Part 5
Product Markets

Principles of Microeconomics
August 2019

Content

This part will be the continuation from production and cost. We study firm's behavior to maximize profit further by looking at revenue in different types of market structure and how firms face with various scenarios. Cost part will also be heavily applied in this chapter as well.

5.1 – Perfect competition

5.2 – Monopoly

5.3 – Monopolistic competition

5.4 – Oligopoly

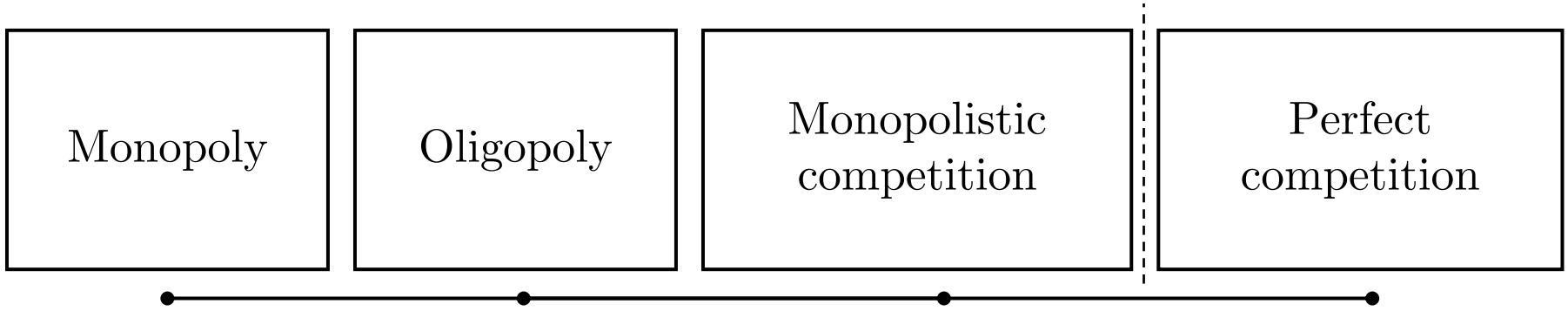
Market is a context where transactions of goods and services occur, which can be categorized with various criteria such as

- **Time of transaction:** there are 'spot' and 'future' markets. In 'spot' market, once the transaction takes place, the delivery takes place, while in case of future markets, transactions are finalized pending delivery for future dates.

- **Types of good:** such as rice market, computer market, camera market, newspaper market.

- **Consumer:** premium markets consist of consumers who possess high purchasing power while other markets consist of consumers who have lower purchasing power.

However, revenue and profit of a producer is determined by market structure. In other words competition or number of sellers. Since we are now studying producer's condition to maximize profit, this part will focus on the specific market structure **based on number of producers**.



(1) Perfect competition

- Infinite number of buyers and sellers. All of them are small and have no control over market power. (Price taker)

- Homogenous products.

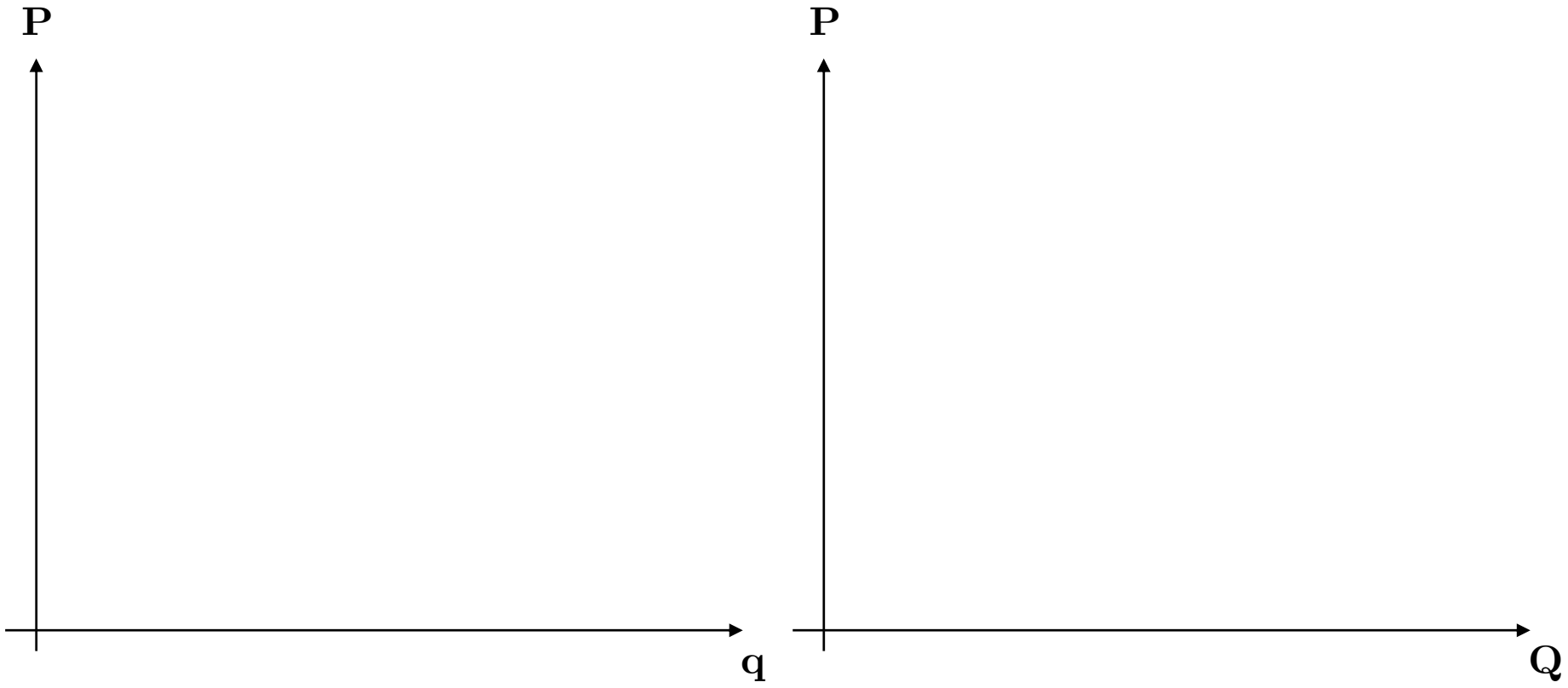
- Free-entry and exit.

- Free flow of factors of production.

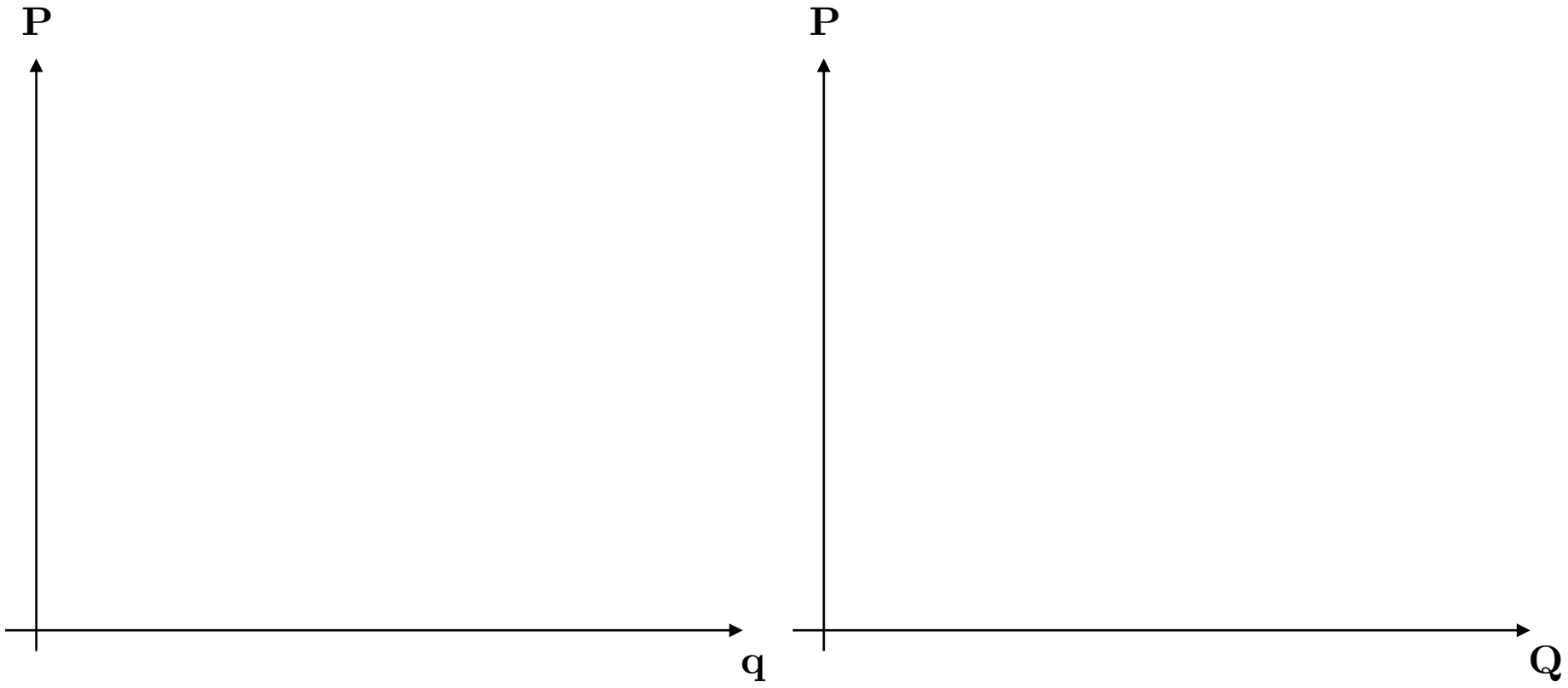
- Perfect information.

Examples of perfect competition

Demand from firm perspective



Price level change



Definition 5-1: Total revenue (TR)

Total revenue is total income from selling all units of goods or services.

$$TR = P \cdot q$$

Definition 5-2: Average revenue (AR)

Average revenue is firm's revenue per good or service.

$$AR = \frac{TR}{q}$$

Definition 5-3: Marginal revenue (MR)

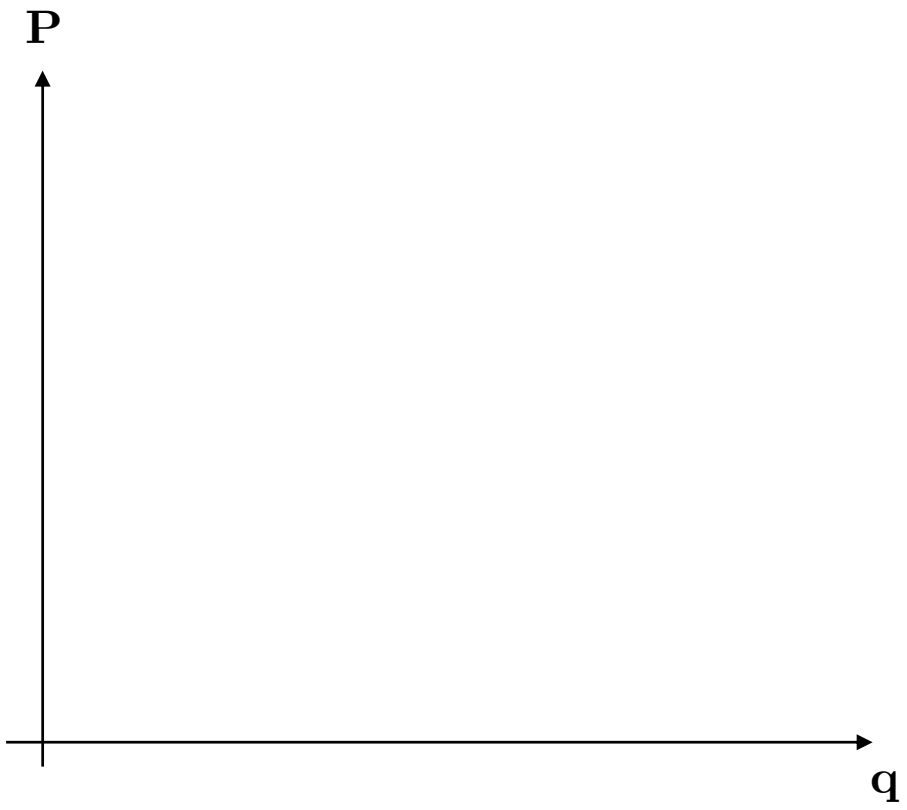
Marginal revenue is additional revenue from selling more 1 unit of goods or service.

$$MR = TR_n - TR_{n-1} = \frac{\Delta TR}{\Delta q} = \frac{dTR}{dq}$$

Example of revenue in perfect competition

Revenue and output				
(1) Output	**(2) Price**	**(3) Total revenue**	**(4) Average revenue**	**(5) Marginal revenue**
q	P	TR	AR	MR
1	10			
2				
3				
4				
5				

Graphing a firm's revenue



What to be noticed? And how should this cost curve relate to TP in the long-run?

Now we have considered both costs and revenues, we can define profit as

Definition 5-4: Profit (π)

Profit (loss) is the difference between revenue and cost.

$$\pi = TR - TC$$

In economics, we define profit a bit different from accounting.

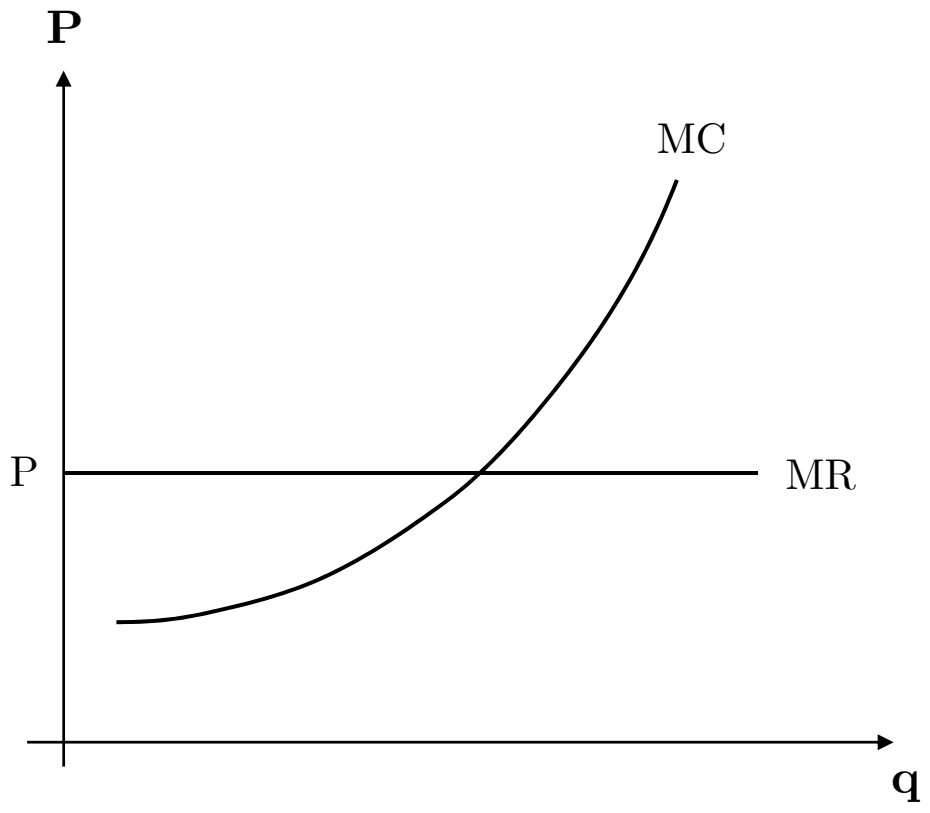
- A firm has **Excess profit** when total revenue is **more** than total cost.
- A firm has **Normal profit** when total revenue is **equal** to total cost.
- A firm has **loss** when total revenue is **less** than total cost.

Why do we define profit against our initial thoughts?

Since we assumed that a firm's goal is to maximizing profit, we can prove from a simple statement here.

$$\max_{q} \quad \pi = TR - TC$$

Why the condition (MR = MC)?

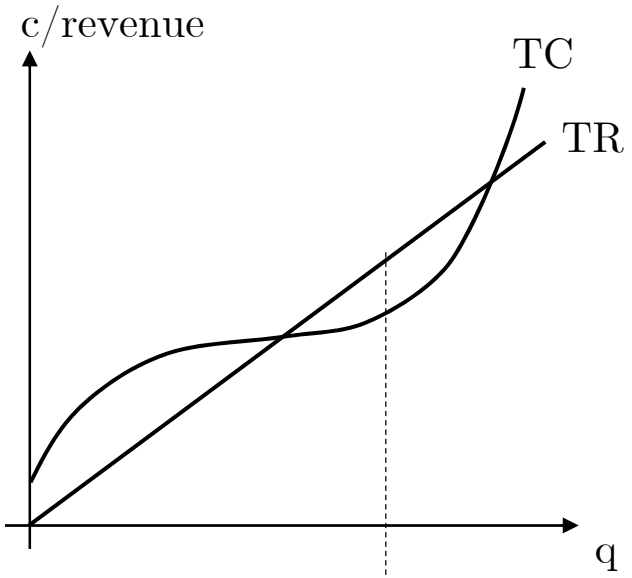


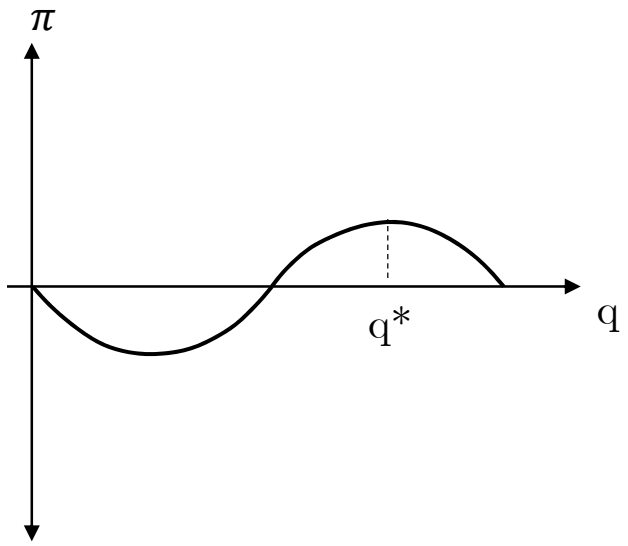
Consider when

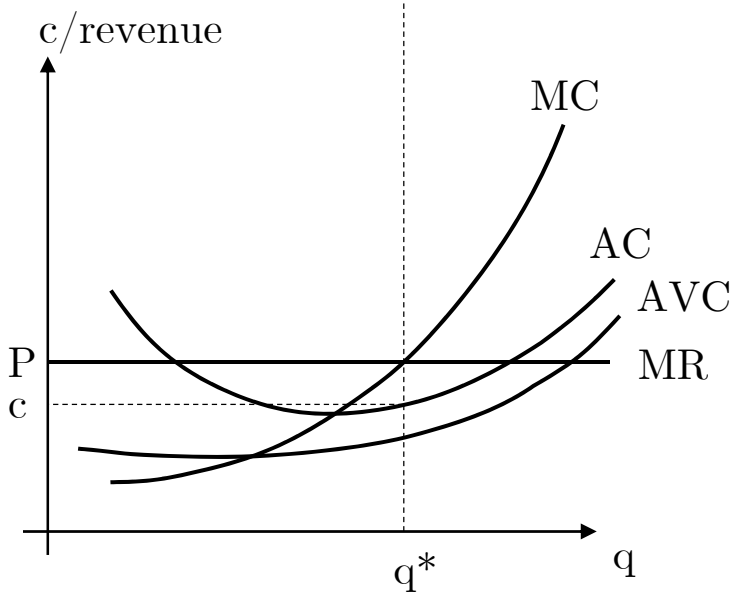
- MR > MC

- MR < MC

Putting costs and revenues altogether



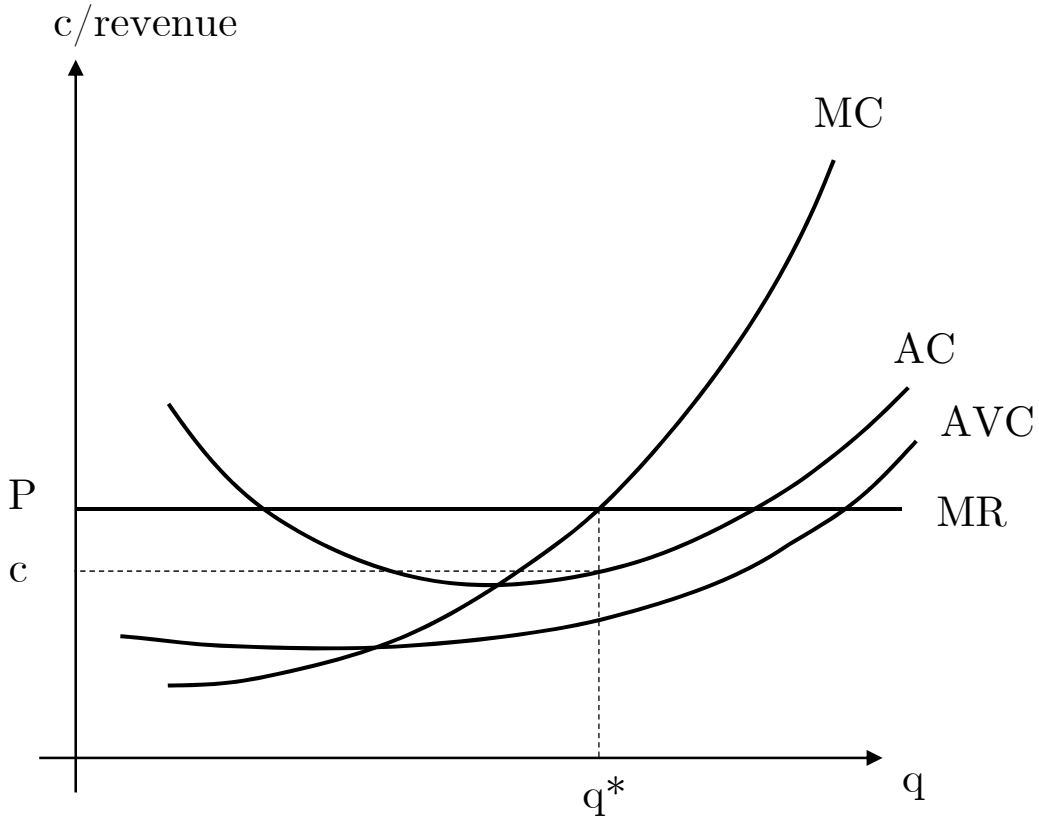




Firms in perfect competition may encounter four of theses scenarios in **the short-run**.

- Excess profit
- Normal profit
- Loss but still operate
- Shut down

Excess profit



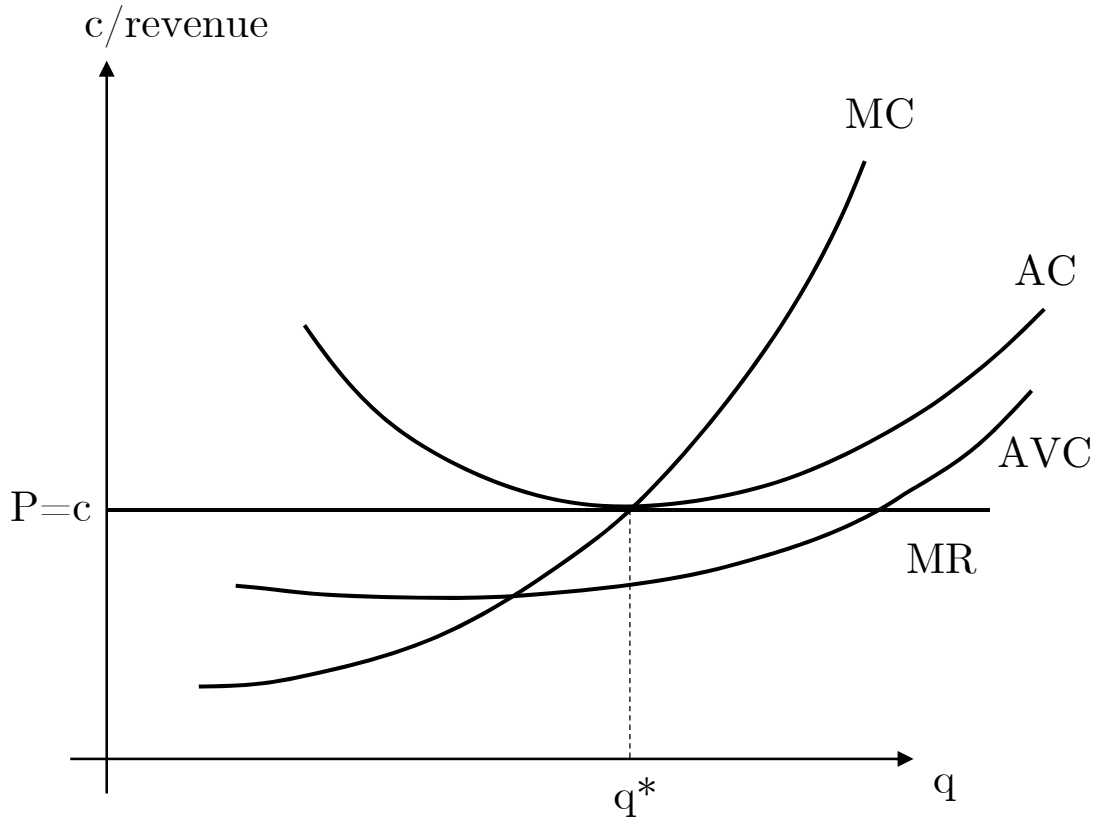
Consider cost, revenue per unit and profit

- Total revenue

- Total cost

- Profit

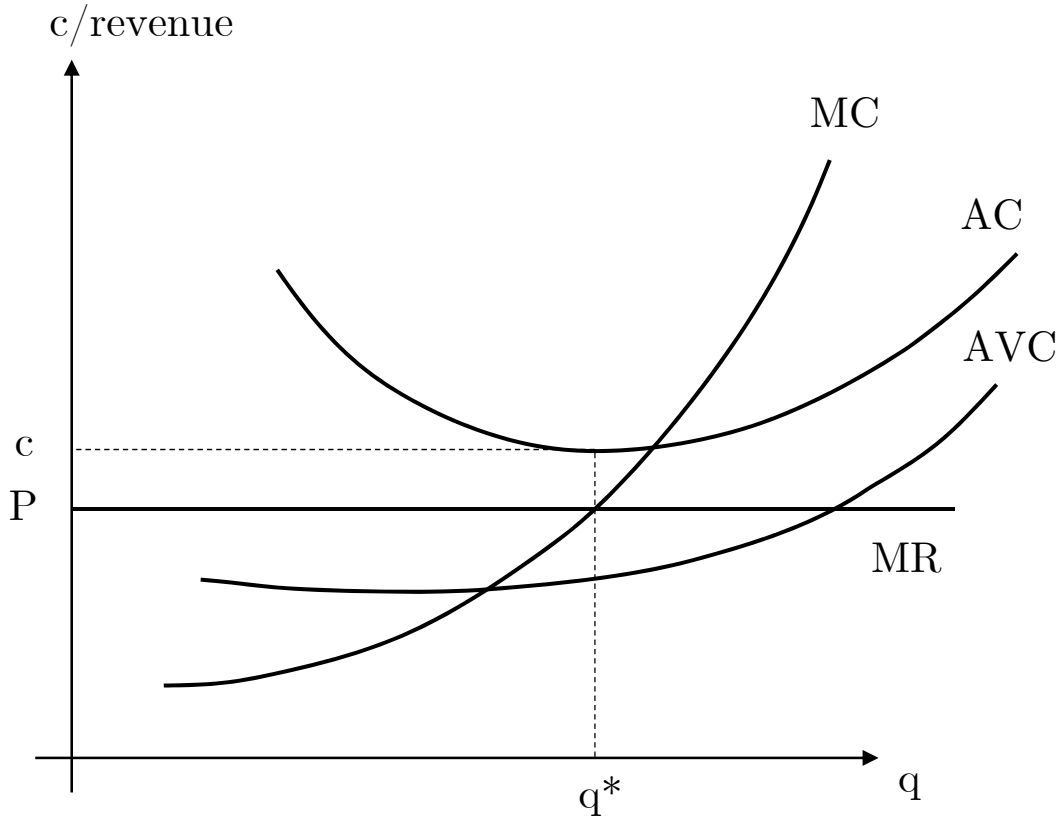
Normal profit



Consider cost, revenue per unit and profit

- Total revenue
- Total cost
- Profit

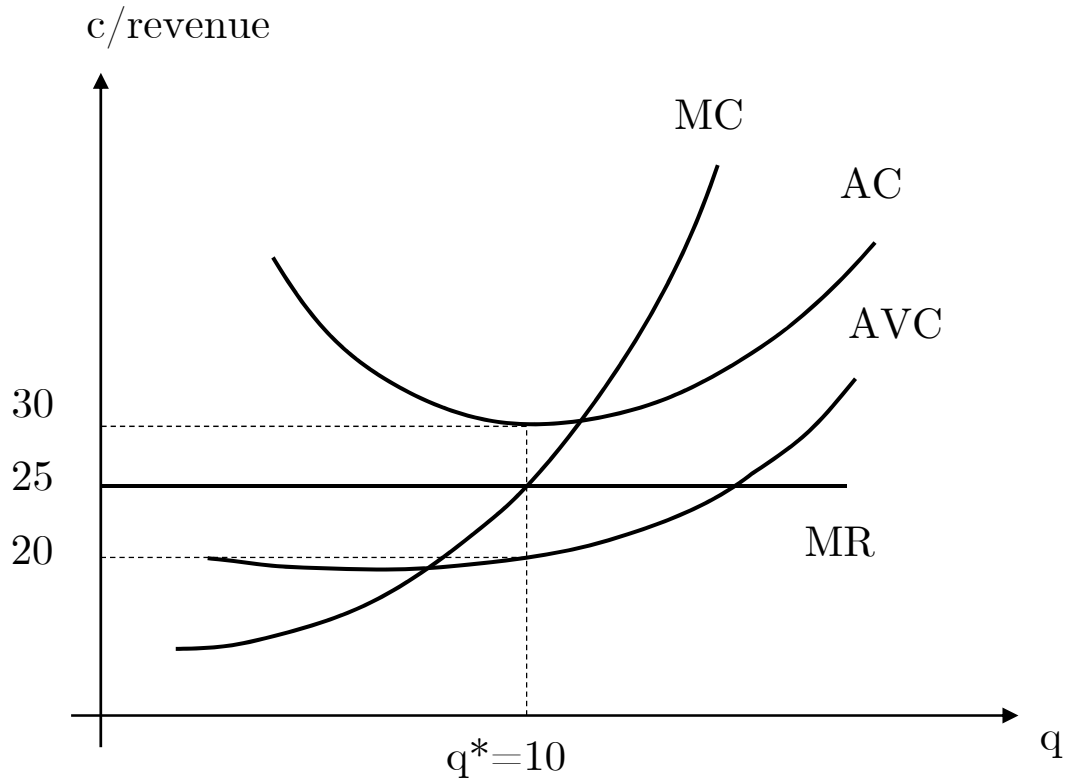
Loss but still operate



Consider cost, revenue per unit and profit

- Total revenue
- Total cost
- Loss

Further proof on this case: average view

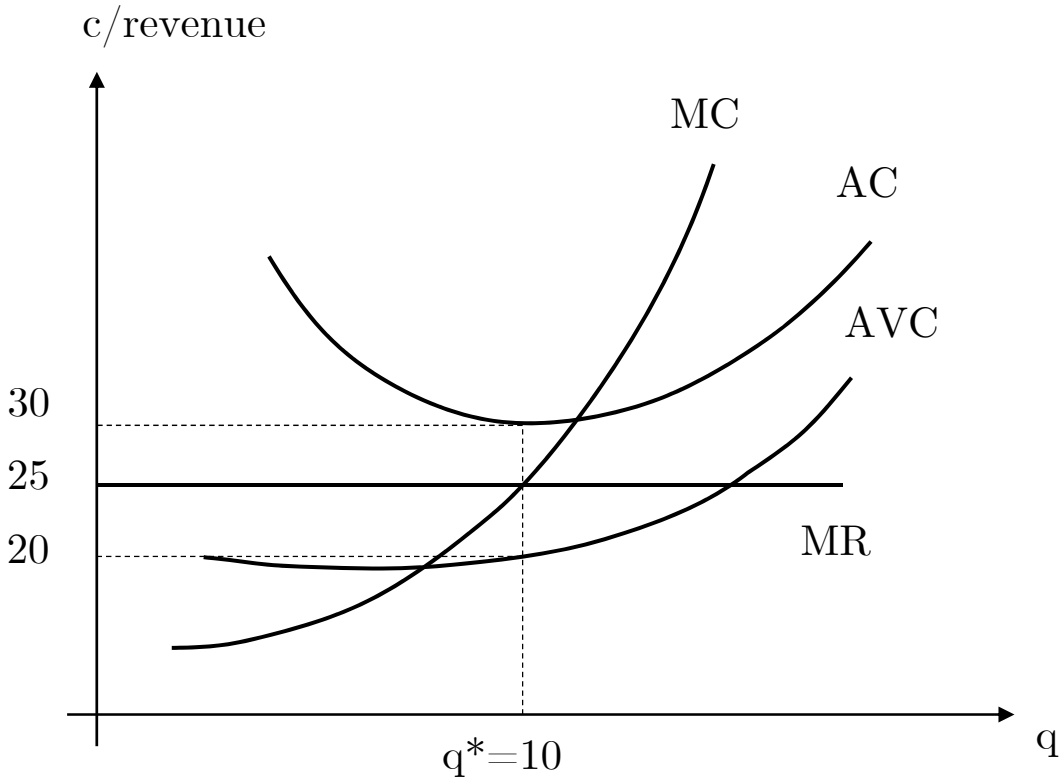


Consider cost, revenue per unit and profit

- Total revenue
- Total cost
- Loss

How much is the fixed cost for this firm?

Further proof on this case: average view

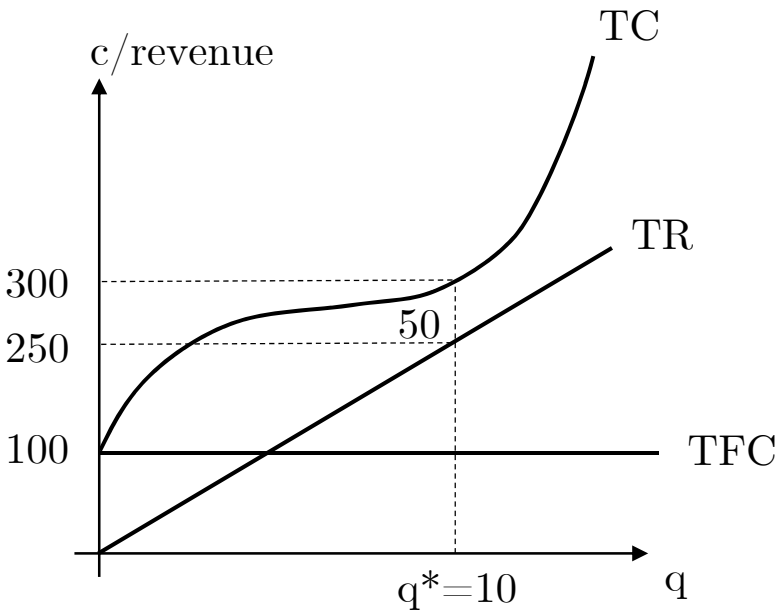


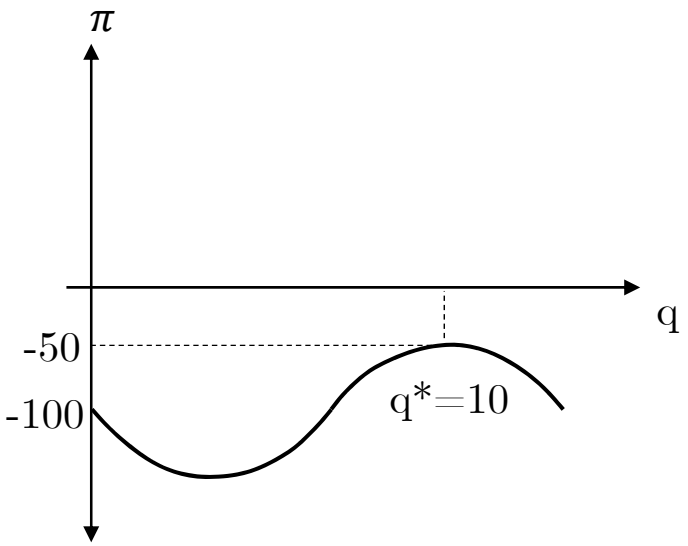
Consider each average cost and revenue again

- Total fixed cost
- Total variable cost
- Total cost
- Total revenue

It can be concluded that when P > AVC, a part of revenue can cover fixed cost.

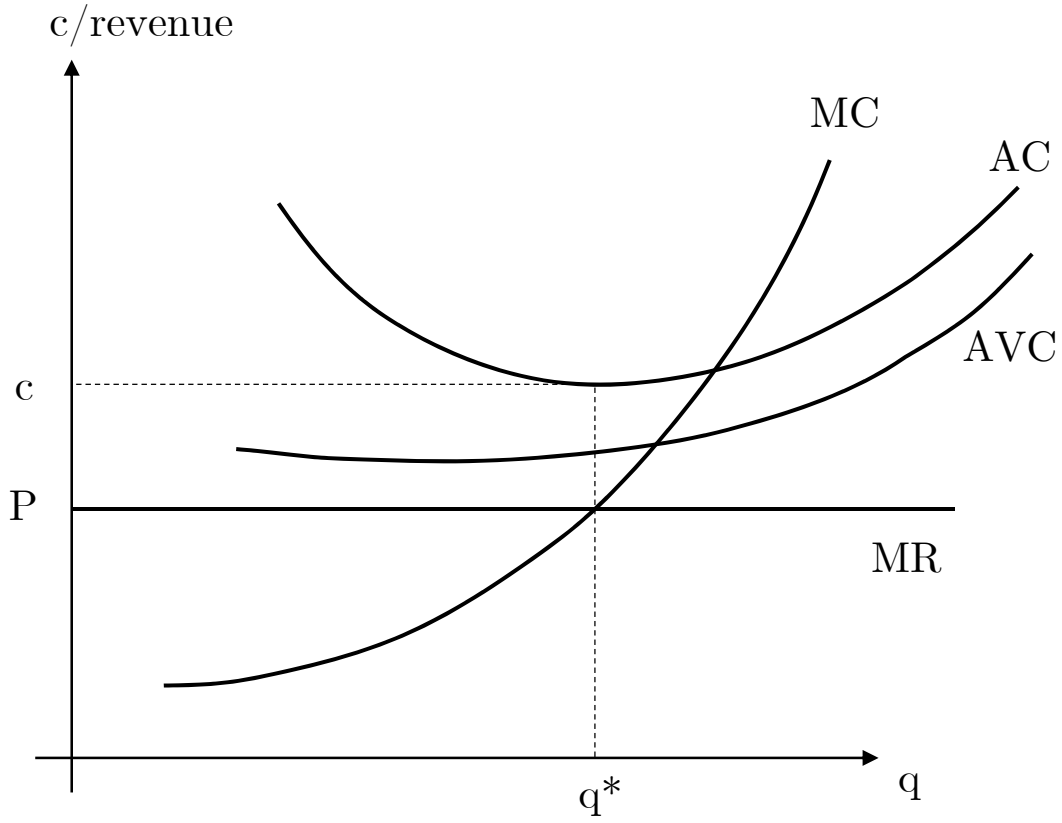
Further proof on this case: total view





Now compare producing 0 unit and at q*

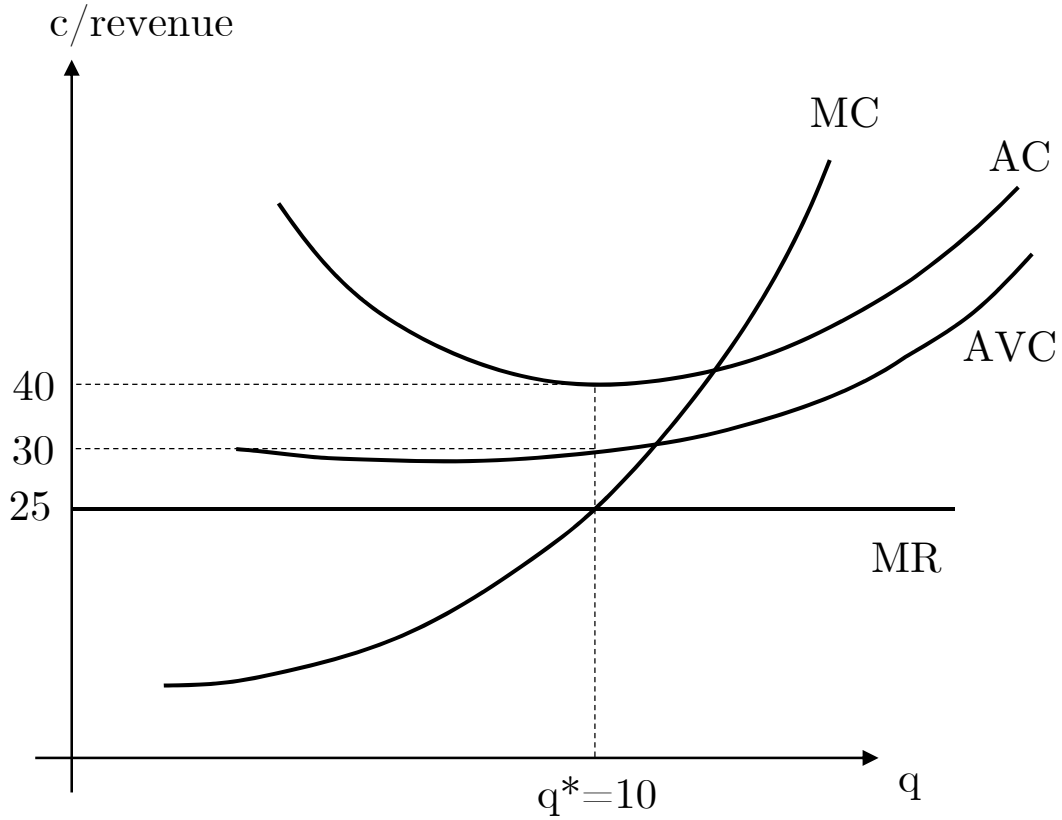
Shut down



Consider cost, revenue per unit and profit

- Total revenue
- Total cost
- Loss

Further proof on this case: average view

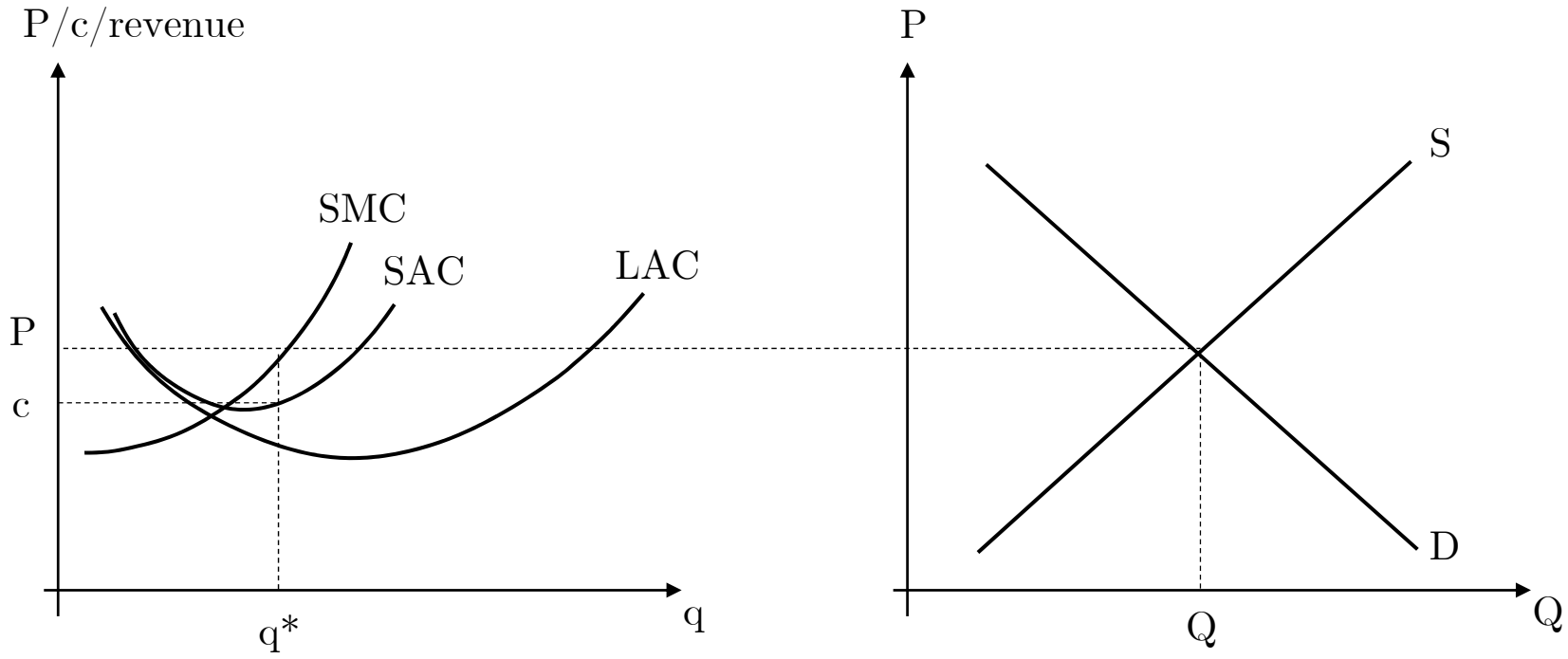


Consider each average cost and revenue again

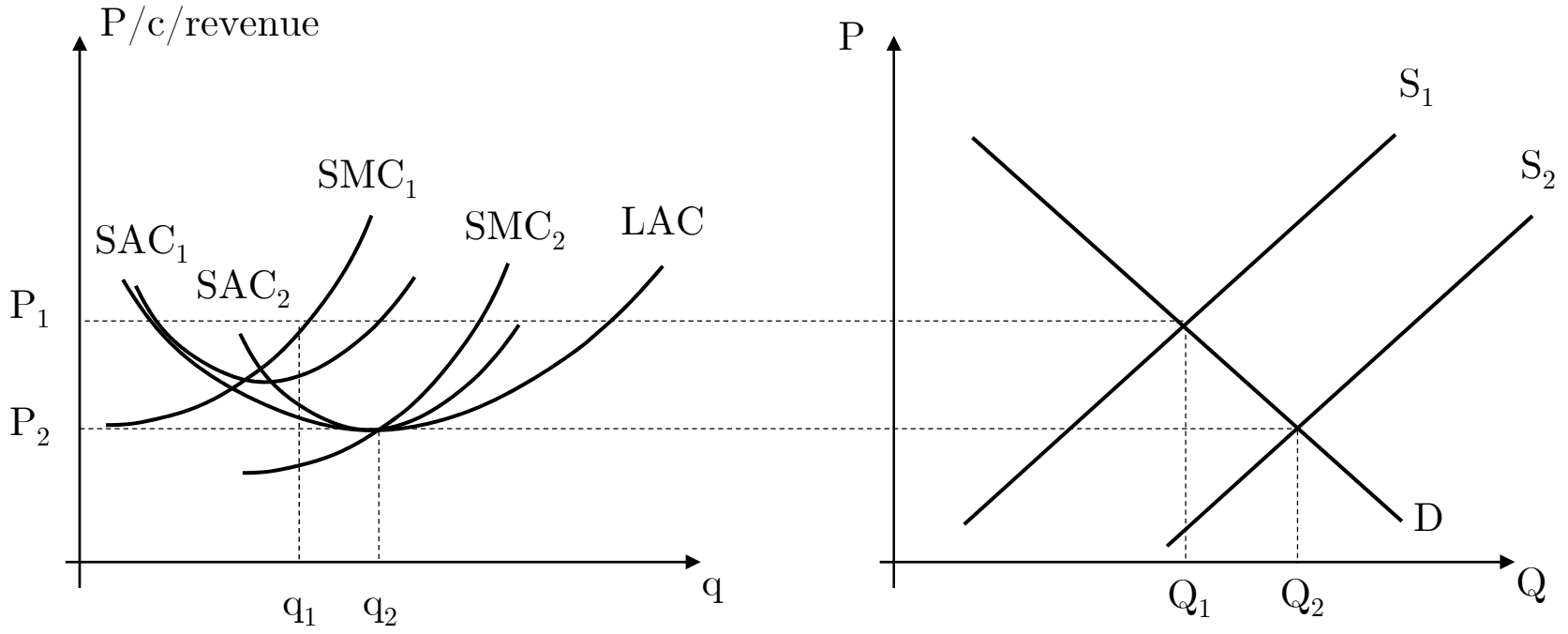
- Total fixed cost
- Total variable cost
- Total cost
- Total revenue

It can be concluded that when $P < AVC$, firm will shut down.

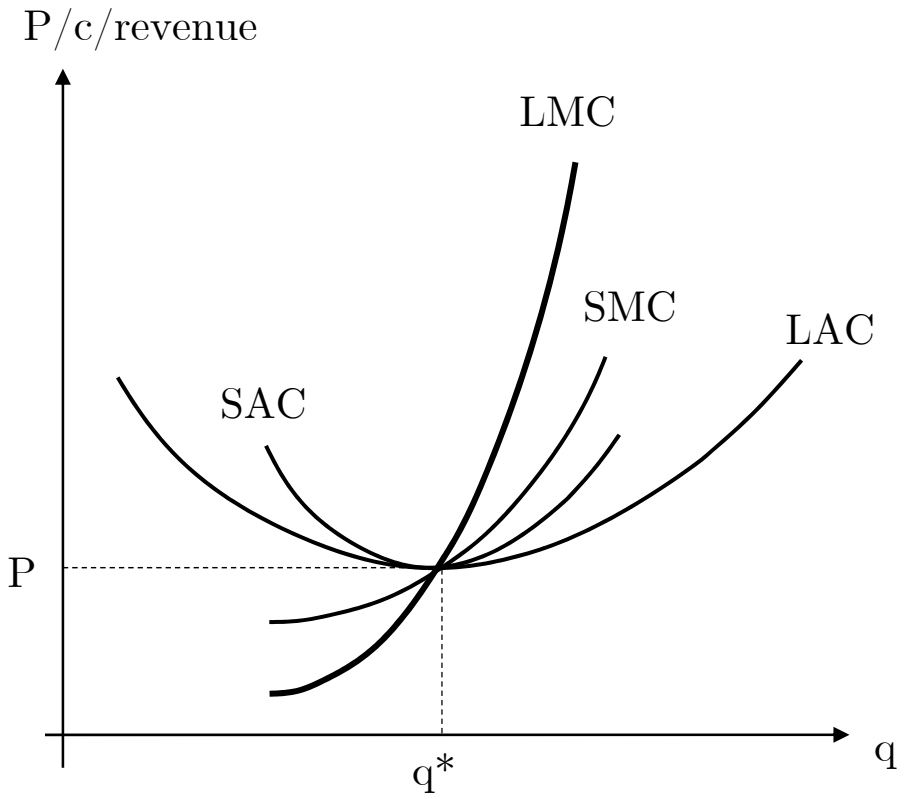
Long-run equilibrium



Long-run equilibrium



Long-run equilibrium



In the long-run, firms' equilibrium will make

$$P = LMC = LAC$$

Let's link consumers' and producers' equilibrium with price.

(2) Monopoly

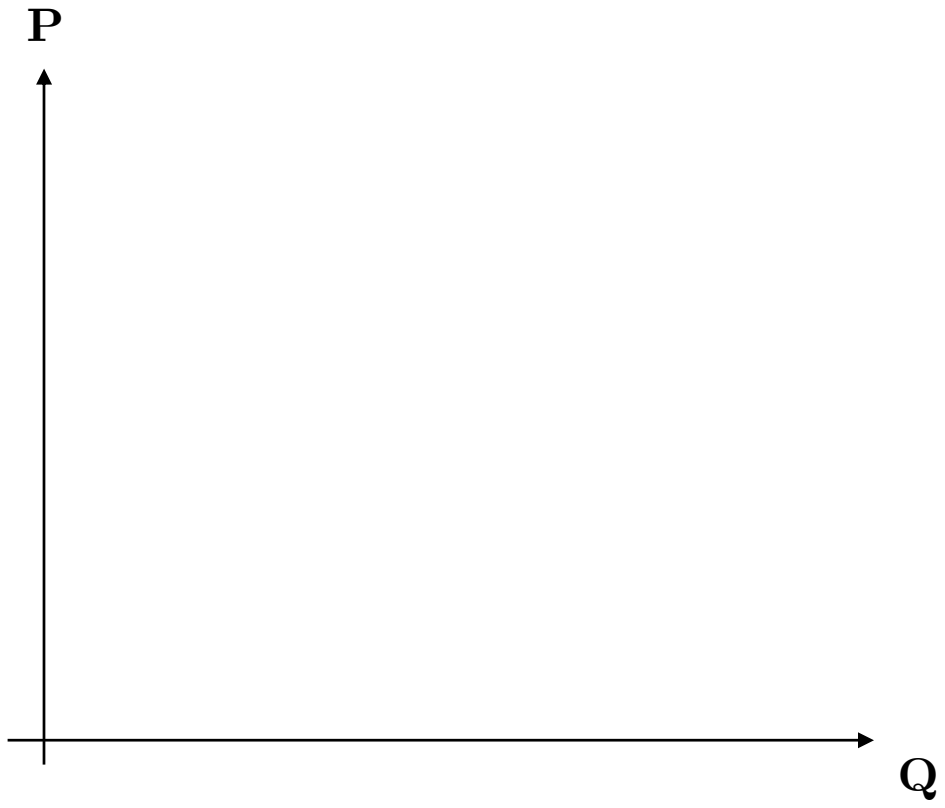
- There are many buyers but only one seller (Price maker).

- Product is rarely or cannot be substituted.

- Barriers to entry due to
    - Monopolist possesses main factors of production or significant materials.
    - Institution accommodate for monopoly such as patenting or concession.
    - Some product is efficiently produced by one producer or 'natural monopoly'.
    - Product differentiation

Examples of monopoly

Demand from firm perspective

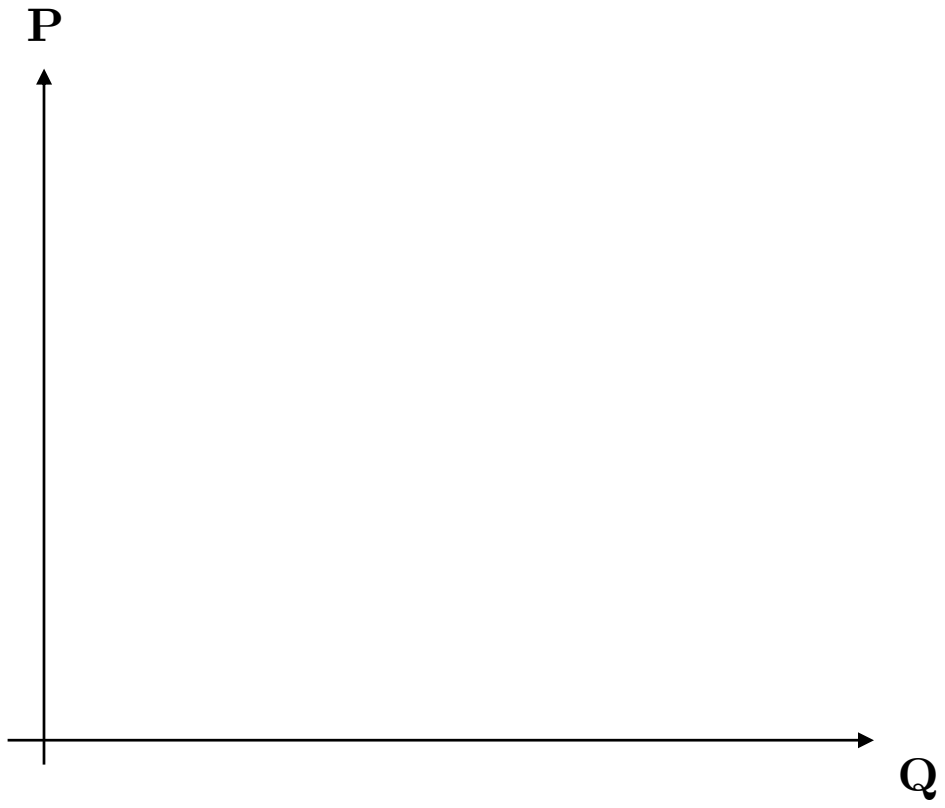


As a price maker, monopolist can either choose only price or quantity.

Example of revenue in monopoly

Revenue and output				
(1) Output	**(2) Price**	**(3) Total revenue**	**(4) Average revenue**	**(5) Marginal revenue**
q	P	TR	AR	MR
1	25			
2	20			
3	15			
4	10			
5	5			

Demand and revenue curves

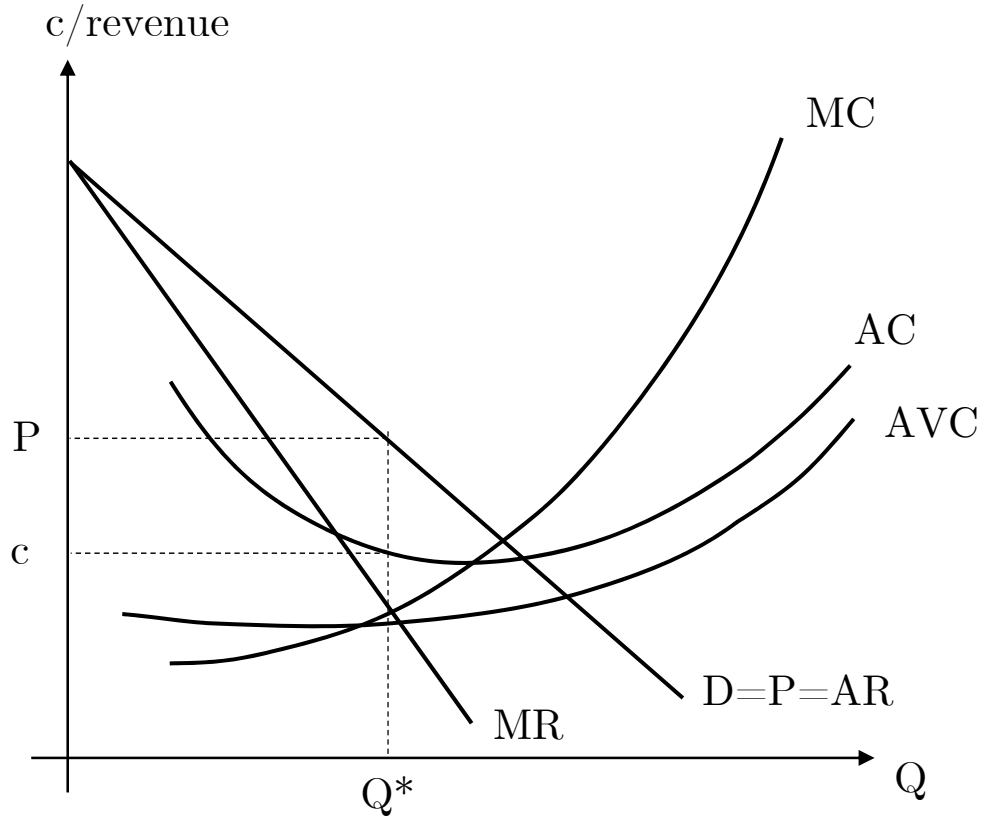


Note: if demand is linear, marginal revenue is as twice as steep compared to demand.

E.g. $D = P(Q) = 60 - 4Q$

Since considering revenue, cost and profit is similar to perfect competition, examples provided below is only **a part** of monopolist's scenarios. Monopolists can encounter 4 scenarios as firms in perfect competition.

Excess profit in the short-run

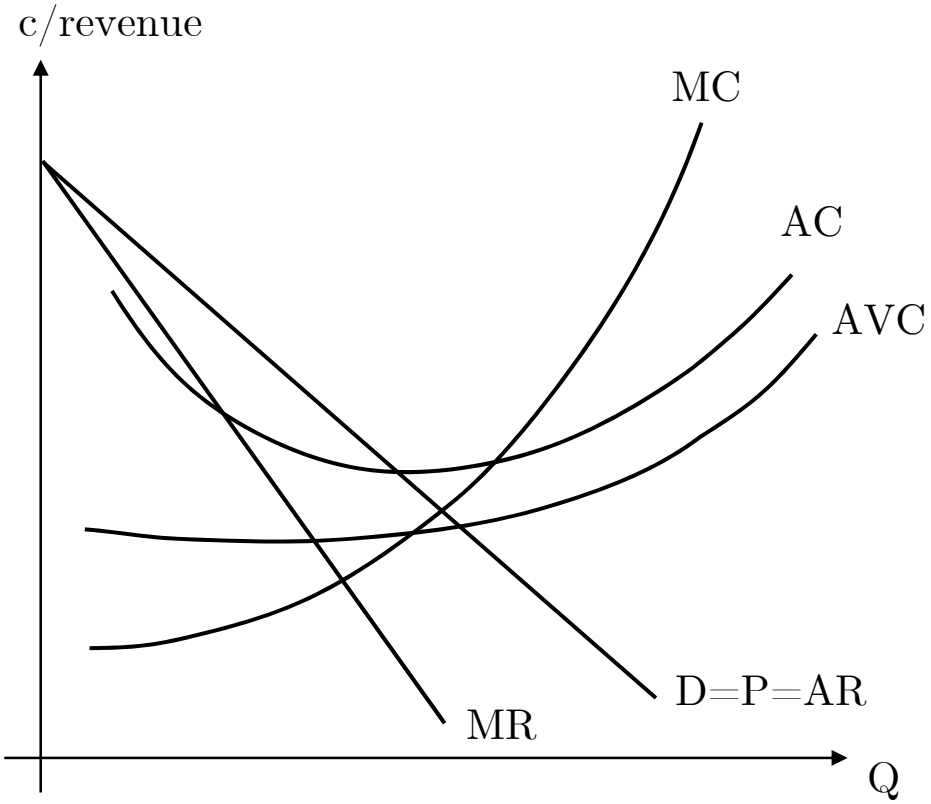


Consider cost, revenue per unit and profit

- Total revenue
- Total cost
- Loss

Steps: (1) indicate Q* where MR = MC and fix the quantity.
(2) Look for price per unit on the demand curve (D).
(3) Look for cost per unit on the average cost curve (AC).
(4) See if monopolist gain or lose from the difference.

Least loss in the short-run



Consider cost, revenue per unit and profit

- Total revenue
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Steps: (1) indicate Q* where MR = MC and fix the quantity.
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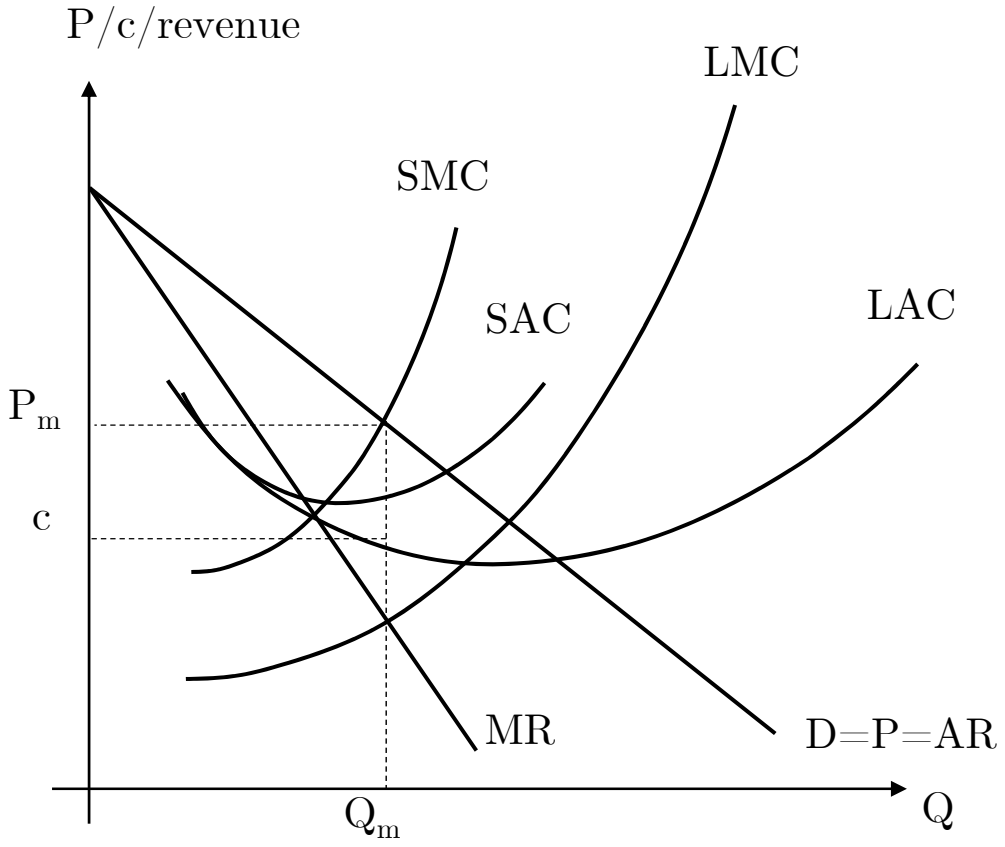
Long-run equilibrium

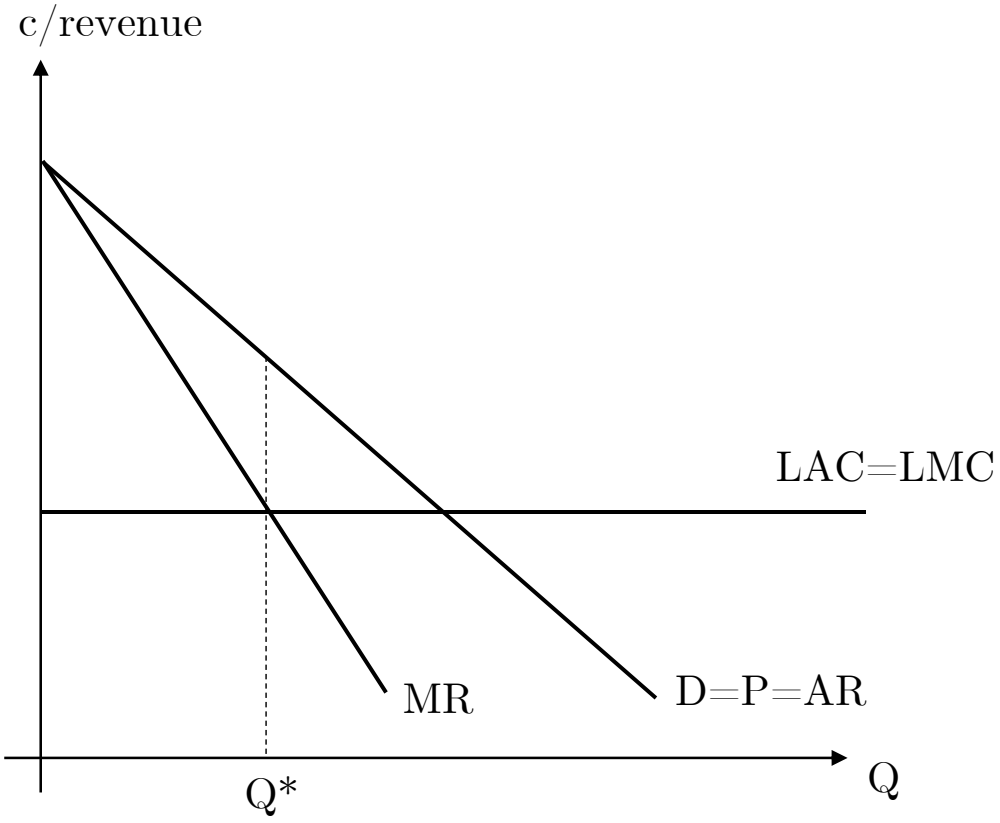


Since we have assumed that there are barriers to entry, monopolists tend to gain excess profit in the long-run, and therefore

$$P_m > LAC > LMC$$

What does the inequality mean?

Deadweight loss in a monopoly



Let's compare perfect competition and monopoly. Assumed that there is no advantages from market structure.

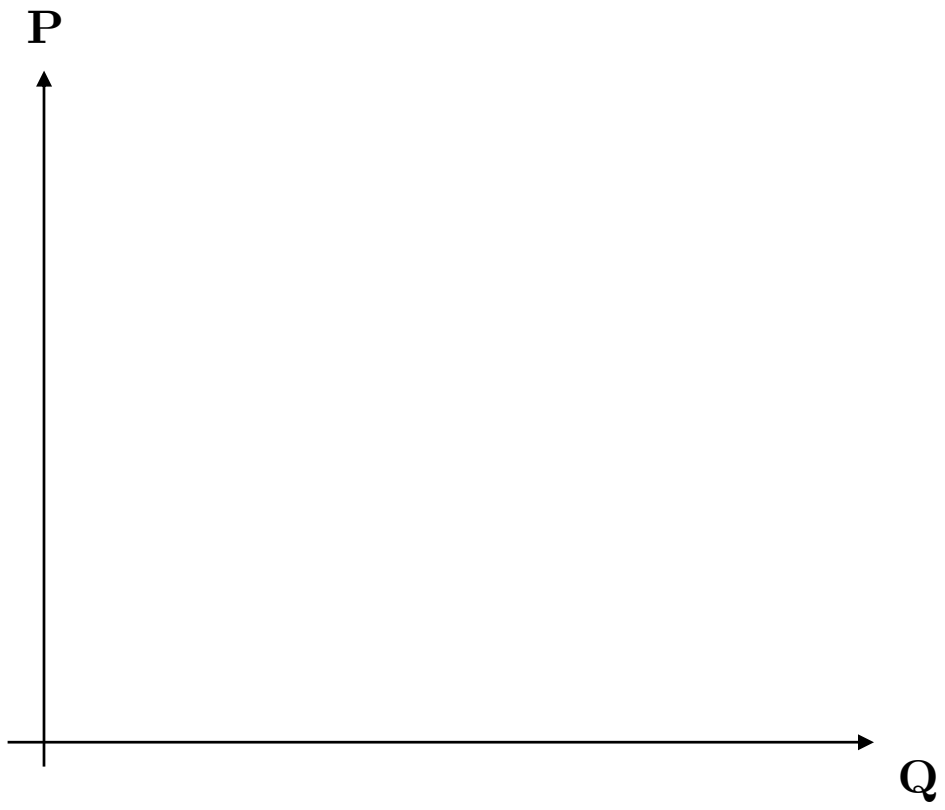
When a monopolist has market power and can earn excess profit in the long-run, monopolist can further manipulate market power to earn more profit by **price discrimination.**

Definition 5-5: Price discrimination

Price discrimination is a tactic that monopolist manipulate market power to sell goods or services to different groups of consumer by characteristic of consumer, quantity, or time. They can set different price to gain profit from consumer surplus.

Price discrimination can be divided into three levels. There are also intertemporal price discrimination such as electronics devices at the beginning of its cycle can be sold at high price and cheaper later, or peak-load pricing such as plane tickets on weekdays and holidays.

First-degree price discrimination

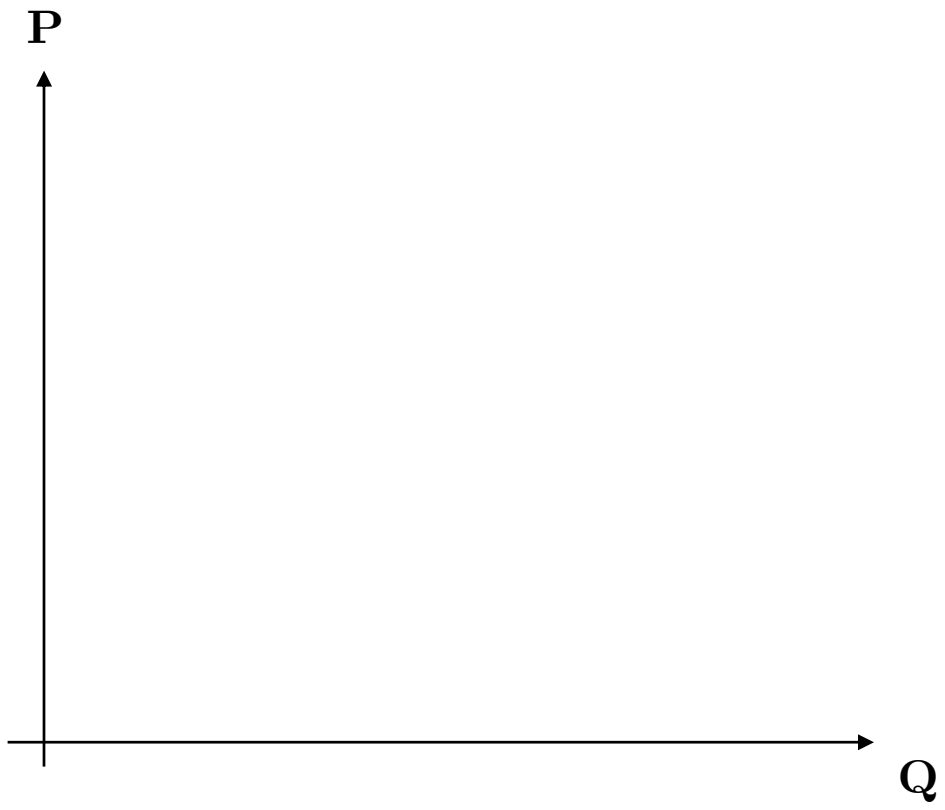


- Monopolist set different prices to fit with all consumers' willingness to pay.

- Monopolist can earn all profit from consumer surplus.

- Monopolist needs to know all consumers' willingness to pay, hence, this is very unlikely practical.

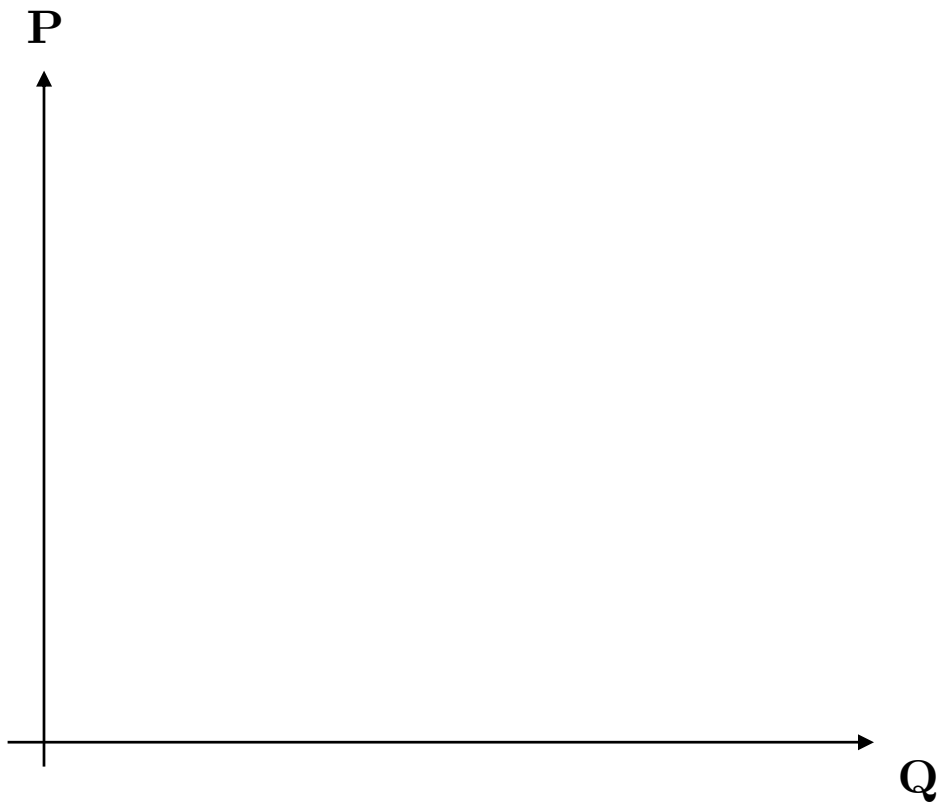
Second-degree price discrimination



- Monopolist can set prices differently for different numbers of sale.

- Monopolist can partially earn more profit from consumer surplus.

Third-degree price discrimination



- Consumers can be divided into at least two groups.

- Each group of consumers is differently elastic to price.

- Consumers cannot buy cheaply from one group to sell more expensively to another group. (Arbitrage)

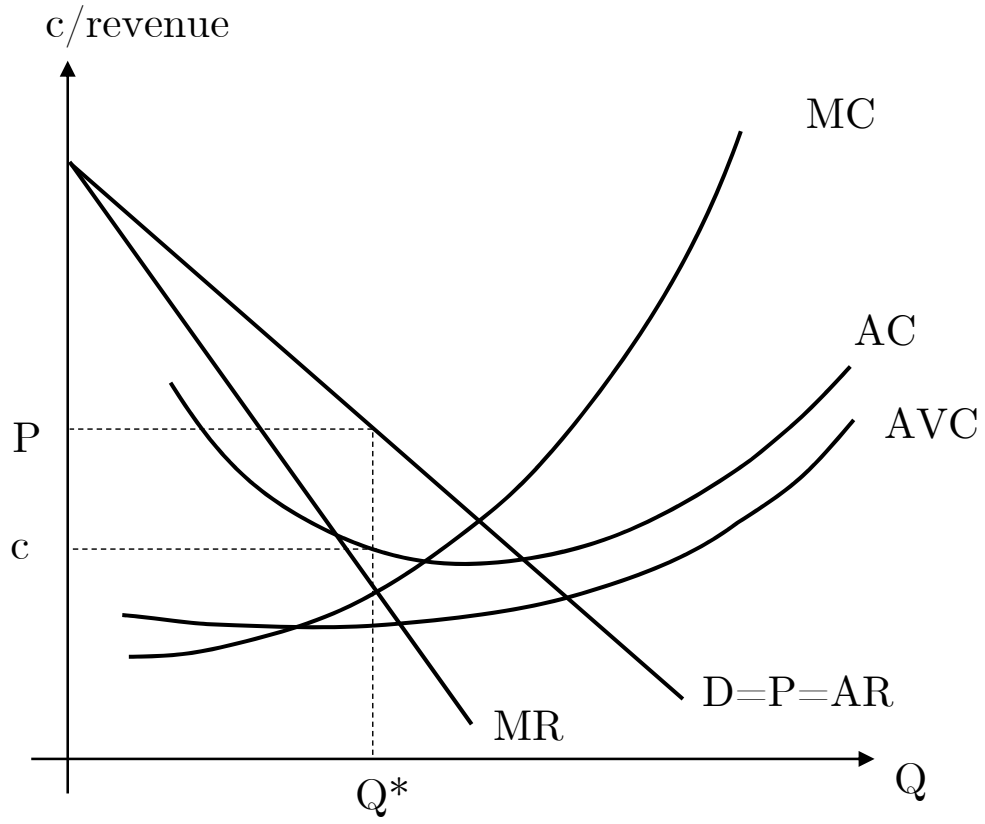
Intervene a monopolist

Some markets are natural monopoly and most of them are public utility such as electricity, tap water, etc. Monopolists may be intervened to prevent taking advantage from consumers. Economic theory suggests two possible methods of price setting.

- Ideal price: set price to P = MC

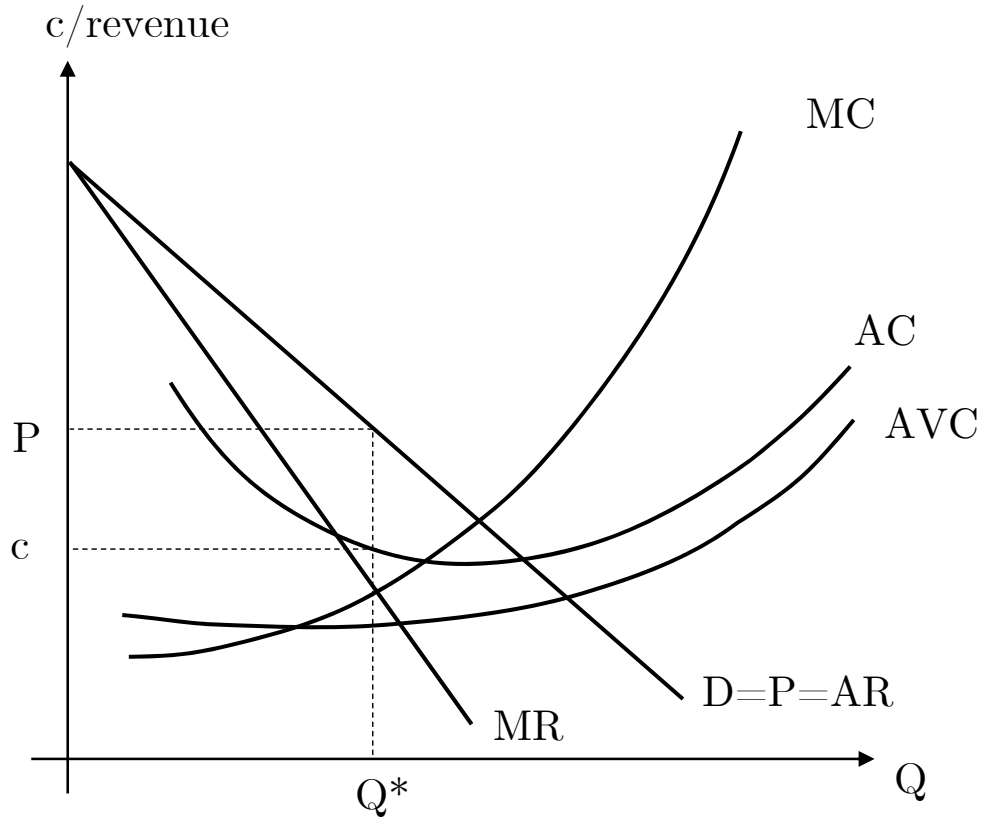
- Fair price: set price to P = AC

Ideal price (P=MC)



How would setting P=MC affect this market? And does the government need to worry about the monopolist?

Fair price (P=AC)



How would setting P=AC affect this market?

(3) Monopolistic competition

- There are plenty of consumers and producers but not as many as in perfect competition.

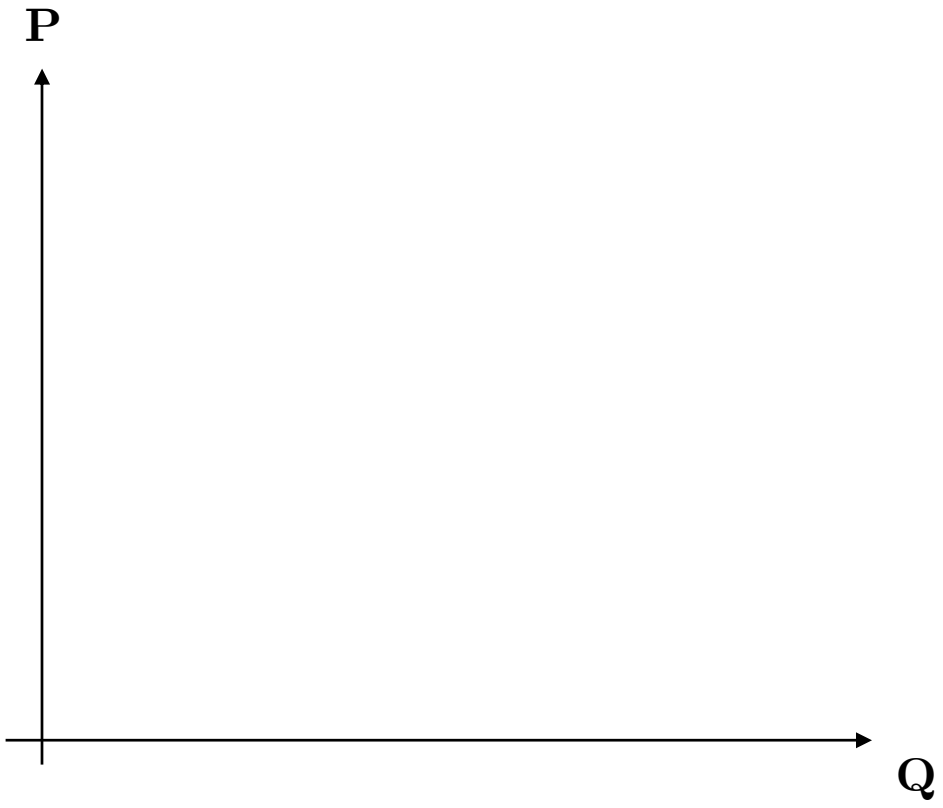
- Producers have market power, but not as much as in monopoly.

- There are minor differences between firms. Products can be easily substitutable.

- New firms can easily enter the market.

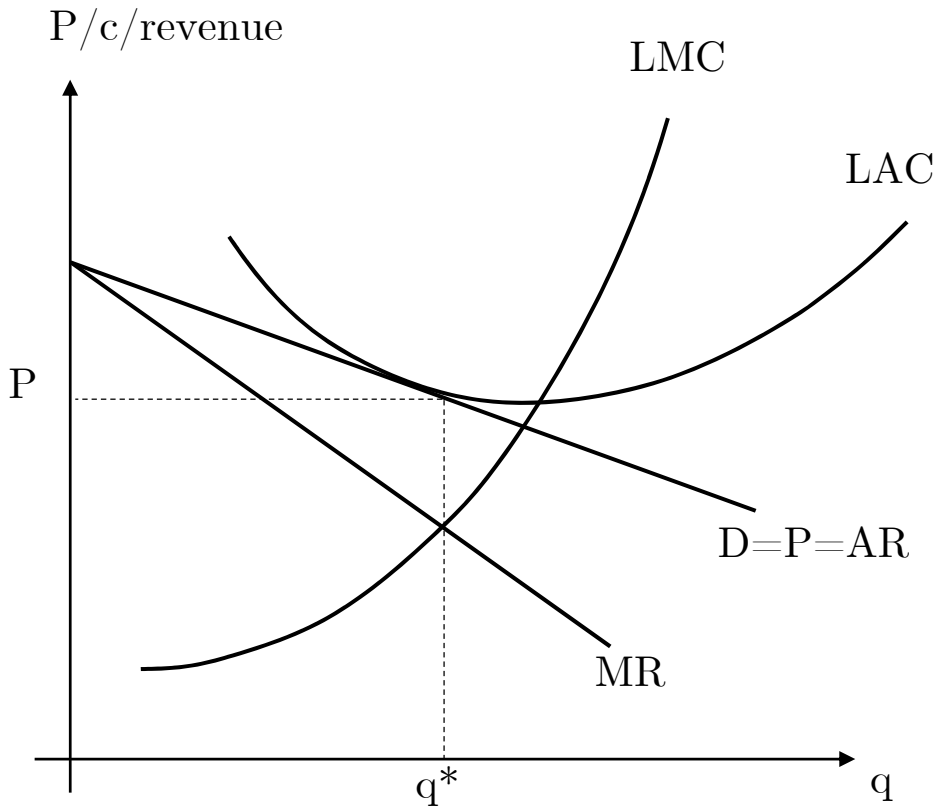
Examples of monopolistic competitive market

Demand from firm perspective



Can you guess how would demand curve look like in this market?

Equilibrium in the long-run



Firms in this market can encounter any scenarios as in perfect competition. As new firms can easily enter the market, normal profit is likely to be achieved in the long-run.

(4) Oligopoly

- Plenty of consumers but small number of producers. Oligopoly with two producers is called **duopoly**. Number of sellers needs not to be exact but rather depends on market share.

- Decision of one producer affects others' decision in the market

- Products can be both similar (Pure oligopoly) or differentiated (Differentiated oligopoly)

- Barriers to entry

Examples of oligopoly

Since the decision of a producer would affect to other producers in the market due to large market share, there is no model that can entirely generalize the producers' behavior in oligopoly.

Pricing strategy, quantity selection, behavior of producer, and interaction of the competitors in the market are mostly resulted from those decisions.

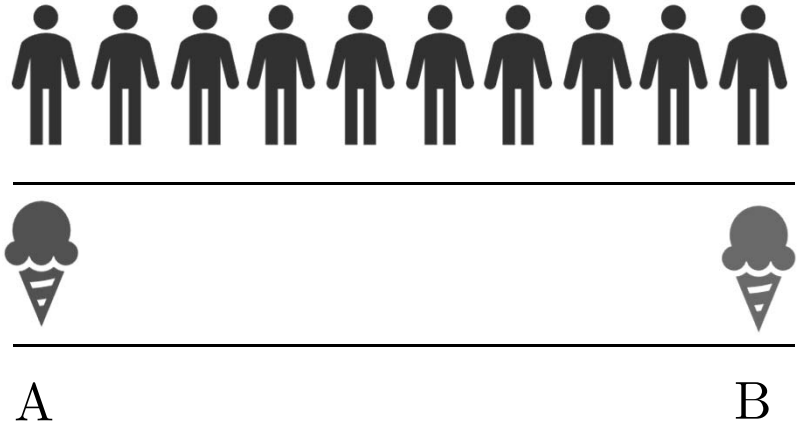
Examples of models in the oligopoly are as follows:

- Kinked demand curve model
- Price leadership model
- Cartel model
- Hotelling's model
- Game theory

Some basic examples are provided as follows.

Hotelling's model

Assumed that there are 2 ice cream parlors (A,B) which can set their store on the horizontal plane, there are 10 people lined up and both stores sell the same price and quality of ice cream. Therefore, people will decide to buy from which parlor depending only on distance between them and a parlor. What is the producers' equilibrium location if both A and B can choose alternately.



Game Theory

Game theory is a tool for studying behavior of player's decision for each side. In each game, there are components as follows:

- Players – In the situation of interest, who are involved?
- Rules – What are the rules for that game, such as who plays first?
- Payoffs – How the decision affect the result?
- Information – What information of each player possess?

Study the behavior of the players will lead to the equilibrium of each game for understanding of the behavior of the players under given condition and result of the game.

Payoff matrix in advertising game

A \ B	Advertise	No advertise
Advertise	**20 , 10**	**25 , 12**
No advertise	**23 , 16**	**30 , 18**

Profit of producer **A , B**

Suppose that in the sliced bread market, there are 2 manufacturers (A,B). Each of them earn profit from selling bread as the table below (unit: million Baht) under circumstances of considering to broadcast an online advertising or not since advertising has a cost which can reduce profit but also may generate some return.

What would A choose no matter what B would play?

Payoff matrix in advertising game

A \ B	Advertise	No advertise
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What would B choose no matter what A would play?

If we impose an assumption that the players are rational, always seeking the highest benefit. Players will choose whatever yields the best result for themselves without paying attention to what the other party will choose. This is called "Dominant strategy" of those players.

Definition 5-6: Dominant strategy

Dominant strategy is a strategy that is better than another strategy for one player, no matter how that player's opponents may play.

There exist a dominant strategy equilibrium when players all have a dominant strategy. Consider the example in the advertising game.

Dominant strategy equilibrium

		B	
		Advertise	No advertise
A	Advertise	**20 , 10**	**25 , 12**
	No advertise	**23 , 16**	**30 , 18**

Profit of producer **A , B**

Which of the option is the equilibrium when consider dominant strategy?

However, for some games, there may not be a dominant strategy for both players. For example, the turning game below. There are 2 players (A, B) walking towards each other from opposite direction. Both want to walk through each other without colliding. The payoffs matrix are shown below.

		B	
		Left	Right
A	Left	**1 , 1**	**-1 , -1**
	Right	**-1 , -1**	**1 , 1**

Satisfaction of **A , B**

From the table, both players do not have a dominant strategy because the outcome of the game depends on the decision another player. Another criteria is needed to figure out an equilibrium.

Definition 5-7: Nash Equilibrium

Nash Equilibrium is the result that no player has the motivation to choose otherwise or change their strategy, while considering other players' options.

Nash equilibrium

		B	
		Left	Right
A	Left	**1 , 1**	**-1 , -1**
	Right	**-1 , -1**	**1 , 1**

Satisfaction of **A , B**

Can you apply the concept of Nash equilibrium to solve this game?

Is Nash equilibrium also a social optimum? The 'Prisoners' dilemma' can prove as a counter example.

Assumed that there are 2 suspects (A, B) being arrested for committing an offense together, two suspects were separately investigated. If one suspect accepts the confession, suspect will be barred as a witness and released.

Both suspect acknowledge the results of this situation and the payoffs matrix, but there is no way to know what the other suspect will choose.

		B	
		Confess	Not confess
A	Confess	**8 , 8**	**0 , 20**
	Not confess	**20 , 0**	**2 , 2**

Jail time for **A , B**

Nash equilibrium and social optimum

		B	
		Confess	Not confess
A	Confess	**8 , 8**	**0 , 20**
	Not confess	**20 , 0**	**2 , 2**

Jail time for **A , B**

Can you apply the concept of Nash equilibrium to solve this game? Is the result(s) the social optimum?