



光华管理学院
Guanghua School of Management

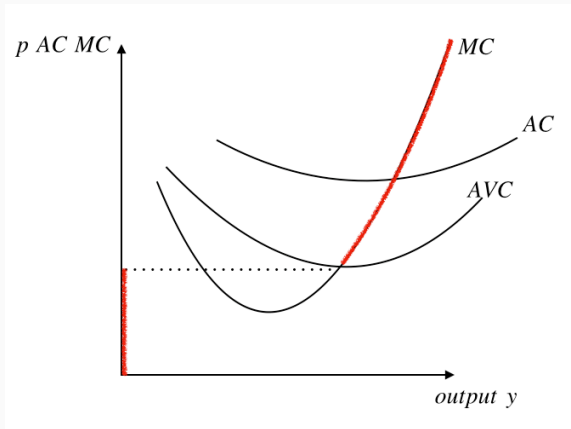
Microeconomics

微观经济学

Yu Gao

1 December 2021

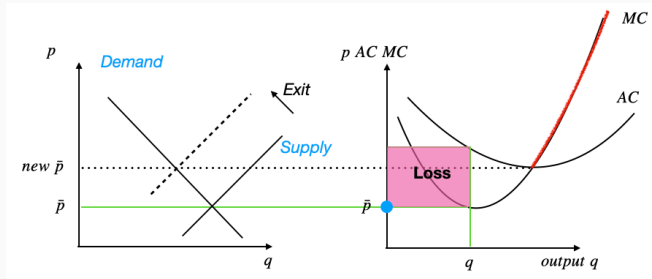
A firm's short run supply curve



$$y = \begin{cases} 0 & \text{if } \bar{p} < \min AVC(y) \\ MC^{-1}(\bar{p}) & \text{if } \bar{p} \geq \min AVC(y) \end{cases}$$

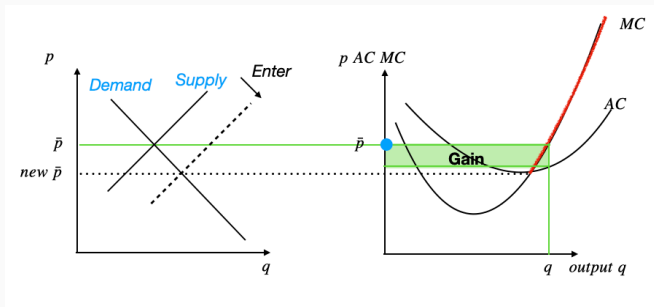
Long-run supply curve

Long-run equilibrium: the process of entry or exit is complete – remaining firms earn zero economic profits.



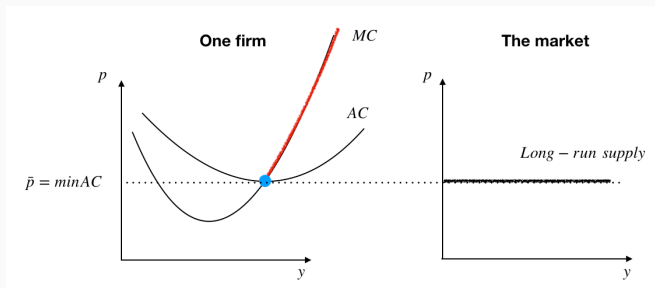
Long-run supply curve

Long-run equilibrium: the process of entry or exit is complete – remaining firms earn zero economic profits.



Long-run supply curve

The long-run market (industry) supply is horizontal at $p = \text{minimum}ATC$.



Zero profit

Think

If in the long run all firms have zero profits, then how could the market exist?

Zero profit

Think

If in the long run all firms have zero profits, then how could the market exist?

- Economic profits include **rent** (of one's own labor, money, and land).
 - All of the factors of production are being paid their market price
 - Each factor of production is earning the same amount in this industry that it could earn elsewhere
- Firms may have (at least they think they have) different costs (technologies). Then for the marginal firm, $\text{profit}=0$. Others are either earning or losing money.
 - If you indeed have better technologies, you can always *rent* it to others.
 - Overconfidence: everyone thinks they are better than the average.
 - Risk-seeking

When profits are zero it doesn't mean that the industry disappears, it just means that it stops growing.

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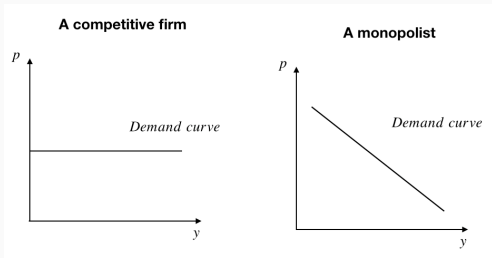
Monopoly 垄断

Monopoly

A **monopoly** is a firm that is the sole seller of a product without close substitutes.

Key difference between perfect competition and monopoly:

- A monopoly firm has **market power**: the ability to influence the market price of the product it sells
- A competitive firm has no market power



Profit maximization of a monopolist

A monopolist's profit maximization problem:

$$\max_y p(y)y - c(y)$$

F.O.C.,

$$\frac{d(p(y)y)}{dy} = \frac{dc(y)}{dy}$$

marginal revenue = marginal cost

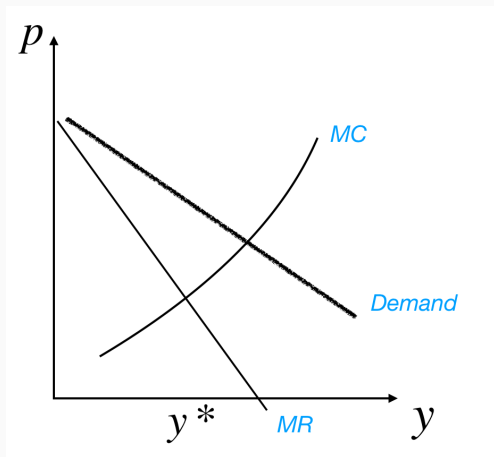
Think

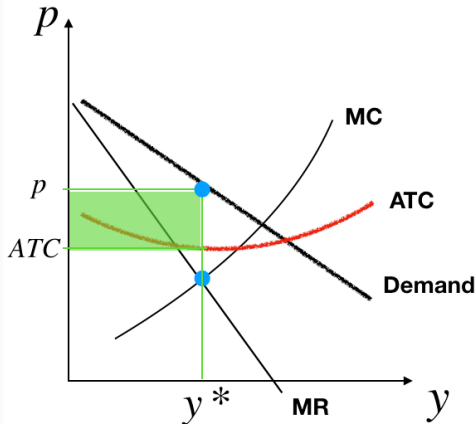
In PMP, how to see the difference between a monopolist and a competitive firm?

Profit maximization of a monopolist

Using the example of a linear demand curve: $p(y) = a - by$.

- The revenue function should be $p(y)y = ay - by^2$.
- The marginal revenue (MR) function is $MR(y) = a - 2by$.





- A competitive firm takes p as given, therefore as a “price-taker”, has a supply curve that shows how its output depends on p .
- A monopolist is a “price-maker”. This power gives profits > 0 . There is no supply curve for monopoly.

Is monopoly “bad”?

Competition vs. monopoly

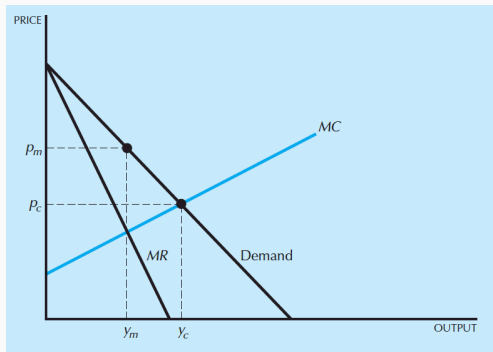
- A competitive industry operates at a point where $p = MC$. A monopolized industry operates where $p > MC$.
- With monopoly, price is higher and output is lower. The firm is better off and the consumer is worse off.
- One must take a *value judgement* 价值判断 about the relative welfare of consumers and the owners of firms.
- However, we can have an argument against monopoly on grounds of efficiency!

Inefficiency of monopoly

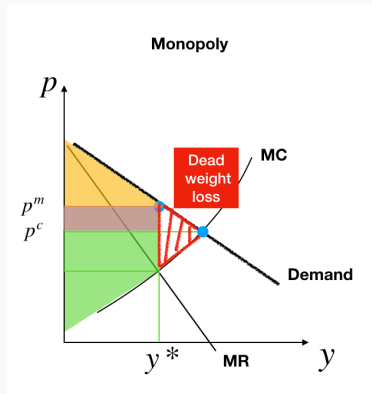
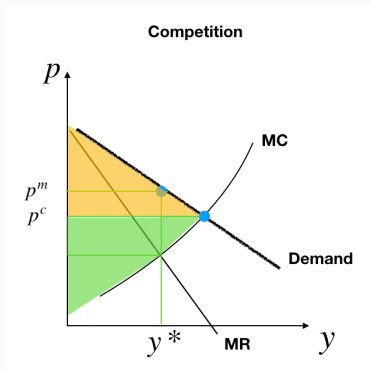
Pareto efficient if there is no way to make anyone better off without making somebody else worse off.

Is the monopoly level of output Pareto efficient?

- A monopolist produces at (p_m, y_m) .
- A competitive firm produces at (p_c, y_c) .

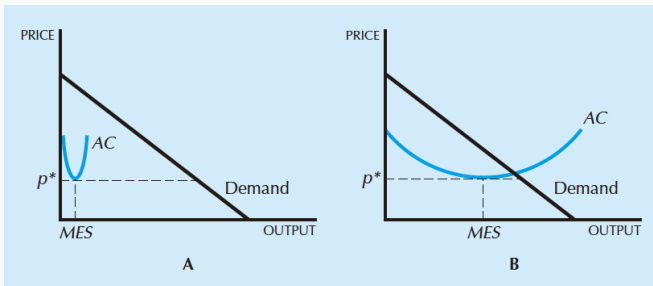


Welfare effect: deadweight loss 无谓损失



Why monopolies arise?

1. The crucial factor is the size of the **minimum efficient scale (MES)** 最低效率规模, the level of output that minimizes average cost, relative to the size of demand.



- A. If demand is large relative to the MES, a competitive market is likely to result.
- B. If it is small, a monopolistic industry structure is possible.

Why monopolies arise?

-
2. Several different firms in an industry might be able to collude and restrict output. The organization is called a **cartel** 卡特尔. Cartels are usually illegal.
3. Due to historical reasons, a single firm may own a key resource: De Beers Group sells approximately 35% of the world's rough diamond production.

Monopoly behaviors

Price discrimination 价格歧视

Selling output at different prices is called **price discrimination**.

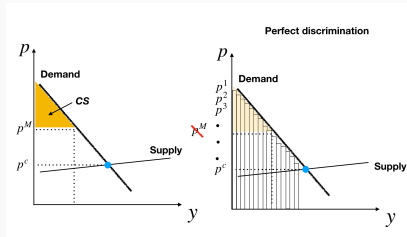
The characteristic used in price discrimination is willingness to pay (WTP) 支付意愿:

- A firm can increase profit by charging a higher price to buyers with higher WTP.
- Different degrees of discrimination are concerned with different ways to **sort the consumers**.

First-degree price discrimination

First-degree price discrimination 一级价格歧视: discriminate consumers one-by-one

- Perfect price discrimination: charge according to each consumer's WTP.
- This is ideal for producers, however very costly!
- Examples: bargaining at the market.
- Inexperienced consumers like places that have a fixed price to avoid “discrimination”.



First-degree price discrimination

First-degree price discrimination 一级价格歧视: perfect price discrimination

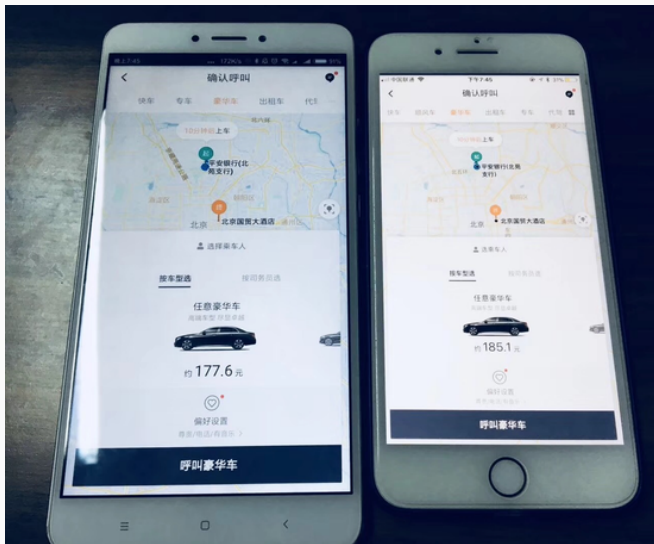
- Examples: bargaining at the market.
- Inexperienced consumers like places that have a fixed price to avoid “been discriminated”.
- A market very close to perfect discrimination: auto repair market
 - Gneezy, List and Price (2012) found that disabled receive offers that are 30 percent higher than the offers received by the abled.
 - One possible reason is search cost differences—one would expect search to be more costly for the disabled.
 - Magic words: “I am getting a few price quotes.”

First-degree price discrimination

Disadvantages:

- This is ideal for producers, however very costly!
- Experienced consumers can “pretend” to have low WTP.

First-degree price discrimination



How would you design the algorithm?

Second-degree price discrimination

Second-degree price discrimination 二级价格歧视: segregate consumers by “self-selection” (consumer type is private).

- Experienced consumers can pretend to have low WTP.
- The monopolist cannot observe the type of each consumer (e.g., his willingness to pay).
- The monopolist can encourage “self-selection” 自选择 by adjusting the quantity or/and quality of the good.
- Consumers have other concerns beyond price (e.g., space, comfort, time, etc.)
- Examples: “bulk discounts”, “Double 11”.

Second-degree price discrimination



Second-degree price discrimination

双11攻略		
全球好货	10月20日 - 10月31日	全球精选好货
	10月31日	全球潮流盛典
红包不停	10月19日 15:00 - 11月10日	火炬红包
	10月25日 - 11月11日	群战队
	11月01日 - 11月07日	品牌狂欢城
玩转线下	10月21日 - 11月10日	花呗亿元免单
	10月26日 - 11月11日	捉猫猫
	11月04日 - 11月12日	品牌快闪店
会员专享	11月08日 - 11月10日	超级会员特权
爆款加购	10月20日 - 11月10日	预售抢先购
	11月01日 - 11月10日	百亿购物津贴
	11月03日 - 11月04日	爆款津贴来袭
狂欢之夜	11月10日 19:40	双11晚会
买不停手	11月11日	好货开售
	11月11日 14:00	下半场

Third-degree price discrimination

Third-degree price discrimination 三级价格歧视: firms already know some information about the consumers (e.g., age, occupation, etc.)

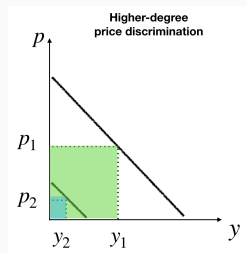
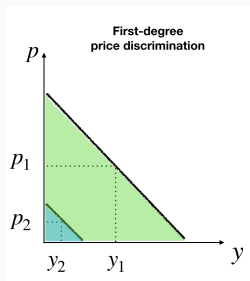
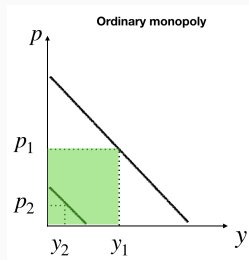
- The monopolist sells to different groups of people at different prices.



Welfare analysis of price discrimination

Assume the market has two demand curves.

Under ordinary monopoly, the monopolist cannot price discriminate. The optimal supply could be only serve the large market.



Exchange

Competitive equilibrium of a single market:

- all prices are assumed to remain fixed, except the price of the good being studied.
- all agents take an exogenous price as outside of their control and determines their demands and supplies.
- the adjusted price clears the market.
- at such an equilibrium price, no agent would desire to change his or her actions.

- *all* prices are variable.
- equilibrium requires that *all* markets clear.
- at such an equilibrium, no agent would desire to change his or her actions.
- it takes into account of all of the interactions between markets.

Economies without Production: pure exchange

Basic concern: how goods are allocated?

Here we explore the basic problem of distribution in a simplified setting: pure exchange.

- There is no production.
- Several consumers, each described by their preferences (utilities) and the goods that they possess (endowments).
- The agents trade the goods among themselves according to certain rules and only care about his or her individual well-being.

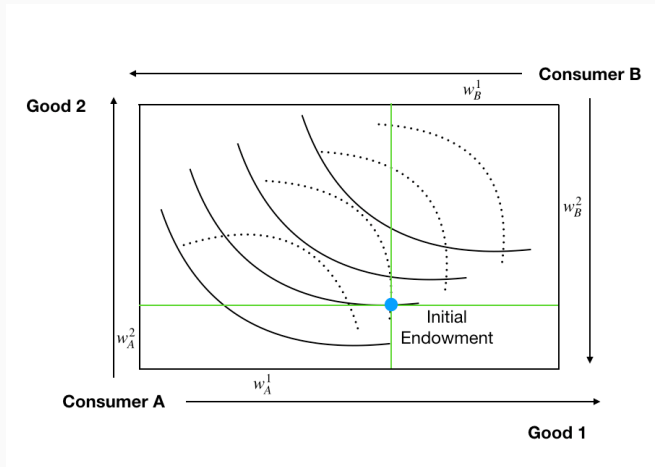
Pure exchange: set up

Two individuals A and B , with two products 1 and 2. No production.

- Initial endowment: $w_A = (w_A^1, w_A^2)$, $w_B = (w_B^1, w_B^2)$
- Consumption bundle (allocations): $x_A = (x_A^1, x_A^2)$, $x_B = (x_B^1, x_B^2)$
- Utility function: $u_A(x_A) = u_A(x_A^1, x_A^2)$, $u_B(x_B) = u_B(x_B^1, x_B^2)$

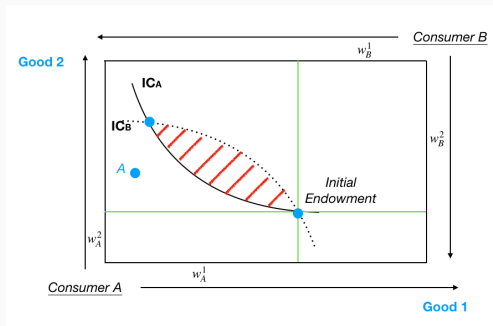
A convenient tool: Edgeworth box 埃奇沃思方框图

For simplicity, assume two agents. We can represent allocations, preferences, and endowments in a two-dimensional form.



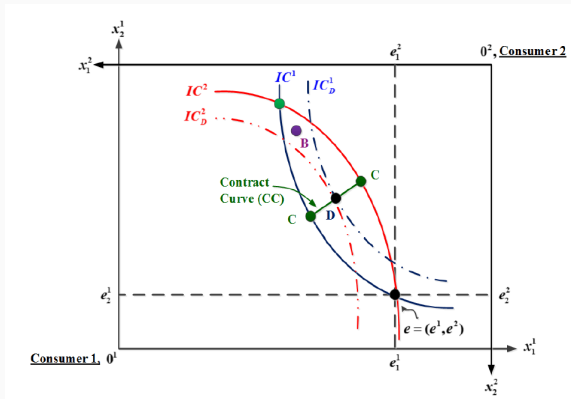
A convenient tool: Edgeworth box

- IC_i is the indifference curve of consumer i , which passes through his endowment point.
- The shaded area represents the set of bundles (x_i^1, x_i^2) for consumer i satisfying
 - $u_i(x_i^1, x_i^2) \geq u_i(w_i^1, w_i^2)$
- Consumer A does not exchange \mathbf{w} for A.



A convenient tool: Edgeworth box

- Bundle B lies inside the lens-shaped area. Thus, it yields a higher utility level than the initial endowment e for both consumers.
- Bundle D, however, makes both consumers better off than bundle B.
 - It lies on “**Contract curve**”, in which indifference curves are tangent to one another.
 - It is an equilibrium, since Pareto improvements are no longer possible.



Pure exchange: Pareto efficiency

Pareto-efficient allocations maximize one agent's utility while holding the other agent's utility constant:

$$\begin{aligned} \max_{x_A^1, x_A^2, x_B^1, x_B^2} \quad & u_A(x_A^1, x_A^2) \\ \text{s.t.} \quad & u_B(x_B^1, x_B^2) = \bar{u} \\ & x_A^1 + x_B^1 = w^1 \\ & x_A^2 + x_B^2 = w^2 \end{aligned}$$

Lagrangian procedure:

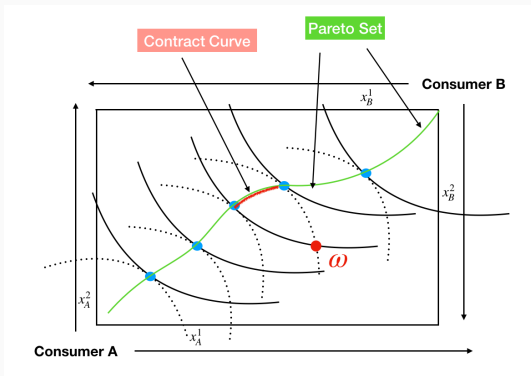
$$\mathcal{L} = u_A + \lambda(\bar{u} - u_B) + \mu_1(w^1 - x_A^1 - x_B^1) + \mu_2(w^2 - x_A^2 - x_B^2)$$

F.O.C.,

$$\begin{aligned} MRS_A &= \frac{\partial u_A / \partial x_A^1}{\partial u_A / \partial x_A^2} = \frac{\mu_1}{\mu_2} \\ MRS_B &= \frac{\partial u_B / \partial x_B^1}{\partial u_B / \partial x_B^2} = \frac{\mu_1}{\mu_2} \end{aligned}$$

Indifference curves of two agents are tangent to each other.

Pure exchange: Pareto efficiency

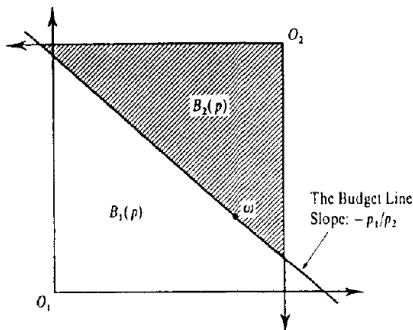


- The set of all Pareto optimal allocations is known as the **Pareto set**.
- The **contract curve** 契约曲线 is the part of the Pareto set where both consumers do at least as well at their initial endowments.
- We might expect any bargaining between the two consumers to result in an agreement to trade to some point on the contract curve.

Pure exchange: Walrasian equilibrium

Now we explore the equilibrium in economics where we allow prices to emerge.

- For each price vector $p = (p^1, p^2)$, consumer i 's wealth equals the market value of his endowments of commodities, $p \cdot w_i = p^1 w_i^1 + p^2 w_i^2$.



- The *budget line* goes through endowment point w with slope $-(p^1/p^2)$.
- Only allocations on the budget line are affordable to both consumers simultaneously at prices (p^1, p^2) .

Pure exchange: Walrasian equilibrium

Throughout, we assume that two consumers act as price takers. Although this may not seem reasonable with only two traders, we could assume that each consumer (perhaps better called a *consumer type*) stands, not for an individual, but for a large number of identical consumers.

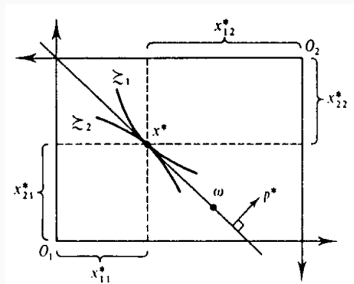
Definition

A *Walrasian (or competitive) equilibrium* for an Edgeworth box economy is a price vector p^* and an allocation $x^* = (x^{1*}, x^{2*})$ in the Edgeworth box such that for $i = A, B$,

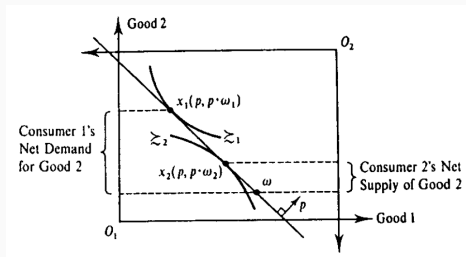
$$x_i^* \succeq_i x'_i \text{ for all } x'_i \in B_i(p^*)$$

At a market equilibrium, markets should clear.

Pure exchange: Walrasian equilibrium



- A Walrasian equilibrium



- A price vector with excess demand for good 2 and excess supply for good 1.

Pure exchange: Walrasian equilibrium

1. Each individual maximizes own utility

$$\max_{x_A^1, x_A^2} u_A(x_A^1, x_A^2) \text{ s.t. } x_A^1 p_1 + x_A^2 p_2 = w_A^1 p_1 + w_A^2 p_2$$

$$\max_{x_B^1, x_B^2} u_B(x_B^1, x_B^2) \text{ s.t. } x_B^1 p_1 + x_B^2 p_2 = w_B^1 p_1 + w_B^2 p_2$$

F.O.C.,

$$\frac{\frac{\partial u_A(x_A^1, x_A^2)}{\partial x_A^1}}{\frac{\partial u_A(x_A^1, x_A^2)}{\partial x_A^2}} = \frac{\frac{\partial u_B(x_B^1, x_B^2)}{\partial x_B^1}}{\frac{\partial u_B(x_B^1, x_B^2)}{\partial x_B^2}} = \frac{p_1}{p_2}$$

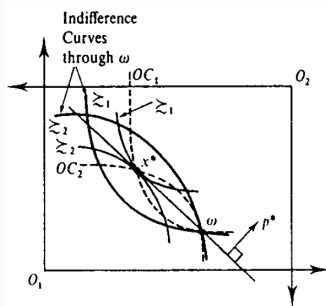
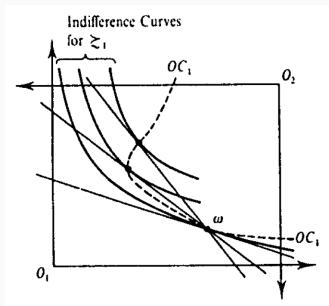
2. Market clearing (Feasibility)

$$x_A^1 + x_B^1 = w_A^1 + w_B^1$$

$$x_A^2 + x_B^2 = w_A^2 + w_B^2$$

Equilibrium occurs at a point where the two indifference curves are tangent.

Pure exchange: Walrasian equilibrium

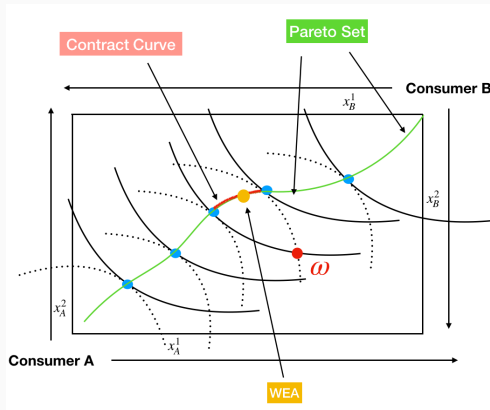


- As the price p varies, the budget line pivots around w , and the demanded consumptions trace out a curve, denoted by OC (offer curve).
- Any intersection of the consumers' offer curves at an allocation different from the endowment point w corresponds to an equilibrium.

First theorem of welfare economics 福利经济学第一定律

First Theorem of Welfare Economics

If (x, p) is a Walrasian equilibrium, then x is Pareto efficient.



First theorem of welfare economics 福利经济学第一定律

Some implicit assumptions:

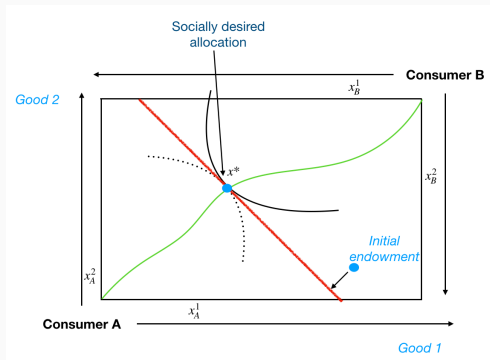
- Each agent only cares about his/her own utility (no externalities).
- Each consumer is sufficiently small relative to the size of the market (price-taker).

With millions of agents, the only thing a consumer needs to know is the prices of the goods. With “invisible hand”, an efficient outcome is guaranteed.

- Compare to a social planner (who needs to know the preferences of every agent to allocate), market can already achieve efficiency with minimal cost.
- Pareto efficiency does not care about equity/equality 平均/公平.
- The only possible welfare justification for intervention in the economy is the fulfillment of distributional objectives.

Second theorem of welfare economics 福利经济学第二定律

The second theorem provides a (partial) converse result.



Second Theorem of Welfare Economics

- Under convexity assumptions, a planner can achieve any desired Pareto optimal allocation by appropriately redistributing wealth in a lump-sum fashion and then “letting the market work”.

Second theorem of welfare economics

- The second welfare theorem implies that the problem of distribution and efficiency can be separated.
- The market mechanism is distributionally neutral; whatever your criteria for a good or a just distribution of welfare, you can use competitive markets to achieve it.
- However, this might not be realistic because of information and practical reason. It is difficult to tax on endowments.
- If you tax on choices, there will be distortions.
- We can only achieve the “second-best” (the situation when one or more optimality conditions cannot be satisfied).

Fairness and social preferences

Let's play some games!

- Game 1: CNY20 to divide between you and another person in the classroom.



https:

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Let's play some games!

- Game 2: CNY20 to divide between you and another person in the classroom, however, the person can reject if she or he is “unhappy”.



https:

[//gsm.syd1.qualtrics.com/jfe/form/SV_3g8XVG3zn6rXIgK](https://gsm.syd1.qualtrics.com/jfe/form/SV_3g8XVG3zn6rXIgK)

Fairness and social preferences

- So far we have discussed economics under the assumption that people only cares about their own interest: selfishness assumption.
- Do you think this assumption is realistic?
- Can you give some examples that people violate selfishness assumption?

- So far we have discussed economics under the assumption that people only cares about their own interest: selfishness assumption.
- Do you think this assumption is realistic?
- Can you give some examples that people violate selfishness assumption?
 - giving to charity
 - donating organs
 - voluntary unpaid work
 - voting

Game 1: Dictator game

- two players: a proposer (P) and a responder (R).
- P has dictator power over R.

What is the best strategy as a proposer?

What is your prediction of our results?

Let's see our results!

Game 1: Dictator game

Empirical findings: dictators offered an average about 20%

- The offer is purely based on “altruism” 利他.

Game 2: Ultimatum game

- two players: a proposer (P) and a responder (R)
- R can either accept the offer, or reject
- In case of rejection, both players receive nothing.

What is the best strategy as a proposer?

What is the best strategy as a responder?

What is your prediction of our results?

Let's see our results!

Game 2: Ultimatum game

Empirical findings: even when stakes are big, people still do not play according to selfishness assumption. In countries with low disposable income where the stake was equivalent to 3 months' income (Camerer 1995).

- Between 60% and 80% of the offers are between 0.4 and 0.5 of the pie.
- Almost no offers below 0.2.
- Low offers are frequently rejected.

The responders are angered by proposals that they regard as unfair, and prepared to punish such unfair behavior at a cost to themselves.

Questions?