one fixed factor.

Counter-intuitive proof: if the law of diminishing returns does not hold, the world's supply of food can be produced in a hectare of land.

Relationship between Average, Marginal and Total Product Curves: *Rule of Thumb*

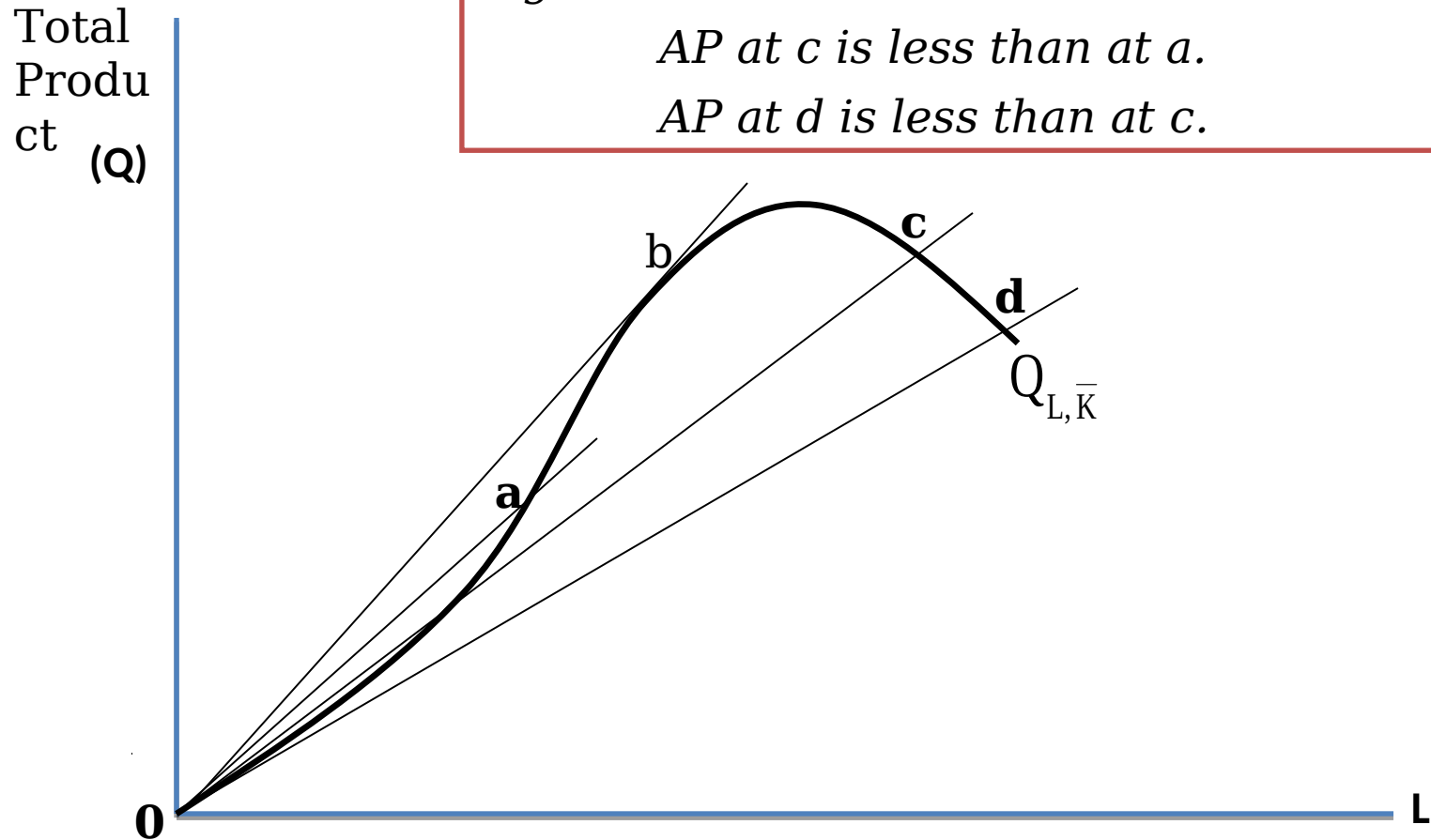
- The principle of diminishing returns yields interesting relationships b/n AP and MP;
- AP at a particular level of labor employment is given by the slope of a line from the origin to a point on the TP corresponding to the given level of employment;
- Thus as we move along TP from left to right up to point *b*, the ray from the origin becomes flatter and flatter;
- Thus, the steepest possible ray from the origin to any point on the TP curve is *ob* (i.e. *b* is the point where AP reaches maximum) .

The slope of a line from the origin is the measure of the **AVERAGE PRODUCT**

The average product at b is highest.

AP at c is less than at a.

AP at d is less than at c.



Relationship b/n TP, AP & MP ... Cont'd

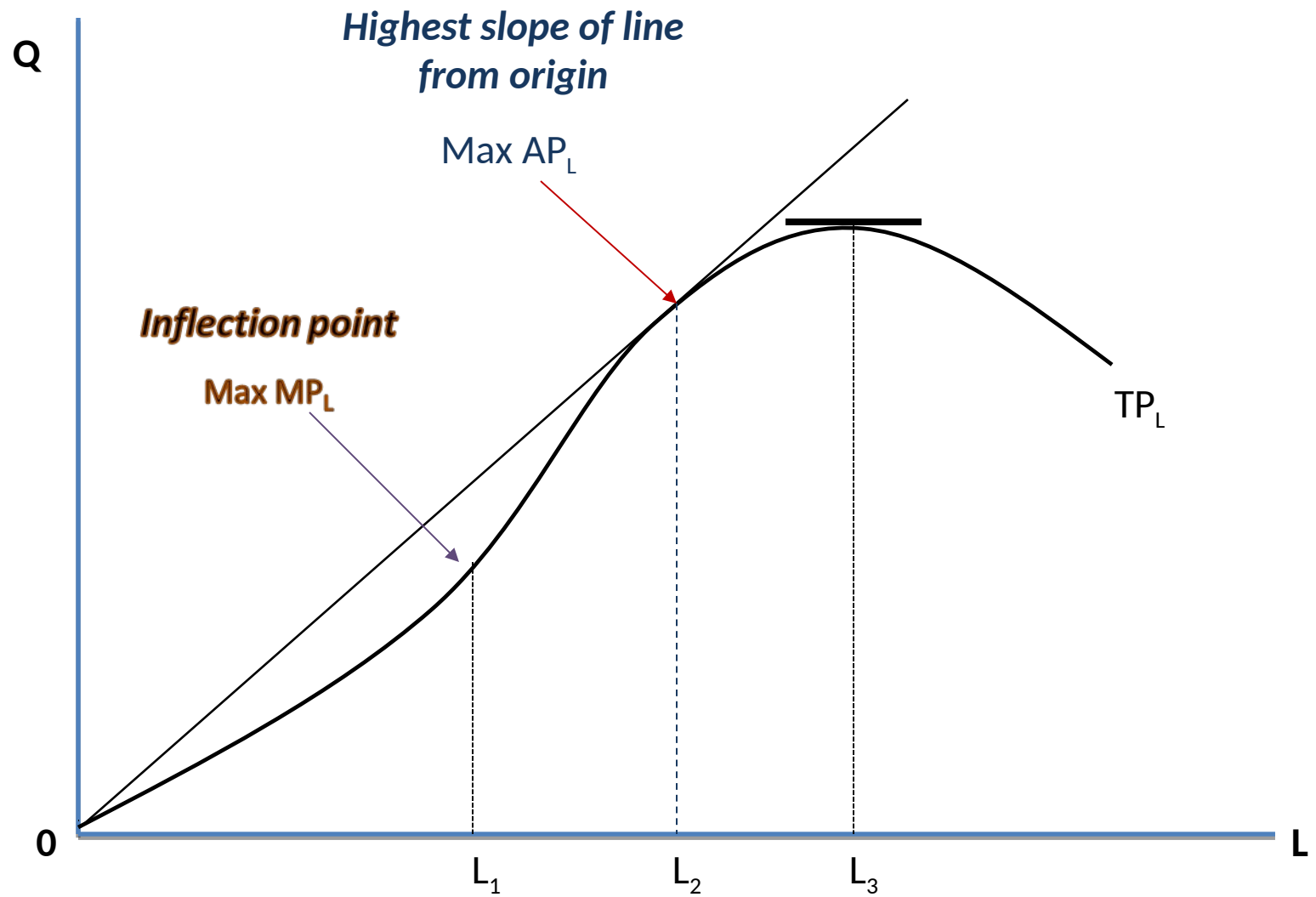
- When the marginal product is less than the average, the average product decreases.
- When the marginal is equal to the average, the average does not change (it is at maximum)
- When the marginal is greater than the average, the average increases (fig. below):

If $MP > AP$ then AP is rising(increases).

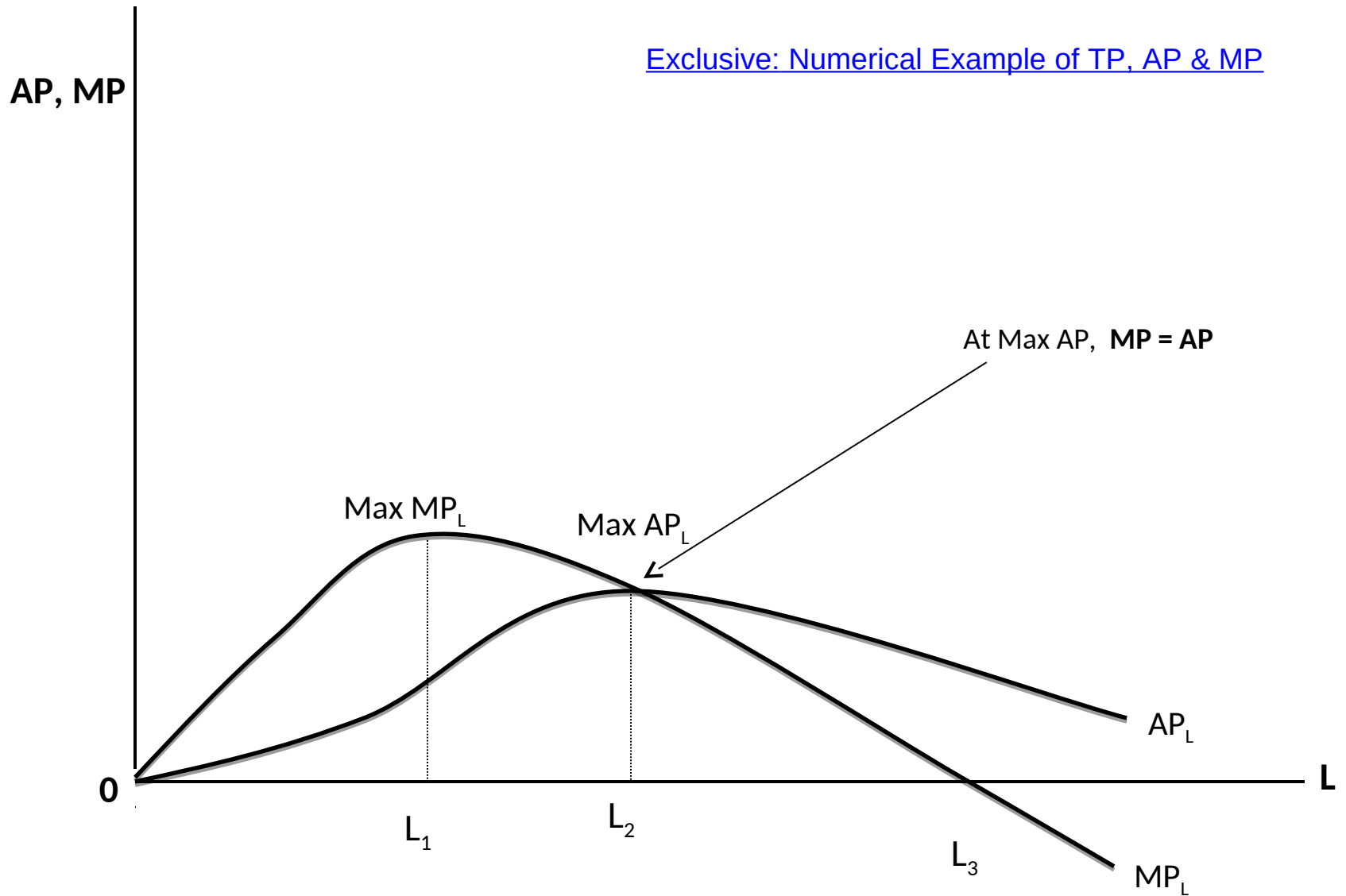
If $MP < AP$ then AP is falling(decreases).

If $MP = AP$ when AP is maximized.

If TP is maximum then MP is zero.



Exclusive: Numerical Example of TP, AP & MP

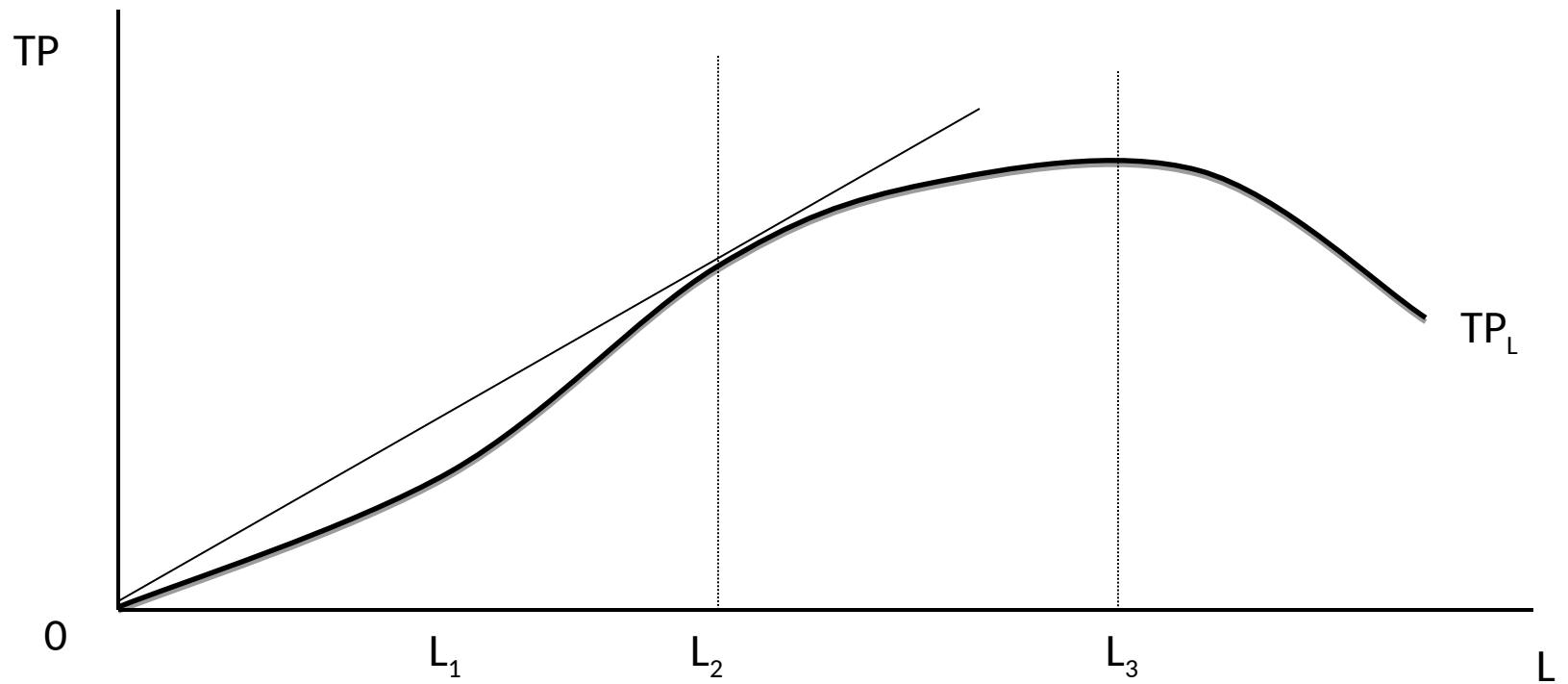
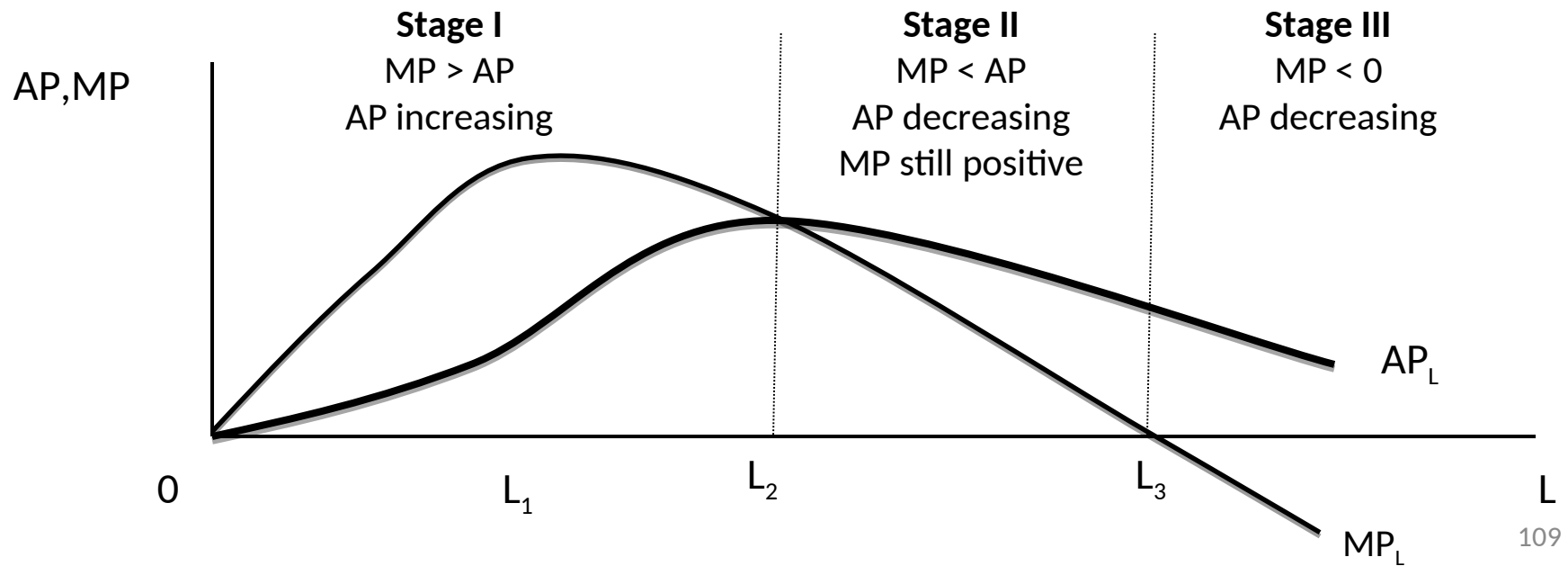


Stages of Production

There are three stages of production (*fig. below*)

- **Stage I:**

- Starts from the origin up to the point where AP is maximum;
- AP_L is increasing so $MP > AP$;
- More or less, all the product curves are increasing;
- Stage I stops where AP_L reaches its maximum;
- MP peaks and then declines and the law of diminishing returns begins to manifest at this stage.



Stage of production ... cont'd

- **Stage II:**

- starts from where $AP_L = MP_L$ up to MP_L is zero;
- *MP is zero when TP is maximum;*
- Marginal product is continuously declining and reaches zero as additional labor inputs are employed.

- **Stage III:**

- starts where the MP_L has turned negative;
- all product curves are decreasing; and
- total output starts falling even as the input is increased.

Theory of COSTS

- **Cost:** is the monetary value of inputs used in the production

- Two types of cost of a product

- ✓ **Social cost:** is the cost of producing an item to the society
- ✓ **Private cost:** is the cost of producing an item to the individual producer._

- Private cost of production can be measured in two ways

- *Economic cost and accounting cost*

A. Economic cost: the cost of all inputs used to produce the item.

Economic cost = Explicit costs + opp. cost + other Implicit cost

Implicit Vs Explicit Costs

- **Explicit costs** – costs paid in cash (payment to outsiders);
- **Implicit cost** – imputed cost of self-owned or self employed resources based on their opportunity costs;
- **Opportunity Cost** - the economic cost of an input used in a production process is the value of output sacrificed elsewhere. The (principle of) opportunity cost of an input is the value of foregone income in best alternative employment.

B. Accounting cost: refers to the cost of purchased inputs only. It is the explicit cost or outlay of production only.

Cost Concepts (Short-run cost of production)

1. Total Fixed Cost (TFC)
2. Total Variable Cost (TVC)
3. Total Cost ($TC = TVC + TFC$)
4. Average Fixed Cost ($AFC = TFC/Q$)
5. Average Variable Cost ($AVC = TVC/Q$)
6. Average Total Cost ($AC = AFC + AVC$)
7. Marginal Cost ($MC = \Delta TVC / \Delta Q$)

Cost Concepts

- Two time horizons in cost consideration: **SR** and **LR costs**;
- **Total fixed cost (TFC) or fixed cost (FC)** is those costs that do not vary as the firm change its output level
 - Examples: include the payment or rent for land, buildings and machinery, Depreciation, Interest, Property Taxes, Insurance
 - The fixed cost is independent of the level of output produced.
 - Graphically, depicted as a horizontal line.

... Concepts ... cont'd

- ***Total variable cost (TVC)* or **Variable cost (VC)**** refers to the cost that changes as the amount of output produced is changed.
 - **Examples** - purchases of raw materials, payments to workers, electricity bills, fuel and power costs.
 - Total variable cost increases as the amount of output increases.
 - If no output is produced, then total variable cost is zero;
 - the larger the output, the greater the total variable cost.

... Concepts ... cont'd

- **Total cost (TC)** is the sum of total fixed cost and total variable cost

$$TC = TFC + TVC$$

– As the level of output increases, total cost of the firm also increases.

- **Marginal Cost (MC) is:** the additional cost incurred from producing an additional unit of output:

$$\begin{aligned} MC &= \Delta TC / \Delta Q, & Q &= \text{output} \\ &= \Delta TVC / \Delta Q \end{aligned}$$

Costs of Production

Q	Total Fixed Cost	Total Variable Cost	Total Cost	Marginal Cost	Average Cost
0	100	0	100	-	-
1	100	30	130	30	130
2	100	50	150	20	75
3	100	60	160	10	53.3
4	100	65	165	5	41.25
5	100	75	175	10	35
6	100	95	195	20	32.5
7	100	125	225	30	32.14
8	100	165	265	40	33.12
9	100	215	315	50	35
10	100	275	375	60	37.5

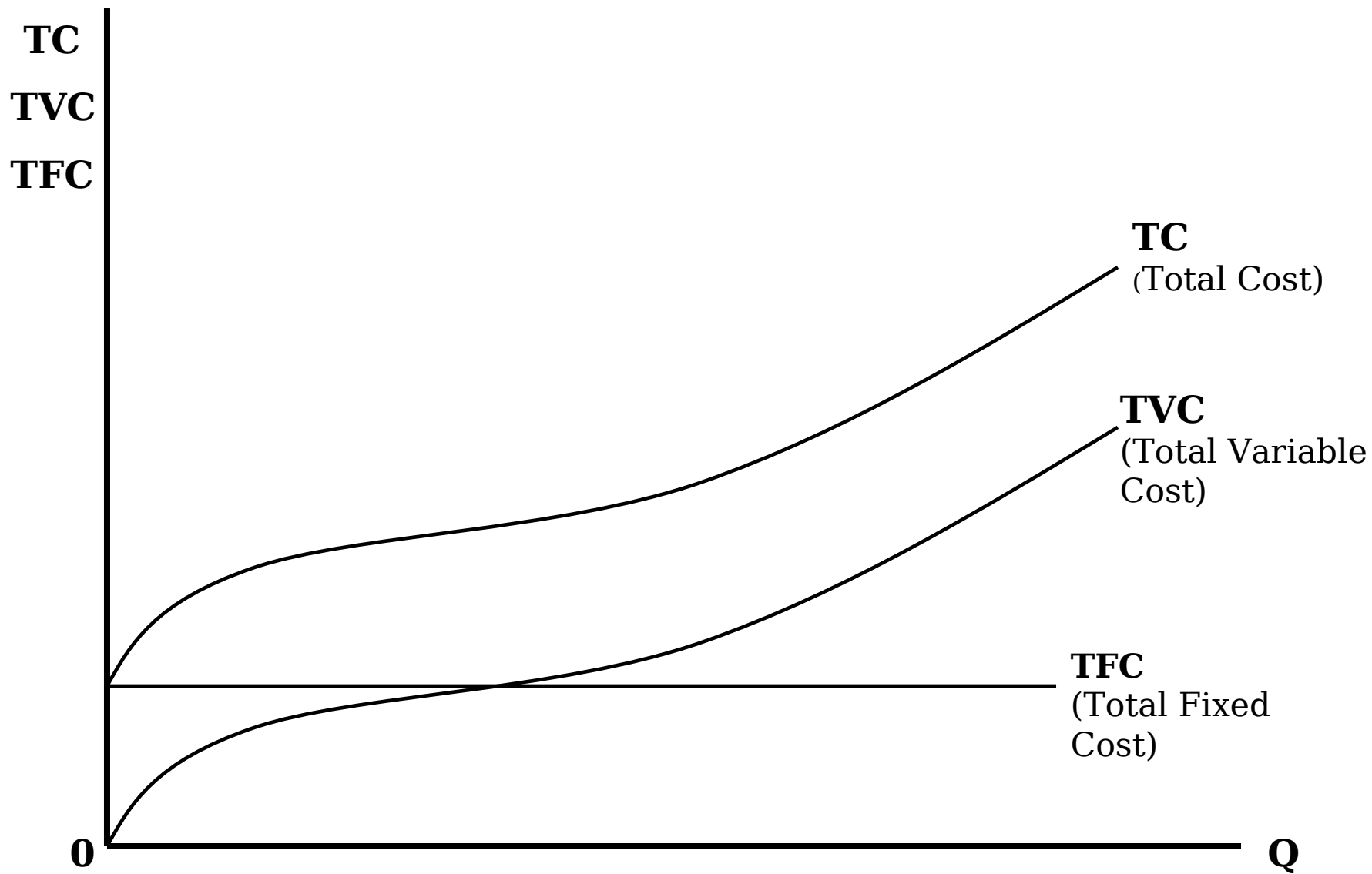


Fig. COST CURVES

AFC

$$AFC = TFC/Q.$$

As more output is produced, the
Average Fixed Cost decreases.

AFC
(Average Fixed
Cost)

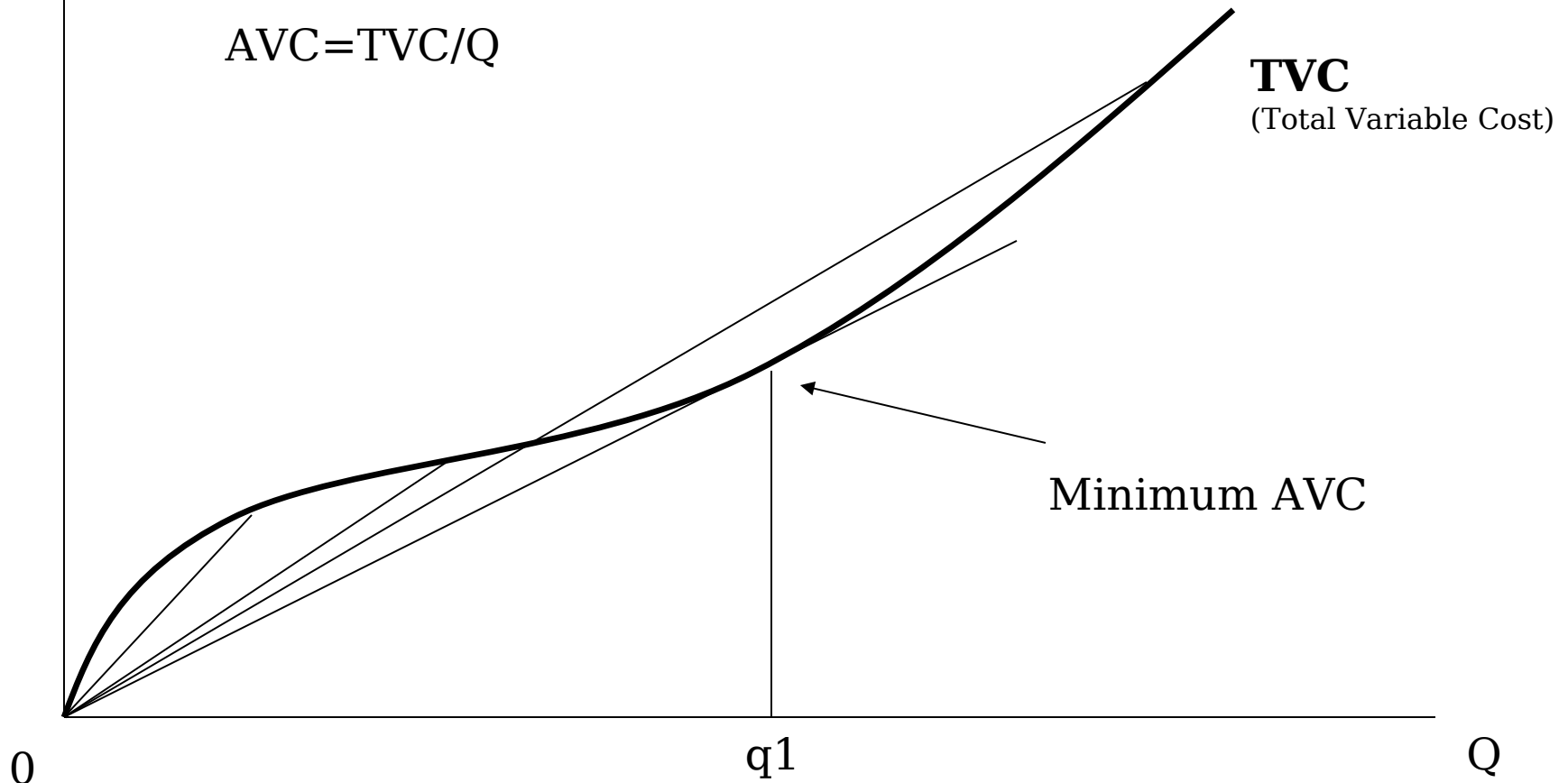
0

Q

TVC
AVC

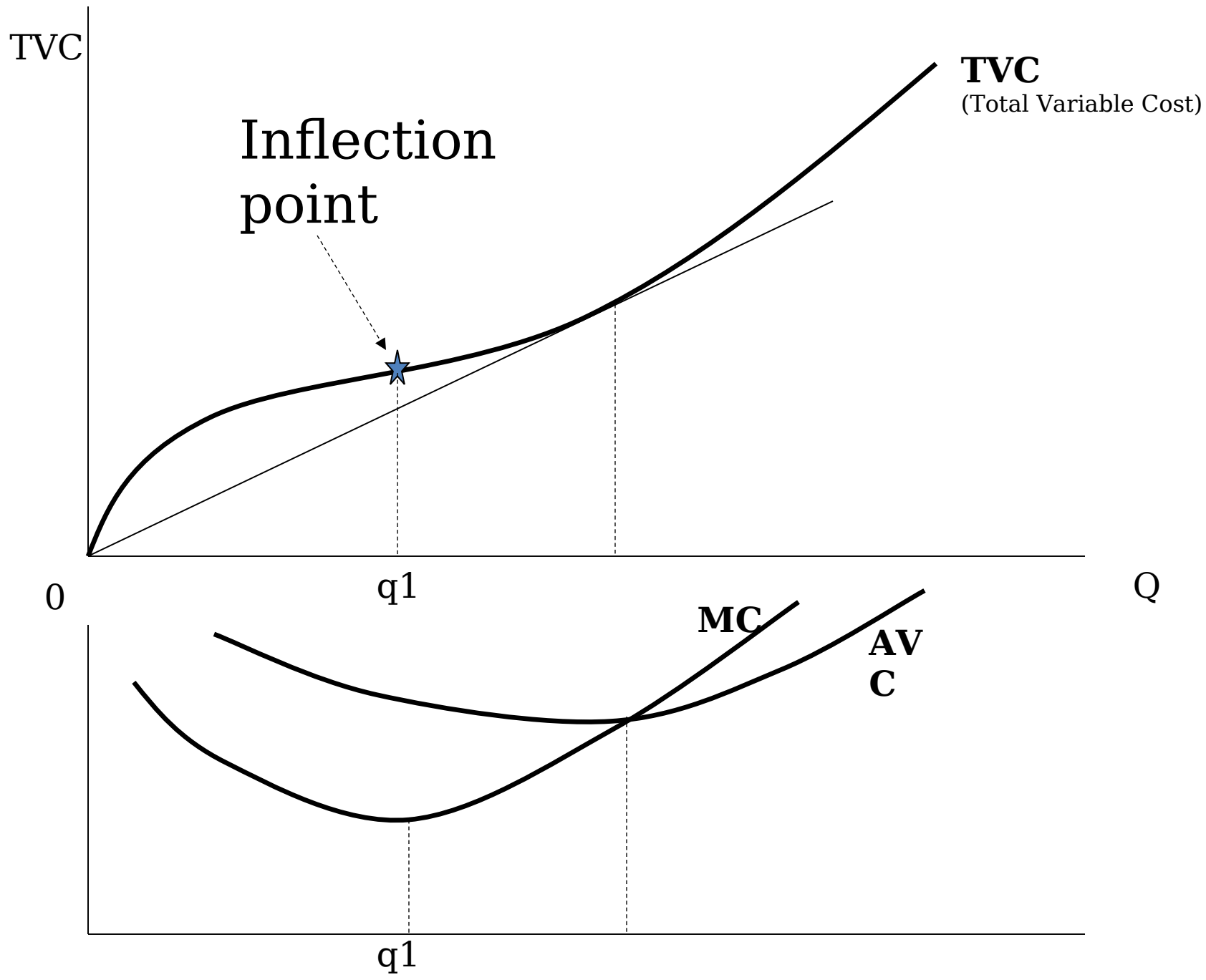
The **Average Variable Cost** at a point on the TVC curve is measured by the slope of the line from the origin to that point.

$$AVC = TVC / Q$$



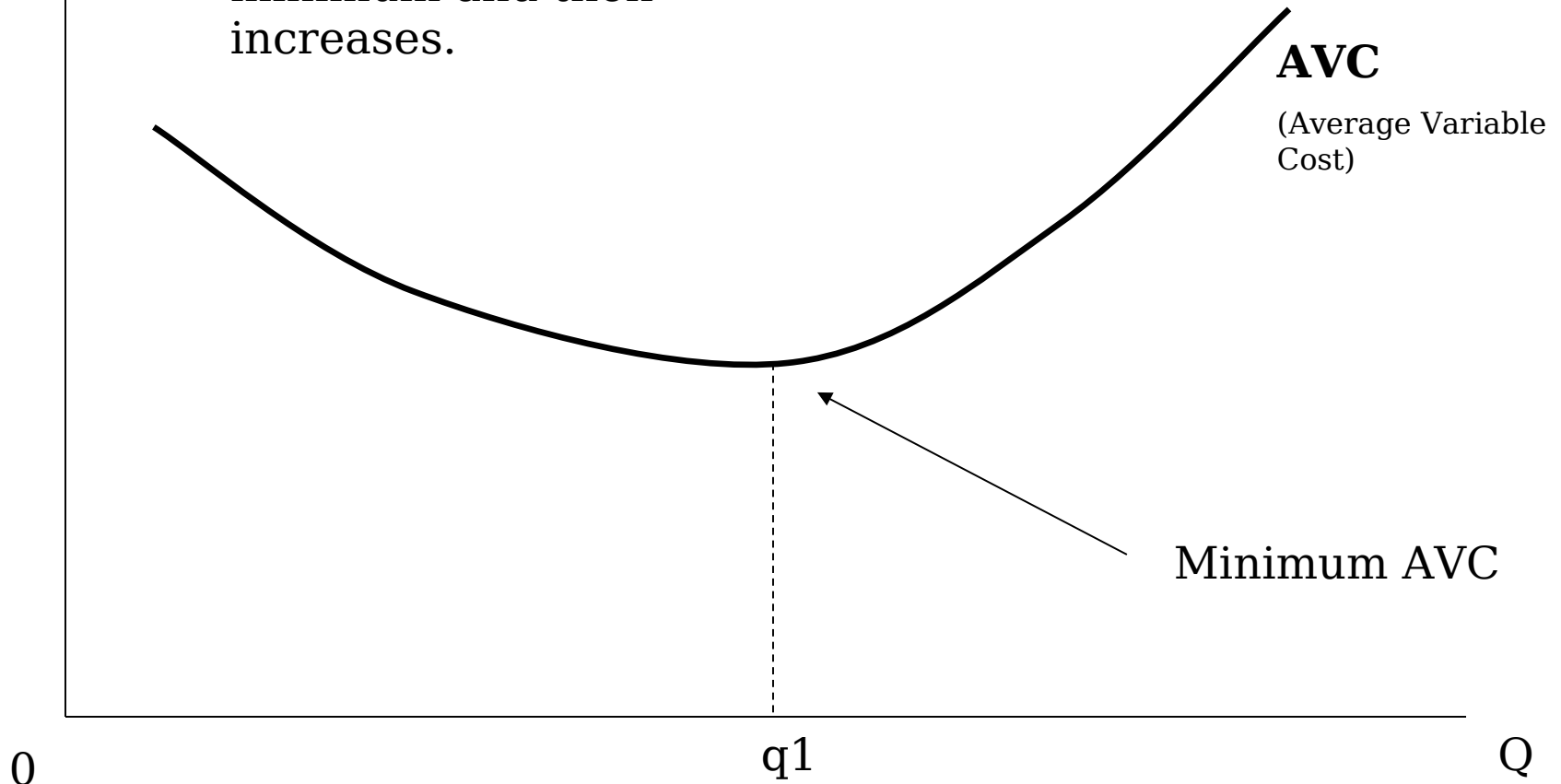
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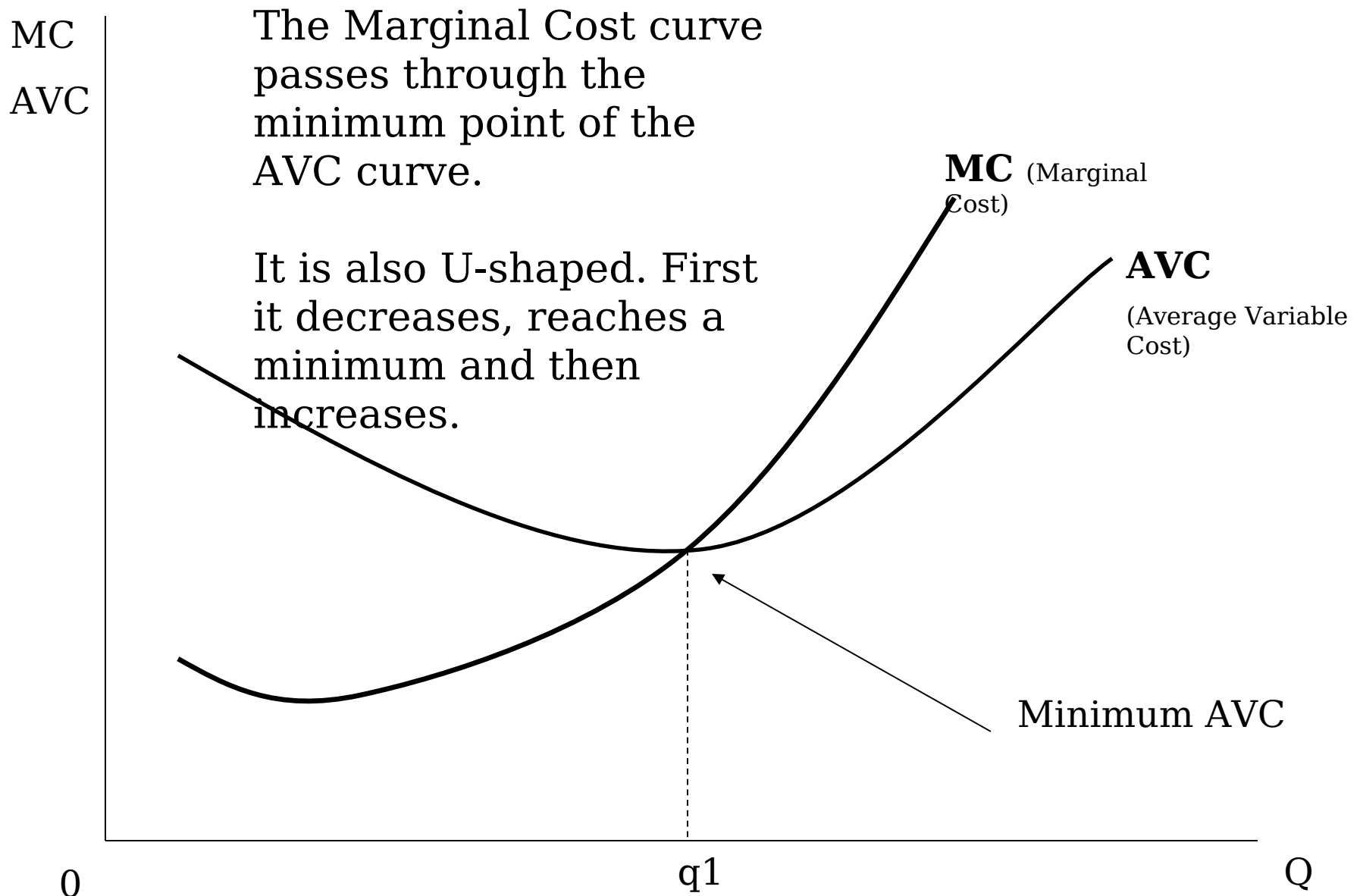
- MC is generally increasing.
- MC crosses ATC and AVC at their minimum point.
- If MC is below the average value:
 - Average value will be decreasing.
- If MC is above the average value:
 - Average value will be increasing.

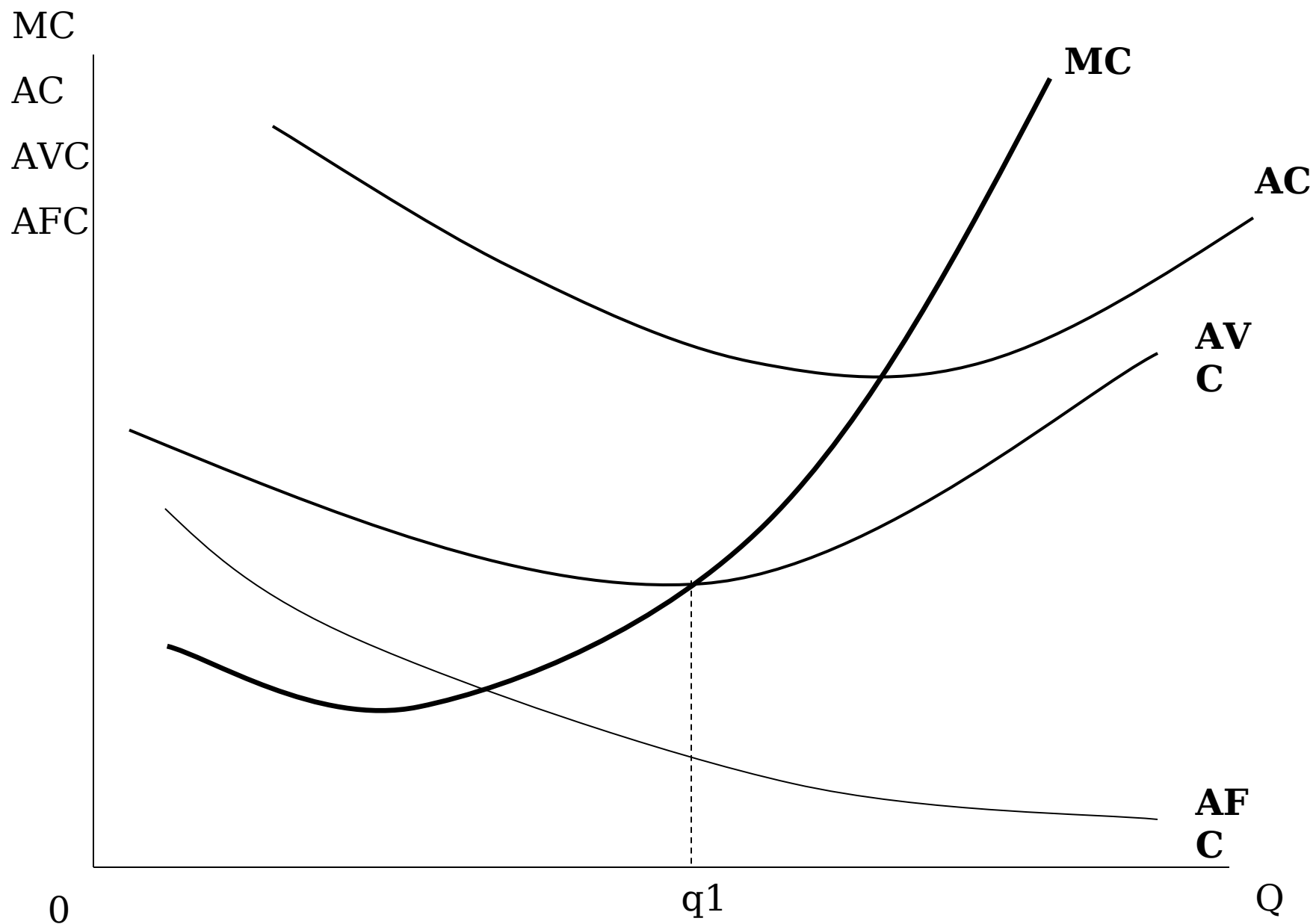


AVC

The Average Variable Cost is U shaped. First it decreases, reaches a minimum and then increases.







The “PER UNIT” COST
CURVES

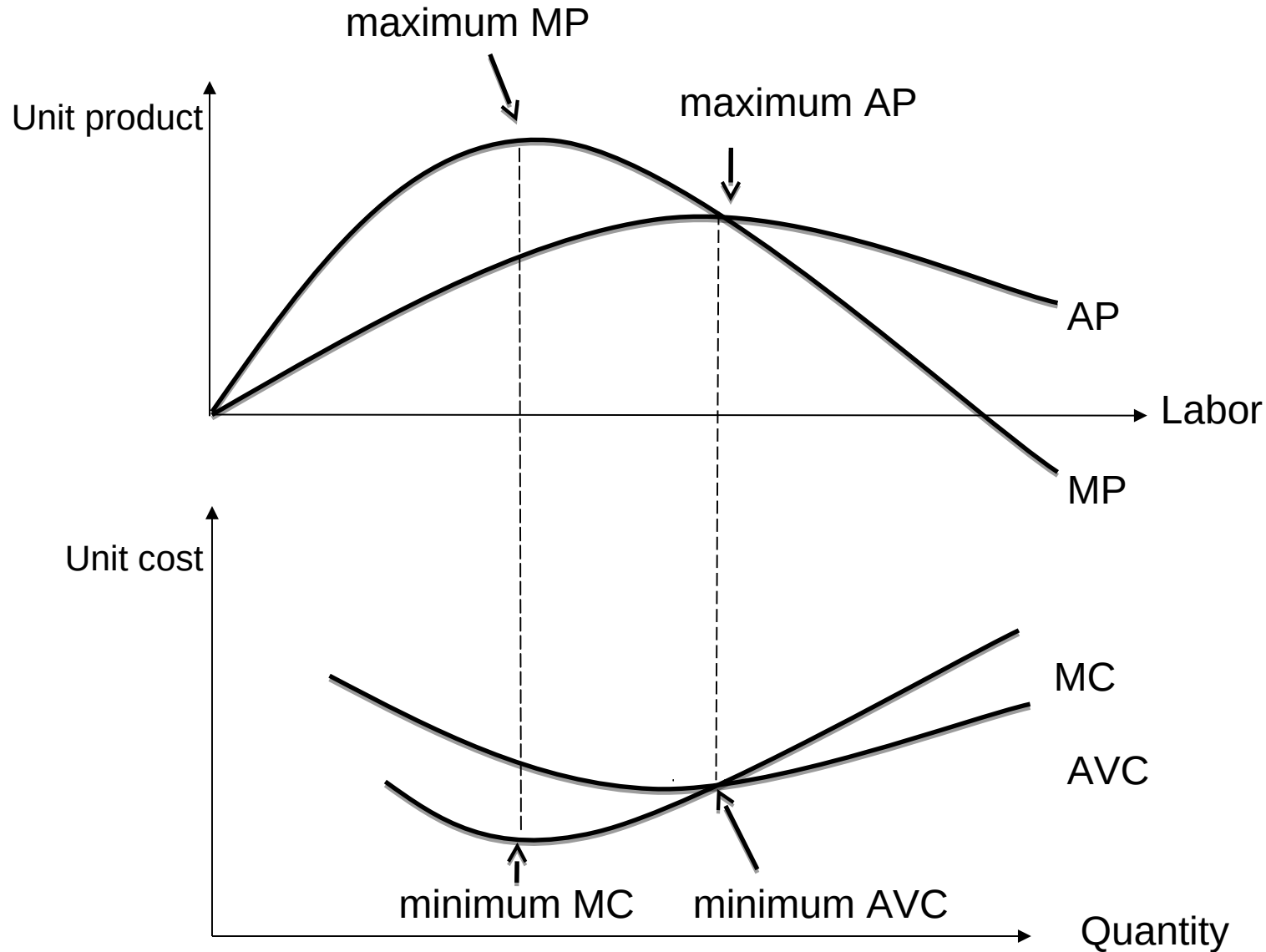
Table 5.4 Average Cost of Production

(Q)	(TC)	(AC)
0	100	-
1	130	130.00
2	150	75.00
3	160	53.33
4	165	41.25
5	175	35.00
6	195	32.50
7	225	32.14
8	265	33.13
9	315	35.00
10	375	37.50

Table 5.5 Average Variable Costs of Production

Output (Q)	Total Variable Cost (TVC)	Average Variable Cost (AVC)
0	0	0
1	30	30.0
2	50	25.0
3	60	20.0
4	65	16.3
5	75	15.0
6	95	15.8
7	125	17.9
8	165	20.6
9	215	23.9
10	275	27.5

The Link between Production and Cost



Summary of production and cost

- There is an inverse relationship between AP and AVC
- There is an inverse relationship between MP and MC
- Whenever MP is above AP, the MC is below AVC
- Whenever MP is below AP, the MC is above AVC
- Whenever MP is equal to AP, the MC is equal to AVC

*i.e. $MP = AP$ when AP is minimum, $MC = AVC$,
when AVC is minimum*

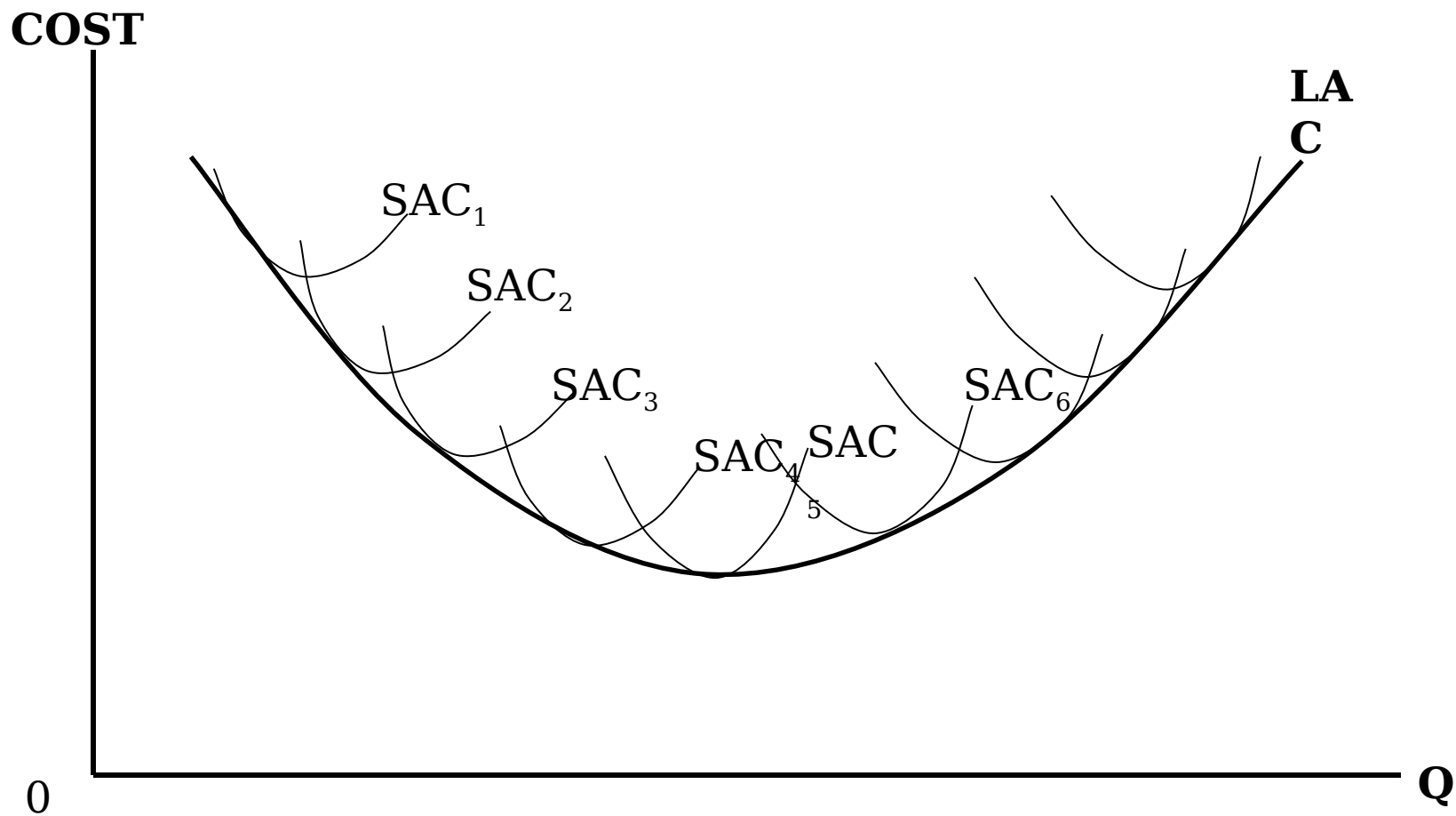
Cost Curves in the Long Run

- In the long run, the amount of all factors of production can be varied so that there are no fixed costs.
- The time period corresponding to the long run will be such a condition that the producers can make all the necessary changes in the size of the plant.
- Fixed cost will be variable in the long run decision of production. When we say that fixed costs vary with the size of the plant, we mean that all costs behave in the same way as all other components of the variable costs.

The Long run average cost curves

- The long- run average cost curve is an '*envelope*' of all the short run ATC curves corresponding to all the different levels of factors of production that are fixed in the short- run.
- The long run average cost curve is given by the point of tangency to all the short-run curves representing all the alternative plant sizes that a firm could be able to build in the long-run.
- To know it more look at the following graph.

LONG-RUN AVERAGE COST CURVE



CHAPTER VI: MARKET STRUCTURE

Classifying Markets by the Degree of

Competition

- ***We Classify markets Based on:***

- number of firms
- freedom of entry to industry
- nature of product
- nature of demand curve

- ***The four market structures***

- perfect competition
- Monopoly
- monopolistic competition
- oligopoly

Profit Maximization: *General Frame*

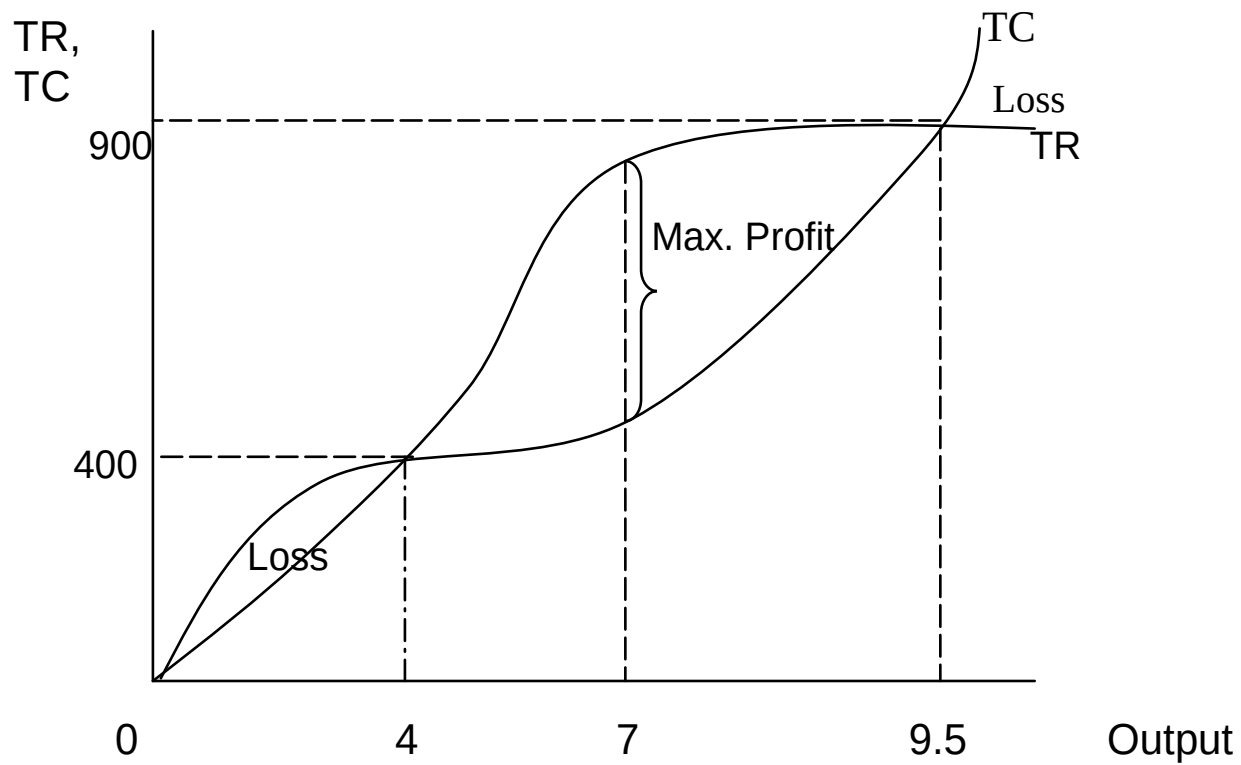
- Disregarding the level of competition, firms are supposed to be rational and optimize their profit;
 - Two methods to identify the optimum level of profit. **NB:** when profit has negative value, we say the firm is minimizing its loss.
- 1) Total Approach:** - this method tries to look at the maximum positive difference or the minimum negative difference (if the firm is running at loss) between ***total revenue & total cost***.

On the other hand, graphically we seek for the point at which the vertical distance b/n the total revenue curve & the TC curve is maximum (minimum when it is a loss).

- **E.g.** for the cost table that you have taken, assume that price of the product is Br. 100.

Q	TR=P.Q	TC	Profit (Π) = TR-TC	
0	0	100	-100	loss
1	100	190	-90	loss
2	200	270	-70	loss
3	300	340	-40	loss
4	400	400	0	breakeven output
5	500	470	30	profit
6	600	550	50	profit
7	700	640	60	profit
8	800	750	50	profit
9	900	880	20	profit
10	1000	1030	-30	loss

This can be shown graphically as follows: -



2) Marginal Approach: - We use the marginal revenue (MR) and marginal cost (MC) curves to determine the optimum output level, where $MR = MC$.

e.g. If the total cost function of a firm under perfectly competitive market is given by $TC = 2Q^2 - 28Q + 100$. Find the optimum level of output & the corresponding profit when price of the product is Br. 20.

Solution: $MC = 4Q - 28$

$P = MR = 20 \text{ Br.}$

At equilibrium: $MC = MR = P \quad \Rightarrow \quad 4Q - 28 = 20$

$Q^* = 12 \text{ units}$

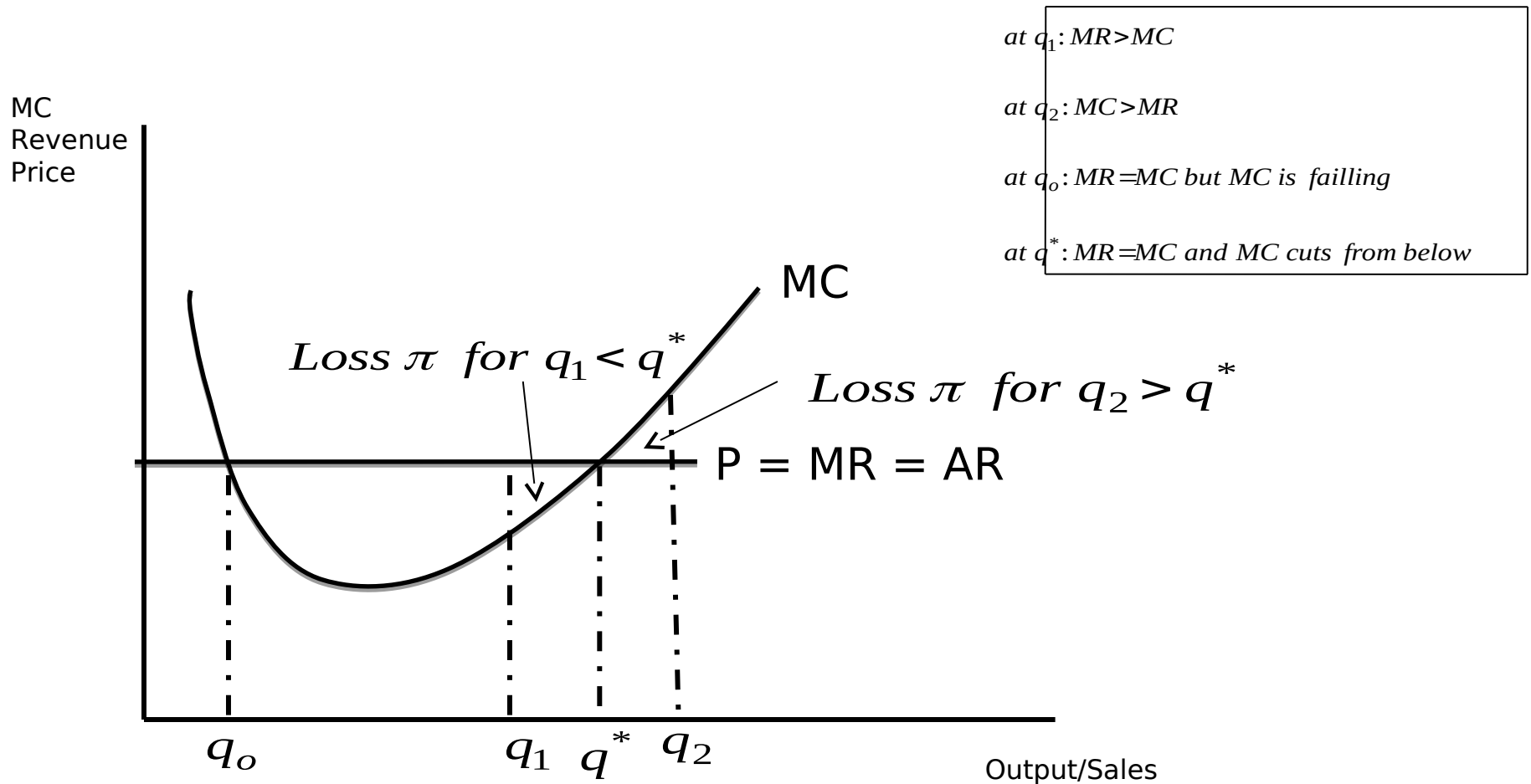
$\pi = 188$ (profit maximization)

6.1 Perfect Competition

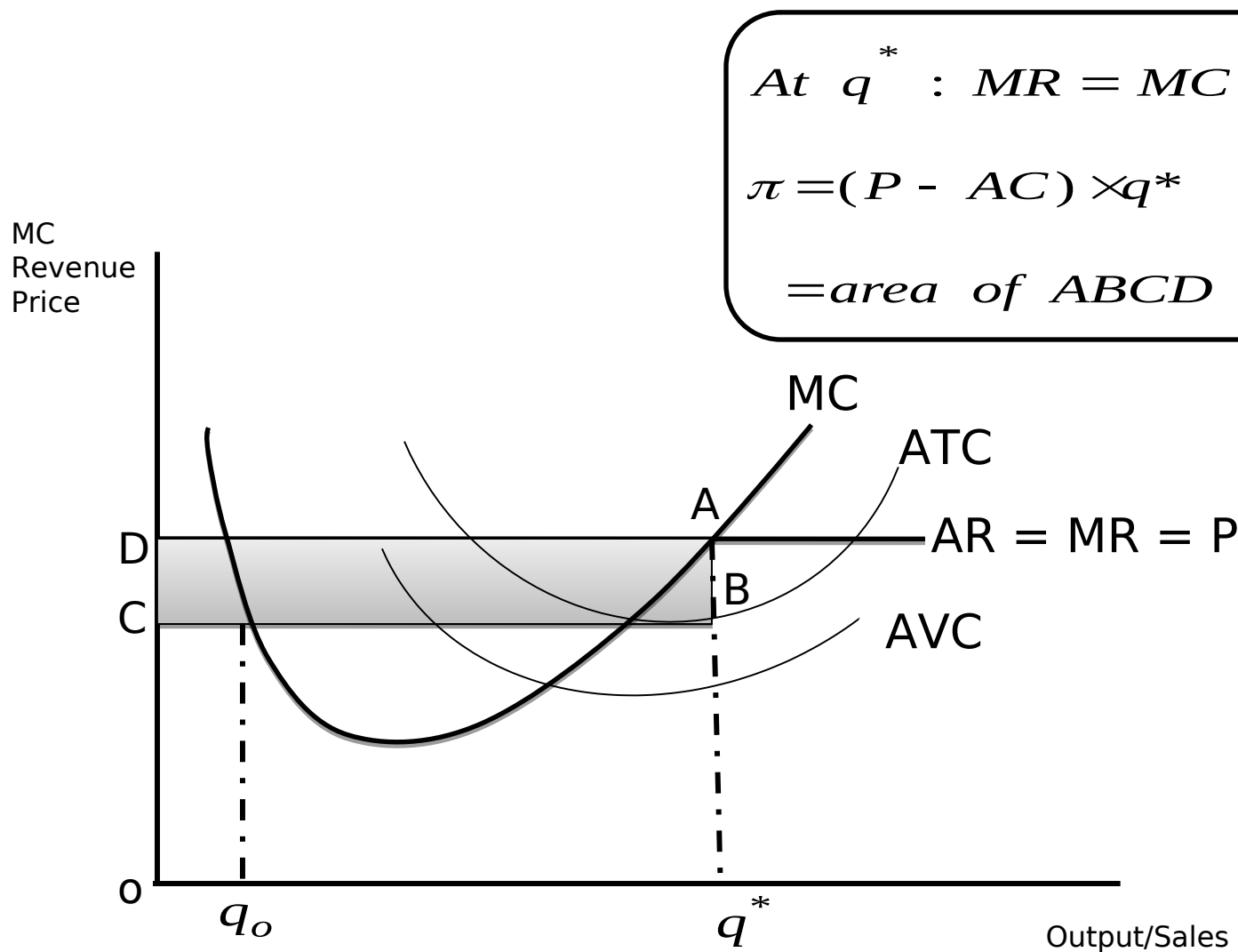
Perfect competition : Mkt characterized by complete absence of rivalry among individual firms

- Assumptions
 - firms are price takers
 - freedom of entry
 - Identical/homogenous products
 - perfect knowledge
- Short-run equilibrium of the firm
 - price, output and profit
- The short-run supply curve of the firm

Output decision of competitive firm



Profit Maxⁿ: A competitive firm making positive profit

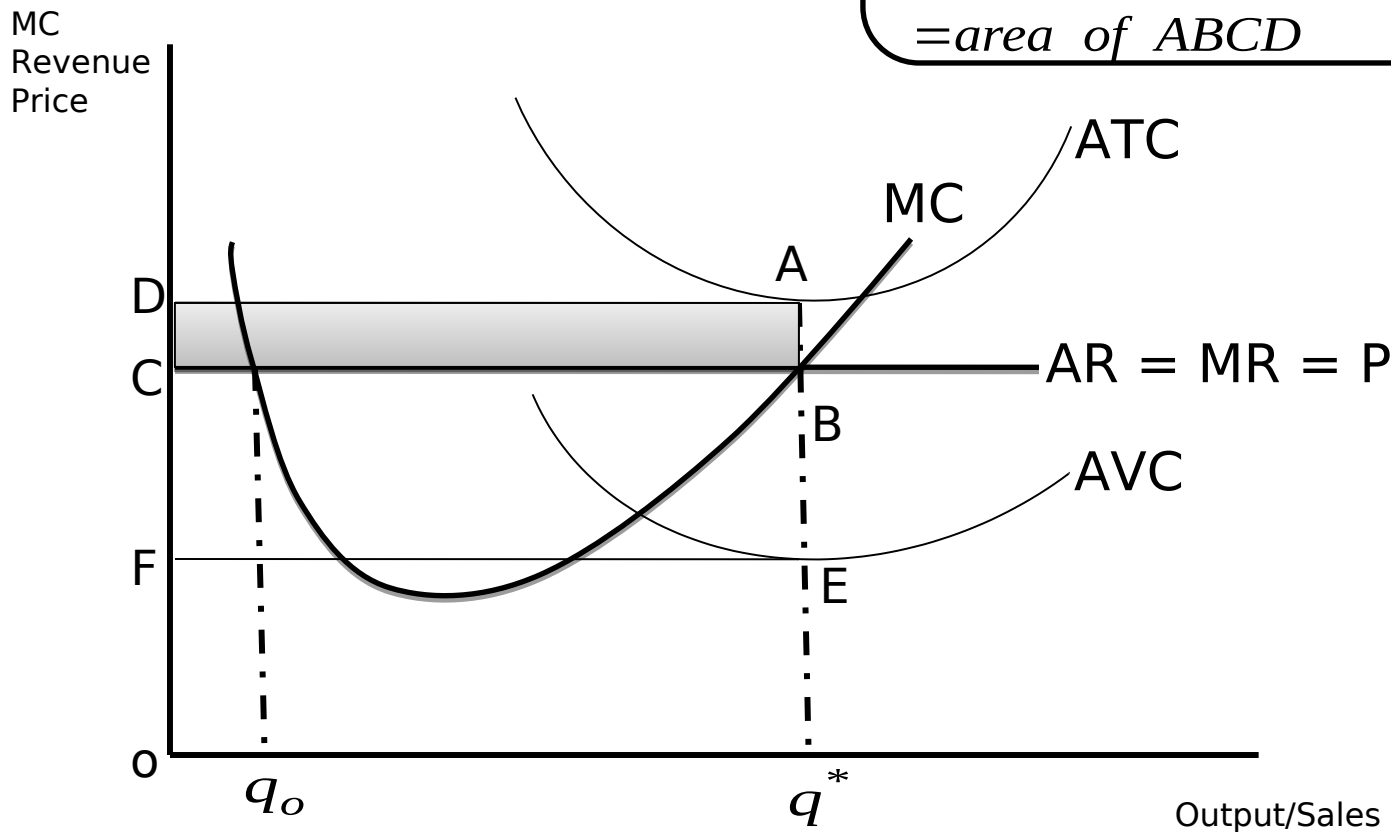


A competitive firm incurring losses

At q^* : $MR = MC$ and $P < ATC$

$$Loss = (P - AC) \times q^*$$

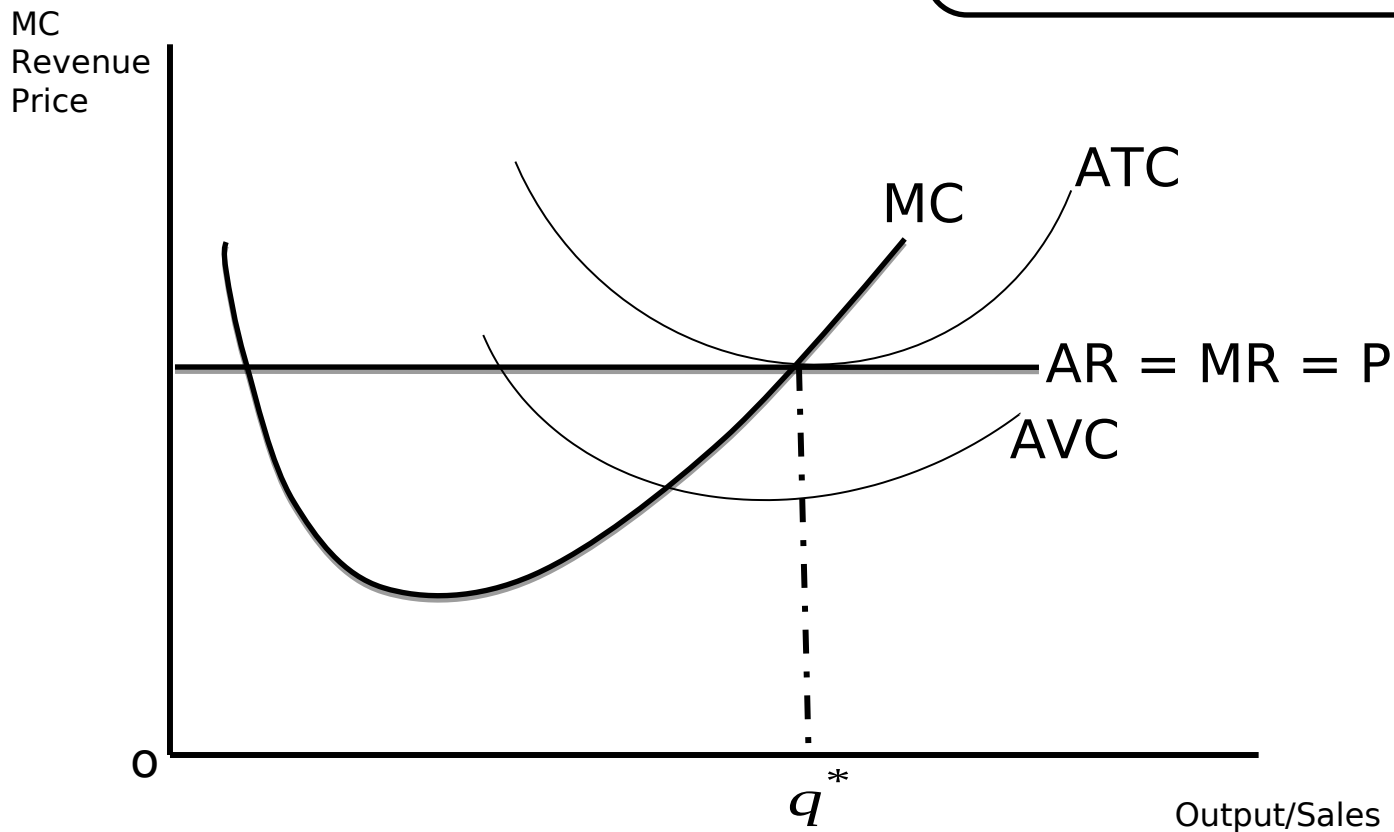
$= \text{area of } ABCD$



A competitive firm at zero profits

At q^* : $MR = MC$ and $P = ATC$

Zero π



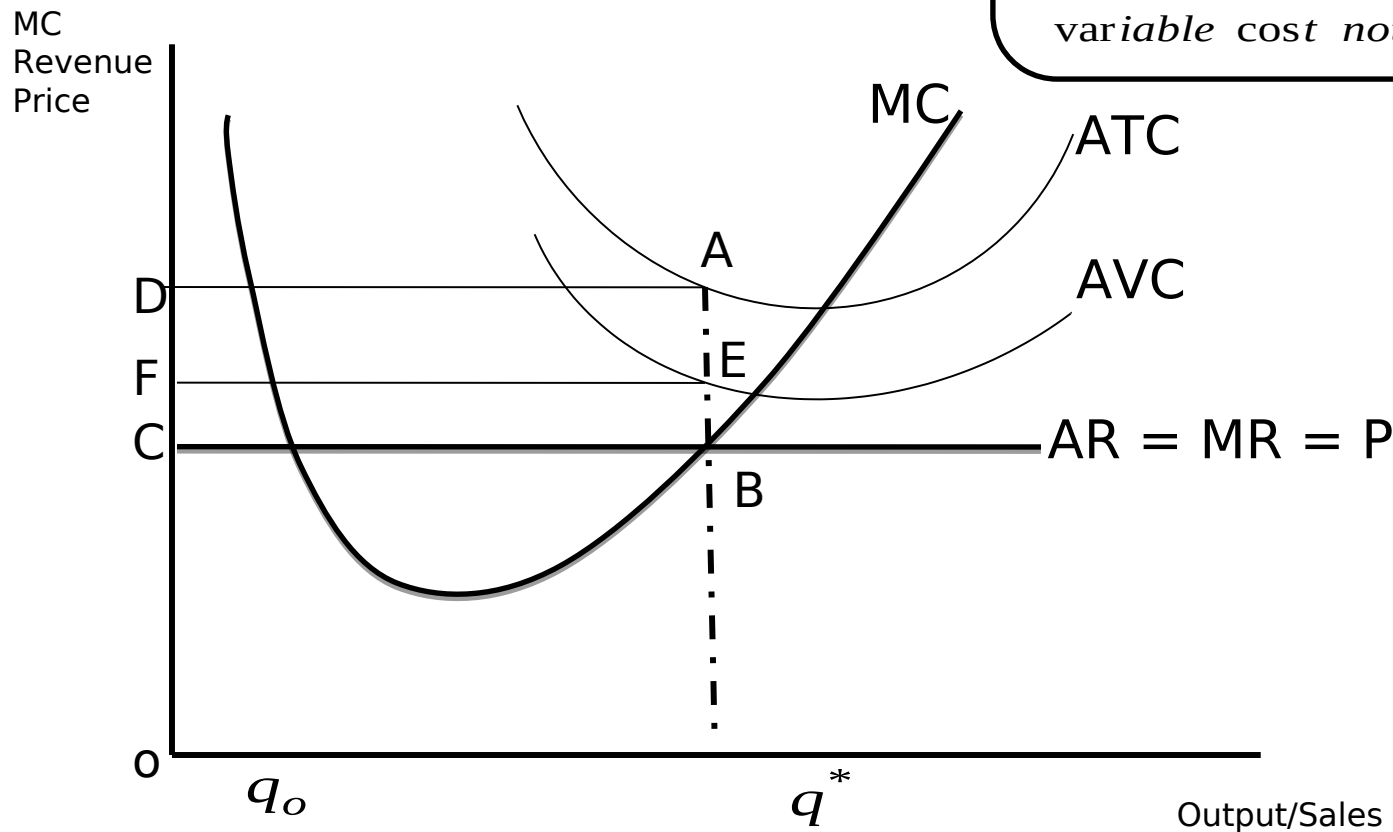
A competitive firm incurring losses

At q^* : $MR = MC$ and $P < ATC$

$Loss = ABCD > \text{fixed costs} = AEFD$

Lossless money at zero output

variable cost not covered



Choosing output In the short run

Summary of production decisions

1. π is max when $MR = MC$
2. If $P > ATC$ the firm making positive π
3. If $AVC < P < ATC$ the firm produces at loss
4. If $P < AVC < ATC$ the firm should shut down

Firm's Profit maximization

- The firm's problem is to maximise profit

$$\pi = TR - TC = P_0 \cdot Q - TC$$

- First-order condition:

$$\frac{d\Pi}{dQ} = P_0 - \frac{dTC}{dQ}$$

$$\Leftrightarrow P_0 = MC$$

- Second-order condition:

$$\frac{d^2\Pi}{dQ^2} < 0 \Leftrightarrow - \frac{d^2TC}{dQ^2} = - \frac{dMC}{dQ} < 0$$

$$\Leftrightarrow \frac{dMC}{dQ} > 0$$

Benefits of perfect competition:

- Output produced at minimum feasible cost;
- optimal allocation of resources;
- consumer pay minimum possible price:

$$P = MC, P = MU \text{ thus } MU = MC$$

- Plants are used at full capacity in long run:
 - No waste of resource.
 - Firms only earn normal profit.

6.2 Monopolistic Competition

Monopolistic competition (MpC) is a market with the following characteristics:

- A large number of firms.
- Each firm produces a differentiated product.
⇒ Down ward slopping dd curve
- Firms compete on product quality, price, and marketing.
- Firms are free to enter and exit the industry.

What Is Monopolistic Competition?

Characteristics of the Firm

1. **Large Number of Firms** - The presence of a large number of firms in the market implies:
 - Each firm has only a small market share and therefore has limited market power to influence the price of its product.
 - Each firm is sensitive to the average market price, but no firm pays attention to the actions of the other, and no one firm's actions directly affect the actions of other firms.
 - Collusion, or conspiring to fix prices, is impossible.

Characteristics ... cont'd

2. Product Differentiation

- Firms in monopolistic competition practice **product differentiation**, which means that each firm makes a product that is slightly different from the products of competing firms.
- producing firms exercise a “mini-monopoly” over their product.
- Product differentiation gives monopolistic competition its monopolistic aspect.

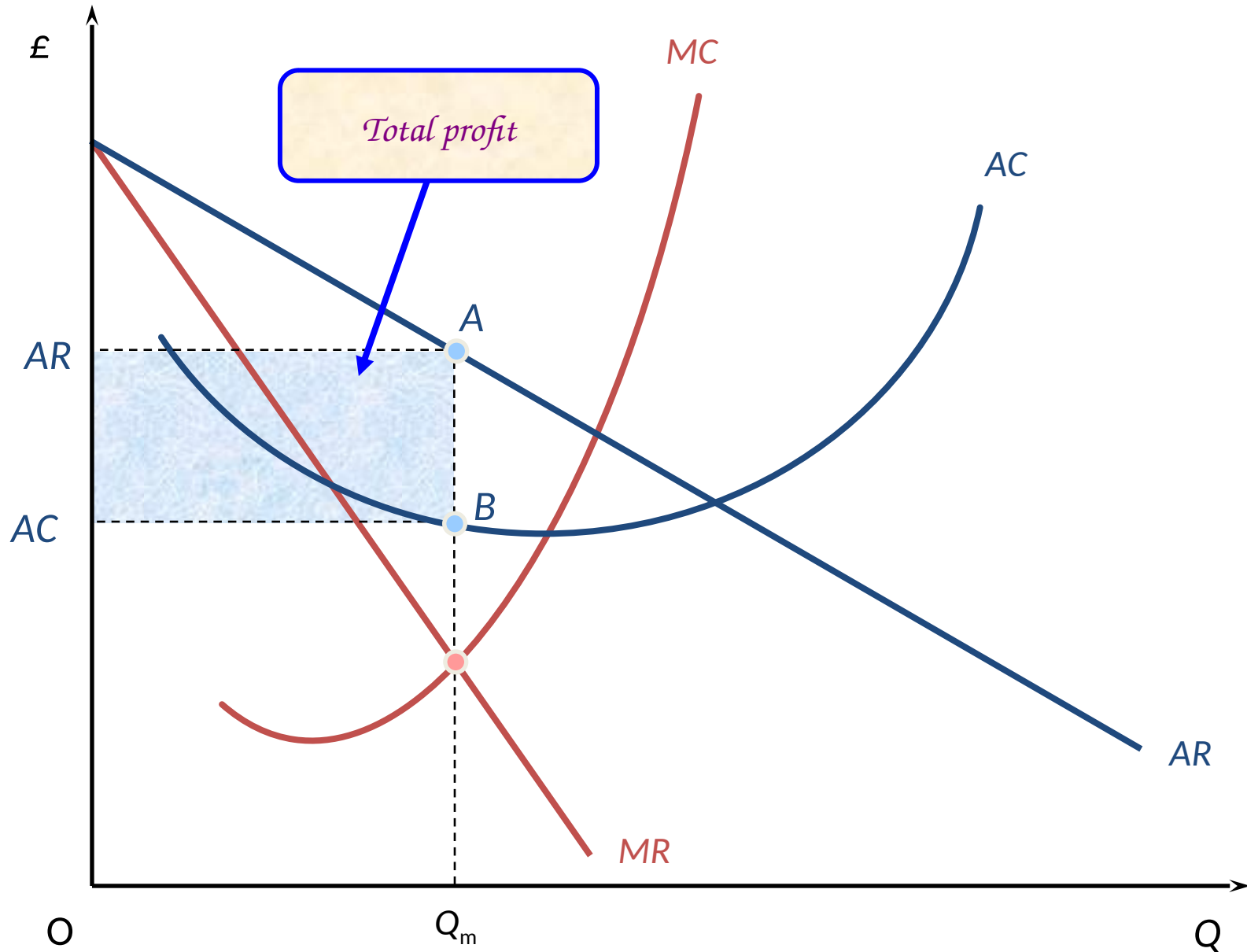
Characteristic Cont'd

- Product differentiation enables firms to compete in three areas: quality, Advertisement, and Patent and trade mark.
 - Quality includes design, reliability, size ,shape and service;
 - Differentiated products must be marketed using advertising, design, location and packaging;
 - Differentiation exists so long as advertising convinces buyers that it exists – By patent right and trade mark.

6.3 Pure Monopoly

- Defining monopoly
 - one seller
 - no substitute products
 - barrier to entry
- Bases of monopoly/barrier to entry
 - economies of scale
 - economies of scope
 - product differentiation and brand loyalty
 - lower costs for an established firm
 - ownership/control of key factors
 - ownership/control over outlets
 - legal protection/patent/trademark/licence
 - mergers and takeovers
 - aggressive tactics
 - intimidation

Profit maximising under monopoly



Monopoly ... Cont'd

- Disadvantages of monopoly
 - high prices / low output: short run
 - high prices / low output: long run
 - lack of incentive to innovate
 - Rent seeking
- Advantages of monopoly
 - economies of scale
 - profits can be used for investment
 - high profits encourage risk taking

Comparing Monopolistic Competition with Monopoly

- The difference between a monopolist and a monopolistic competitor is in the position of the average total cost curve in long-run equilibrium.
- For a monopolist, the average total cost curve can be, but need not be, at a position below price so that the monopolist makes a long-run economic profit.
- For a monopolistic competitor, the average total cost curve must be tangent to the demand curve at the price and output chosen by the monopolistic competitor.
- No long-run economic profit for monopolistically competitive firms.

6.4 Oligopolistic Market

Definition:

- **Oligopoly** is a mkt structure where there are a few sellers of a particular product or service;
- Firms recognize their rivalry & interdependence;
- Aware that any action on their part is likely to induce counter-actions by the rivals (strategies & Counter-Strategies b/n mkt participants);
- It is one of mkt in b/n the two extreme cases: in b/n PC & PM like the MpC mkt structure.

Oligopoly ... Cont'd

- **Characteristics of the market:**
 1. **Few sellers** but large producers in the mkt;
 2. Entry is difficult (obstacles to entry);
 3. Products may be either homogeneous or d/ted (standardized sometimes);
 4. Mutual **interdependence** of firms (b/c firms have substantial power over price);
 5. **Sticky** or rigid price: – prices tend to be sticky while it is flexible in the other mkt structures such as MpC.
- Based on this chtx, there are 2 types of oligopoly: *Non-collusive and Collusive oligopoly*

Summary: Features of the four market structures

Type of market	Number of firms	Freedom of entry	Nature of product	Examples	Implications for demand curve faced by firm
Perfect competition	Very many	Unrestricted	Homogeneous (undifferentiated)	Cabbages, carrots (approximately)	Horizontal: firm is a price taker
Monopolistic competition	Many / several	Unrestricted	Differentiated	Builders, restaurants	Downward sloping, but relatively elastic
Oligopoly	Few	Restricted	Undifferentiated or differentiated	Cement cars, electrical appliances	Downward sloping. Relatively inelastic (shape depends on reactions of rivals)
Monopoly	One	Restricted or completely blocked	Unique	Local water company, train operators (over particular routes)	Downward sloping: more inelastic than oligopoly. Firm has considerable control over price

Exercise

1. The demand and cost equations of a firm are given by: $Q = 50 - 0.5P$ and $TC = 50 + 40Q$
 - a. Find the level of output that maximizes profit
 - b. Find the maximum profit
 - c. Justify the magnitude you got in b is maximum?
2. Suppose the monopolist faces a market demand function given by $P = 40 - Q$. The firm has a fixed cost of \$ 50 and its variable cost is given as $TVC = Q^2$ determine:
 - a. the profit maximizing unit of output and price
 - b. the maximum profit