Chapter 12 Factor Input Demand

◆ Input Demand for Profit-maximizing Firms

1. Marginal Revenue Product

•Marginal Revenue Product (MRP) of input A is the additional revenue produced by an additional unit of input A

•Calculation: $MRP = MP_i \times MR$

Market Structure	Marginal Revenue (MR)	Marginal Revenue Product (MRP)
Perfect Competition	MR=P	$MRP = MP_i \times P$
Imperfect Competition	MR(q) depends on the specific output level	$MRP = MP_i \times MR$

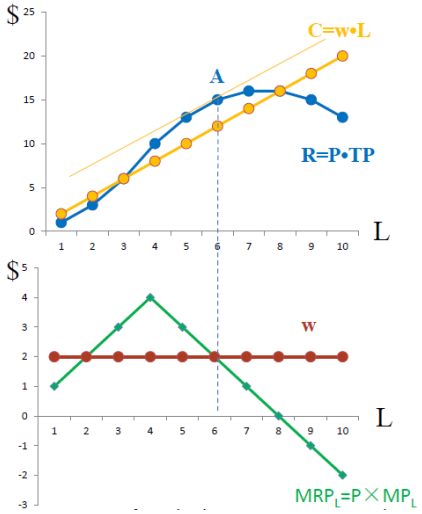
2. Input Demand for Profit-maximizing Firms

•As factor input ↑, marginal productivity ↓, eventually MRP_i = Price of factor i when firm's profit is maximized

•For labor, this means that $MRP_L = MP_L \times MR$ = wage

Rule: Profit-maximization labor input

Manager should keep hiring labor, until MRP_L=w in the diminishing marginal return region



3. Least Cost Rule

•Profit maximizing problem can be thought as to

1.minimize the cost of producing a given level of output

2.Chose a output level that maximize profit

•Condition of achieving cost minimization: $\frac{MP_L}{wage} = \frac{MP_K}{interest}$

•This ratio gives us the amount of output being generated if we spend $1 in factor inputs; it does not matter we spend the extra $1 on labor or capital.

Therefore $\frac{MP_L}{wage} = \frac{MP_K}{interest} = \frac{\Delta Q}{\Delta C} = \frac{1}{MC}$

Now, we should chose a output level that can maximize profit

–MR=MC

–Therefore $\frac{MP_L}{wage} = \frac{MP_K}{interest} = \frac{1}{MR}$

–This is equivalent with the condition obtained from maximizing profit directly

$MRP_i = MP_i \times MR$ = Price of factor i

4. Two Approaches to Maximize Profits

Approach 1	Approach 2
	Step 1. Given a targeted production level Q, choose inputs
Choose factor inputs K, L to maximize profit π	K, L to minimize production cost C
Max π= p·Q(K,L) -rK-wL	Min C=rK+wL given Q = F(K,L)
Optimization: $p \cdot MP_L = w$; $p \cdot MP_K = r$	**Optimization**: $MP_K/r = MP_L/w$
	Step 2.
	Choose production level Q to maximize profit π
	Max π = p·Q – C(Q)
	Optimization: MR(Q) = MC(Q)

◆ Substitution among Factor Inputs

•Optimization requires: $\frac{MP_L}{wage} = \frac{MP_K}{interest} = \ldots = \frac{1}{MR}$

•What if the interest rate increases while wage remain fixed ? $\frac{MP_L}{wage} > \frac{MP_K}{interest}$

–Keeping the same level of capital use will increase production cost without increase in output

–Reduce the use of capital and use more labor for cost minimization

–$MP_K \uparrow$ and $MP_L \downarrow$ until the above equation is balanced again

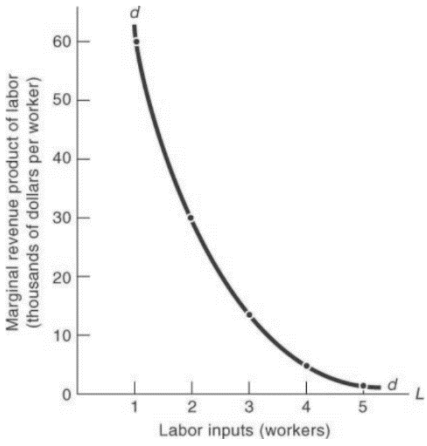
•**Substitution Rule**: If the price of one factor rises while other factor prices remain fixed, the firm will profit form substituting more of the other inputs for the more expensive factor.

（同理可知，技术变化使得 MP 改变也会出现替代效应）

◆ Firm's and Market's Factor Demand

• The MRP schedule for each input gives the demand schedule of the firm for that input

•As with all demand curves, the competitive market demand curve is the horizontal summation of demand curves of all the firms



Chapter 14 Natural Resources and the Environment

◆ Resource Categories

	Definition	Example	Management
Nonrenewable	Resources with fixed supply	Fossil fuels, Nonfuel mineral resources (copper, silver, stone, and sand)	Distribution of a finite quantity of the resource over time
Renewable	Resources that are regularly replenished	Solar energy, agriculture land, river water, forests, and fisheries	Sustainable usage. E.g., forest management, protection of fish breeding grounds, regulation of pollution

◆ Environmental Economics

➢ Concepts

Externality

•Externality is an activity that imposes involuntary costs or benefits on others, or an activity whose effects are not completely reflected in its market price

•Negative: action by one party imposes a cost on another party (dump waste in a river)

•Positive: action by one party benefits another party (a beautiful garden)

Public Goods

•Public goods: ones whose benefits are indivisibly spread among the entire community, whether or not individuals desire to consume them or not

–An extreme example of externality

–Consumption by one individual does not affect the supply available for other individuals

–Efficient provision requires government involvement

–Examples: knowledge, national defense, lighthouse, public television

•Private goods: ones that can be divided up and provided separately to different individuals, with **no** external benefits or costs to others

–Efficient provision can be achieved through private market mechanism

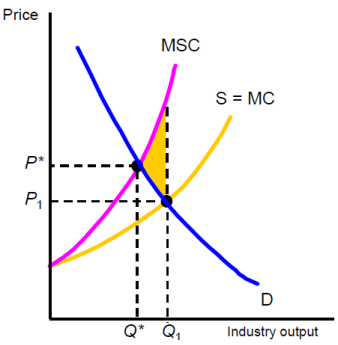
➢ Market Provision of Goods with Negative Externalities

•Marginal Social Cost (MSC): MC incurred by producers + marginal external cost imposed on others (not taken into account by the producers)

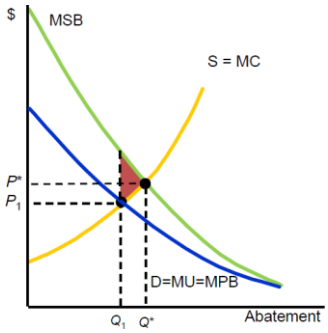
•Socially Efficient Level: MSC=MC→Q*

•Market provision level: Q1>Q*→To much production

•Efficiency loss



➢ Market Provision of Goods with Positive Externalities

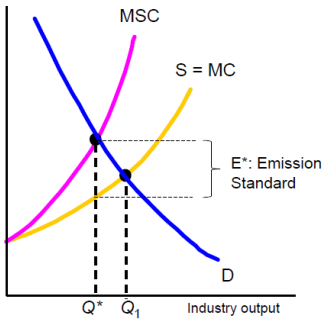


•Marginal Private Benefit (MPB): marginal benefit in pollution reduction enjoyed by the firms
•Marginal Social Benefit (MSB): MPB + external benefits enjoyed by the society
•Socially Efficient Level: MPB=MC⟶Q*
•Market provision level: –Q1<Q*⟶To little abatement
•Efficiency loss

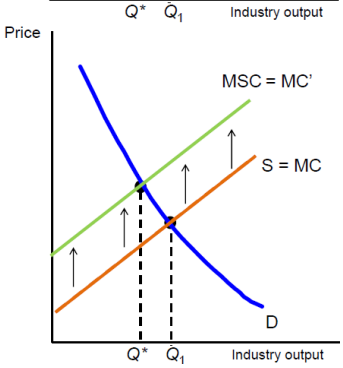
➢ Summary

–Negative externalities ⟶ Over provision than optimal
–Positive externalities ⟶ Under provision than optimal

➢ Policies to Correct Externalities



Direct control
•Emissions Standard: a legal limit on emissions at E*
–Enforced by monetary and criminal penalties
–Increases the cost of production and the threshold price to enter the industry



Emission Fee
•Suppose that MSC=MC+E, where E is the social cost of emission
•By charging a emission fee of E, we can restore efficiency
–The new marginal cost curve of the firm (MC') is the same as MSC
–Firm produce at the social efficient level Q*
–Emission fee internalizes the externality of the pollution

Ensure complete property rights (**Coase Theorem**)
（案例：上游造纸厂和下游景区）
•Insight: if the owners of the two parties can easily bargain with each other, the existence of externalities may not necessarily result in inefficiency
•The efficient result is INDEPENDENT of the specific ownership
If trade of the externality can occur, then bargaining will lead to an efficient outcome no matter how property rights are allocated.

Crucial condition for optimality
(1) well-defined
(2) enforceable property rights
(3) Transaction Cost
    •The practical application of the Coase Theorem depends largely on the number of parties being affected

- When millions of parties are affected (as the case with air pollution in urban areas), it is hard to see how effective negotiation can happen
  - Transaction costs of the negotiation would be far too high
- Government's role in pollution control:
  - Build up legal system to ensure property rights
  - When transaction costs are high, government may intervene on our behalf to deal with the negotiation

Chapter 18 International Trade

◆ Comparative Advantage

➢ Key Concepts

• Absolute Advantage: one country has an absolute advantage in the production of good X if it takes fewer resources to produce one unit of X there than in another country
– Reasons: low costs, high productivity
• Comparative Advantage (CA): The situation that exists when a country can produce a good with less forgone output of other goods than can another country

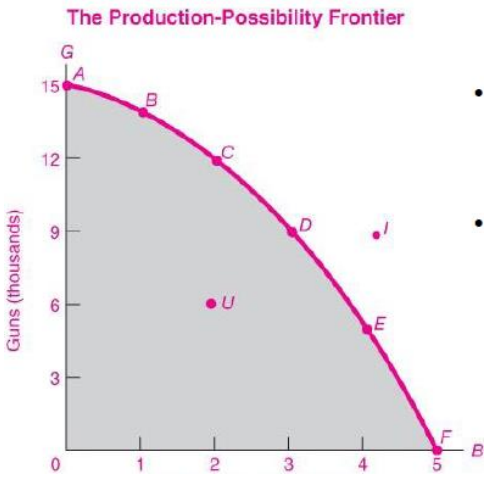
➢ Gains from Trade

产品 X 从在生产它上拥有比较优势的国家流向其他国家；
国内的生产要素从该国家在生产上没有比较优势的行业流向在生产上拥有比较优势的行业。
——specialization
Remark: 只考虑两件商品时，不可能一个国家同时具有两件商品的比较优势。

◆ Graphical Analysis

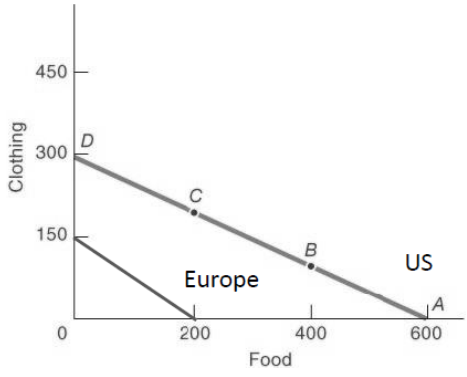
➢ Production-Possibility Frontier

• Production-Possibility Frontier (PPF)
– Given technology and inputs, the maximum bundles of outputs (goods and services) can be produced.
• Production: inputs-----technology----outputs
• Intercepts（截距）: the maximum output of good x when a country devote all its resources in producing that good
• Diminishing marginal returns/products
– Implies that PPT is concave
– Increasing Opportunity Cost: cost of producing one unit more of butter (as measured by the amounts of guns must be given up) increases as the output of butter increases
• Efficiency:
– Point D: Pareto efficient
– Point U：Inefficient production point
– Point I: Infeasible production point



➢ US without Trade

• PPF of US
– Price (cost) ratio between food and cloth 1/2
– Reflecting the relative production cost: 1 food = 1/2 cloth
– Constant opportunity cost

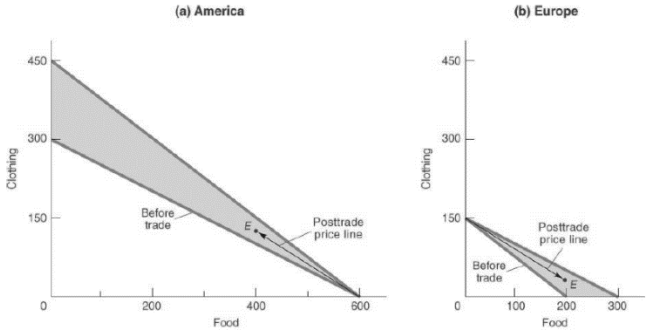


- Consumer and Production:
– Without trade, a country can only consumer what it produces
- We can do exactly the same thing for Europe
– But EU's PPF will be different with the US
– Price (cost) ratio 3/4

➢ Opening Up to Trade

- Relative Price between food and clothing should lie between 1/2 and 3/4
- The final price ratio depends upon the relative demand for food and clothing
  - When food demand is high → price of food ↑ → final price = 3/4 → US specializes in food and Europe produces both food and cloth
  - When Cloth demand is high → price of cloth ↑ → final price = 1/2 → Europe specializes in cloth and US produces both food and cloth

  Remark: 这里的 demand 来源是无差异曲线的位置。



➢ US' Gains from Trade

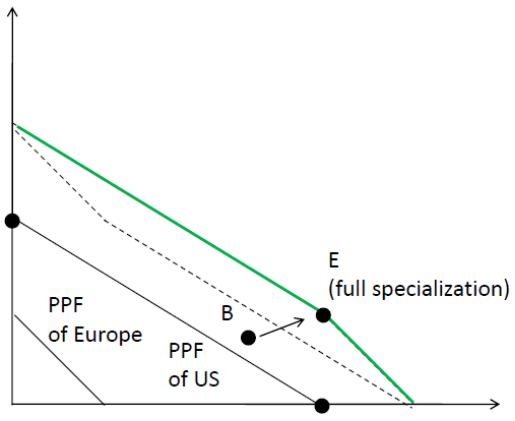
- Consumption possibility curve:
– Begins at the region's point of complete specialization

没有贸易时，一个经济体的生产点即为其消费点；

进行贸易时，消费可能性曲线不再是生产可能性曲线，而会以介于两个经济体贸易前价格之间的交换比例延伸。

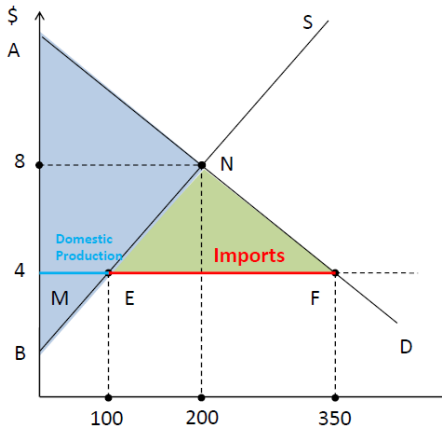
➢ The World's PPF with Free Trade

- The world PPF represents the maximum output that can be obtained from the world's resources when goods are produced in the most efficient manner
– The maximum possible Cloth production
– The maximum possible Food production
– All the possible production levels in between
- Gains from trade
– Before trade B (inside the PPF)
– After trade E (on the PPF)



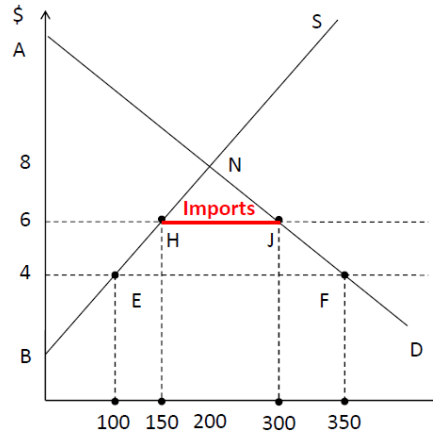
◆ Protectionism

➢ Free Trade vs No Trade



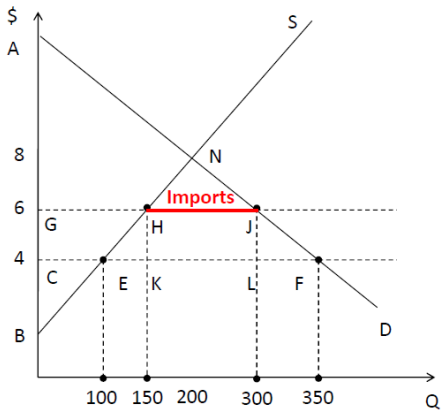
- Free Trade equilibrium:
– Small open economy;
No transaction/transportation cost
– Take the world price ($4) as given
– Foreign goods flow into the country, driving the price down to the world price
– The gap is filled in by imports
- Gains from trade
– Social surplus without trade: ABN
– Social surplus with trade: ABN+NEF

➢ Trade Barriers



- Prohibitive Tariff: One that prevents all imports
- Non-prohibitive Tariff: Lower than the prohibitive one
- Transportation Cost:
– Imposed by nature
– Same effects as a tariff
– Tariffs as the “negative railway”

➢ The Economic Costs of Tariffs



- Effects of Tariffs Relative to Free Trade:

1. Domestic producers, operate under a price umbrella provided by the tariff, expand their production
2. Consumers are faced with higher prices and therefore reduce their consumption
3. The government gains tariff revenue

- GCEH is transferred from CS to PS
- Loss in CS: HEFJ
- Gain in government revenues: HKLJ
- Efficiency loss: EKH+JLF