

International Trade

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Chapter 1

Basic Model of International Trade

1.1 Introduction

We will use social indifferent curves representing the demand side. Those who gain can compensate the ones who lose, such that they are indifferent and they continue to be winners.

Inter-industry: countries export goods without importing goods of the same industry.

Example: exchange of cars and crude oil.

Explained by: (1) non-availability; (2) differences in relative prices or costs.

Intra-industry: export and import of similar good, i.e. of the same industry.

Example: Germany import cars to France and imports French cars at the same time.

Explained by: (1) imperfect competition; (2) product differentiation;

(3) oligopolies (new trade theory)

Remark

The distinction between inter-industry and intra-industry trade depends on the level of aggregation of industries.

e.g. Export of printing machine, import of car.

In case of quality differences (*vertical product differentiation*) sometimes also trade within narrowly defined industries may be explained by **comparative cost advantages**, i.e. differences of countries explain, which country produces and exports **the standard version** of the product and which country produces and exports the **high-tech-version**.

Example: Standard-pump and “Prominent”-metering-pump. (→ product cycle).

Models of Non-Availability to explain trade.

1. Geological reasons (metal ore, crude oil, sea fish)
2. Climate (Coffee, Bananas, Cotton)

Medium-term or technological non-availability

1. Temporary or seasonal non-availability
2. Fruit and vegetables in different times of peak demand

The **standard trade model** is built on four key relationships

- (1) The relationship between the *production possibility frontier* and the *relative supply curve*;
- (2) The relationship between *relative prices* and *relative demand*;
- (3) The determination of world equilibrium by *world relative supply* and *world relative demand*;

(4) The effect of the terms of trade—the price of a country's exports divided by the price of its imports—on a nation's welfare.

Basic Assumptions

We consider a model in which two countries engage in trade and in which each country is capable of producing only two kinds of commodities (food and clothing). Labour and any other inputs in the production process are assumed to be trapped within national boundaries, and international trade provides each country the opportunity to consume food and clothing in properties different from those produced locally.

The Result of the Trade

If relative commodity prices differ between countries in the absence of trade, both countries can gain by exchanging commodities at any intermediate price ratio, which each country exports the commodity that is relatively expensive in that country before trade.

1.2 Background Behavior: Demand

1. Consider a single individual.
2. Assume that a country's demand behavior can be represented in a similar fashion.

1.2.1 The budget constraint and Relative Prices

Remark

Terms of Trade (TOT)

If two goods are traded on world markets, their relative price of the export good and the import good is known as the terms of trade.

$$TOT = \frac{P_{EX}}{P_{IM}} \quad (1.1)$$

If the ratio decrease - TOT worsen; If the ratio increase - TOT improve.

The classical form of the budget constraint: Individuals (and, therefore, nations as well) spend exactly the value of their incomes.

Remark

- The slope and inverse of slope can represent these 2 goods' relative price respectively. ($\tan \alpha = MRT = -\frac{\Delta F}{\Delta C} = -\frac{P_C}{P_F}$)
- The budget line through the endowment point shows only what food and cloth *could be* purchased, it does not specify which point *would be* demanded.

1.2.2 Preferences: Indifferent Curves (IC)

In different curves, expressing our individual preferences or tastes concerning food and clothing.

The marginal rate of substitution (MRS) represents individual's willingness to substitute more of one commodity dry less of another changes along an indifference curve. It is indicated by the absolute value of the slope of the indifference curve.

1.3 Background Behavior: Supply

1.3.1 The Transformation Curve

The transformation curve shows the maximum amount of one commodity that can be produced, given the quantities of all other commodities produced.

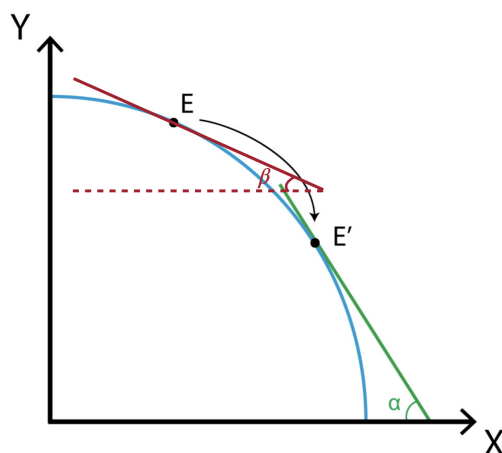


Figure 1.1: Transformation Curve

A general illustration of such a schedule is the TT' Curve.

Remark

- It is not necessary that $f'(0) = 0$ and $f'(c^*) \rightarrow +\infty$.
- If the production function is Leontief production function, then there is likely to be some factors remain if the economy only produces only one product.
- The TT' schedule bows out from the origin, reflecting the so-called law of increasing costs.
- Reason: specialization of factors, difference of production function return of scale.

1.4 Production Possibilities and Relative Supply

An economy whose production possibility frontier is TT will produce at Q, which is on the highest possible isovalue line.

1.5 Relative Price and Demand

The absolute value of the slope of the line is $\frac{P_C}{P_F}$. In figure (a), the iso-yield lines become steeper when the relative price $\frac{P_C}{P_F}$ increase. Which means, as $\frac{P_C}{P_F}$ increases, the relative quantity of production $\frac{Q_C}{Q_F}$ also increases.

Hence we have the relative supply curve shown as figure (b).

Remark

It is important to note that the relationship here is only between relative price and relative quantity supplied, and is not related to the absolute quantity supplied. It simply indicates the proportion that the production of a certain commodity occupies in the country's total production.

Further, the country on the right-hand side of the relative supply curve may not produce as much of both commodities in absolute terms as the country on the left-hand side.

1.6 Gains from Trade and Free Trade Equilibrium

We begin by showing how two countries can each gain from trade even in the case in which prices changes in production.

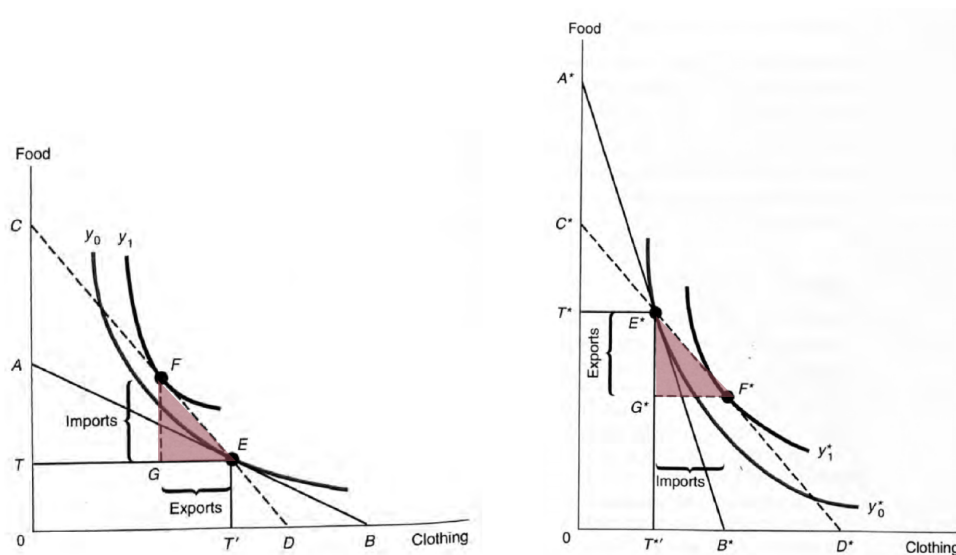


Figure 1.3: Trade Triangles of Home and Foreign

1.6.1 The trade triangle of the home country

The home country originally consumes its endowment bundle, E , at relative prices shown by line AB .

If it could trade at prices shown by line CD , it could export GE units of clothing to obtain FG units of food. Thus, consuming the bundle F represents a higher utility.

1.6.2 The Trade triangle of foreign country

The foreign country consumes its endowment bundle, E^* , at relative prices shown by line A^*B^* . If it could trade at prices shown by C^*D^* (the same slope of CD), it could export E^*G^* units of food to obtain G^*F^* units of clothing, thus consuming the bundle shown by F^* and improving its real income to the level shown by the y_1^* indifferent curve.



Remark

The opportunity to trade at relative prices different from those in isolation at home must improve *real incomes* at home.

1.7 Gains form Trade with Resource Reallocation

The trade triangle in the home country with free-trade prices shown by the slope of line 2.

Production at home takes place at A and consumption at B . BDA is the trade triangle.

The community exports DA units of clothing in exchange for imports of BD units of food.

Autarky consumption and production are at point E , with autarky prices shown by line 1.

1.8 Compare Advantage and Comparative Costs

Compare Advantage

A country has a comparative advantage in a commodity if, in autarky, that commodity is **relatively less expensive** than in the other country.

Remark

It is clear that as long as autarky relative prices are not identical between countries, each country must have a comparative advantage in

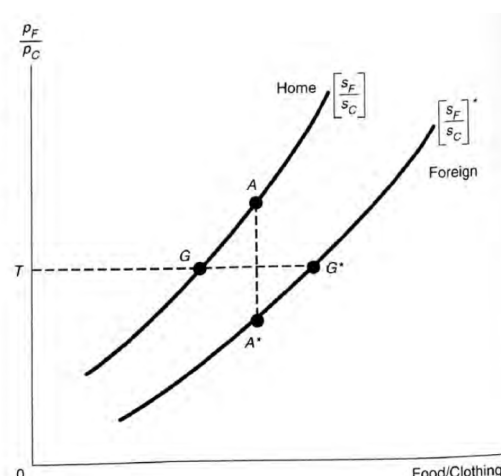


Figure 1.5: Comparative Advantage

some community, and trade patterns according to comparative advantage lead to mutual gains.

1.9 The Doctrine of Comparative Cost

Conclusion

A country gains from international trade by exporting the commodity in which its costs are comparatively lower than in the other country.

1.9.1 Comparative Advantage

The pair of relative supply curves illustrate the production bias in favor of the foreign country possessing a comparative advantage in producing food.

If tastes are comparable, positions of comparative advantage and the trade pattern (foreign country exports food) are consistent with the production bias.

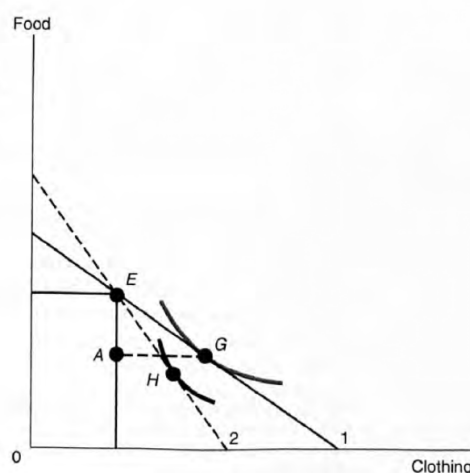


Figure 1.6: Individuals who Lose from Trade (Pure Exchange Economy)

1.10 Winners and Losers: Autarky to Free Trades

Remark

The slope of budget constraint is $\frac{p_C}{p_F}$.

If a country is made up of individual with different incomes or taste, opening up the country to international trade **may hurt some people**.

Indeed, the potential losers are easy to identify—all the individuals who are **net sellers** of food at home before world trade is opened up.

Note that we are now talking about the gains and losses of individuals when the country is open to free trade. When considering individual utility in a pure exchange economy, we use endowment rather than PPF (production possibility frontier).

Although the typical result in such cases is that some group do get hurt while others gain, the economist is tempted to ask about the possibility if **compensation so that all parties can gain by the more**.

Remark**The main point here is this:**

If we consider countries as a whole, then both countries can benefit from trade as long as they produce two goods at different relative prices. (If one country is large and one is small, then the large country has almost nothing to lose and nothing to gain, and the small country can gain.)

But if we consider individuals who are heterogeneous within countries, then the interests of individuals who are net sellers of the import good (net sellers of the import good) will be harmed. This is shown as a downward shift in the undifferentiated curve (from 1 to 2) in the figure above.

However, since the country as a whole benefits, the country can redistribute some of the gains from net sellers of the export good to subsidise those individuals who suffer, so that everyone in the economy benefits from trade.

1.10.1 A Compensation Scheme

The redistribution scheme involves switching the original endowment point for each individual to the consumption point that would be chosen when internal trade (but not international trade) is allowed.

Remark**Slutsky Compensation and Hicks Compensation**

Slutsky Compensation: the utility is the same as the one before the price increasing. (Consumption bundle is different due to substitution effect)

Hicks Compensation: Households can purchase the same consumption bundle as before. Since there exists substitution effect, the final utility levels of households will be higher than before, i.e. before the price increases.

1.11 Summary

(a) **Assumption:** 2 countries; 2 goods, different relative prices different relative supply curves

(b) **Analysis process**

(1) Suppose the production point will not change

⇒ Both countries gain from the change of relative price

(2) Consider the movement of production point as a result of the change of relative price.

⇒ Both countries gain more than fixing the production point.

(c) **The result of trade**

Transition Triangle: The amount of export and import

Terms of Trade: (The relative price of export good) $TOT = \frac{P_{EM}}{P_{IM}}$.

(d) **Compensation:** consider the heterogeneity of individuals of the country, the gains and the loss

compensation: Slutsky compensation; Hicks Compensation

Chapter 2

The Heckscher-Ohlin Model

Basic Idea:

Comparative cost advantages are explained by different relative factor endowments in two countries. (*assuming the same technologies in both countries*)

Heckscher-Ohlin Theorem

The country that is abundant in a factor exports the good whose production is intensive in that factor.

2.1 Assumptions

(1) Basic Structure:

2 goods, A and B

2 countries, 1 and 2

2 input factors K and L

(2) Basic assumptions of neo-classical trade theory

Perfect competition on goods and **factor** markets

Production factors are internationally immobile, but perfectly mobile be-

tween sectors within a country.

Remark

In short -term, the specialized factors can't move among different industries.

In long-term, specialized factors will depreciate among years and then at the end of the depreciation period, we can invest the money on other products to produce the other good.

(3) Factor endowment

Exogenous factor supplies, K_1, K_2, L_1, L_2 .

Different relative factor endowment in the two countries: country 1 is capital abundant and country 2 is labor abundant, i.e. $\frac{K_1}{L_1} > \frac{K_2}{L_2}$.

(4) Production technologies

Production functions of the same product is the same in the two countries.

Different products have different production function.

The production function is well-behaved, i.e. constant return to scale (CRS); diminishing marginal productivity.

(5) Classification of goods according to factor intensity

Good A is capital intensive and Good B is Labor intensive.

(6) Demand

Preferences are internationally identical and homothetic.

Remark: Homothetic Preference

In consumer theory, a consumer's preferences are called homothetic if they can be represented by a utility function which is homogeneous of degree 1.

For example, in an economy with two goods x, y , homothetic preferences can be represented by a utility function u that has the following

property: for every $a > 0$

$$U(ax, ay) = aU(x, y)$$

Utility functions having constant elasticity of substitution (*CES*) are homothetic. They can be represented by a utility function such as

$$u(x, y) = \left[\left(\frac{x}{\omega_x} \right)^r + \left(\frac{y}{\omega_y} \right)^r \right]^{\frac{1}{r}}$$

Since the *CES* function is homogeneous of degree 1.

Linear utilities, Leontief utilities and Cobb-Douglas utilities are special cases of CES functions and thus are also homothetic.

Note that, the quasilinear utilities are not always homothetic. e.g. the function $u(x, y) = x + \sqrt{y}$.

2.2 Capital-Labor Ratio and Wage-Rental Ratio

Production function for good A with constant returns to scale (for good B analogously)

$$A = F_A(L_A, K_A) = L_A F_A\left(1, \frac{K_A}{L_A}\right) = L_A f_A(\rho_A)$$

Hence the production of good A can be written as

$$A = L_A f_A(\rho_A) \tag{2.1}$$

where $\rho_A = \frac{K_A}{L_A}$ capital intensity, f_A per capita production function.

The factor price depends on the marginal product of each factors.

$$\frac{\partial A}{\partial K_A} = L_A f'_A(\rho_A) \frac{1}{L_A} = f'_A(\rho_A)$$

$$\begin{aligned}
\frac{\partial A}{\partial L_A} &= f_A(\rho_A) + L_A f'_A(\rho_A) \left(-\frac{K_A}{L_A^2}\right) \\
&= f_A(\rho_A) - \frac{K_A}{L_A} f'_A(\rho_A) \\
&= f_A(\rho_A) - \rho_A f'_A(\rho_A)
\end{aligned}$$

In conclusion, the first order partial derivative of K_A and L_A are

$$\frac{\partial A}{\partial K_A} = f'_A(\rho_A) \quad (2.2)$$

$$\frac{\partial A}{\partial L_A} = f_A(\rho_A) - \rho_A f'_A(\rho_A) \quad (2.3)$$

Hence, the **wage-rent ratio** is

$$\omega = \frac{w}{r} = \frac{\frac{\partial A}{\partial L_A}}{\frac{\partial A}{\partial K_A}} = \frac{f_A(\rho_A) - \rho_A f'_A(\rho_A)}{f'_A(\rho_A)}$$

That is

$$\omega = \frac{w}{r} = \frac{f_A(\rho_A)}{f'_A(\rho_A)} - \rho_A$$

Let's take the first derivative of ρ_A to the monotonicity.

$$\frac{d\omega}{d\rho_A} = \frac{(f'_A(\rho_A))^2 - f_A(\rho_A)f''_A(\rho_A)}{[f'_A(\rho_A)]^2} - 1 = -\frac{f_A(\rho_A)f''_A(\rho_A)}{[f'_A(\rho_A)]^2} > 0 \quad (2.4)$$

Therefore, the function is monotonically increasing.

A Short Note

From the above equations, we can know that the marginal production of these 2 factors only depends on the capital intensity, i.e. the ratio of capital factor and labor factor $\rho = \frac{K_A}{L_A}$.

Furthermore, let's take the second derivative of these 2 factors respectively, we have

$$\frac{\partial^2 A}{\partial K_A^2} = f''_A(\rho_A) \frac{1}{L_A} < 0$$

$$\begin{aligned}
\frac{\partial^2 A}{\partial L_A^2} &= f'_A(\rho_A)\left(-\frac{K_A}{L_A^2}\right) - \left\{\left(-\frac{K_A}{L_A^2}\right)f'_A(\rho_A) + \rho_A f''_A(\rho_A)\left(-\frac{K_A}{L_A^2}\right)\right\} \\
&= -\frac{\rho_A}{L_A}f'_A(\rho_A) + \frac{\rho_A}{L_A}f'_A(\rho_A) + \frac{\rho_A^2}{L_A}f''_A(\rho_A) \\
&= \frac{\rho_A^2}{L_A}f''_A(\rho_A) < 0
\end{aligned}$$

Since, we can find that the second partial derivative not only depends on ρ_A but on K_A and L_A . And both labor and capital satisfy marginal production diminish.

2.3 Wage-rental ratio and relative price of goods

Let's talk about the relationship of wage-rental ratio and relative price of goods. The bridge to connect these 2 ratios is 'the prices of factors are the marginal return of factors'.

To find the relationship between these 2 ratios, we firstly use That is to say

$$\begin{aligned}
r_A &= P_A \frac{\partial A}{\partial K_A} = P_A f'_A(\rho_A) \\
\Rightarrow P_A &= \frac{r_A}{\frac{\partial A}{\partial K_A}} = \frac{r_A}{f'_A(\rho_A)}
\end{aligned}$$

Similarly, for good B, we have

$$\begin{aligned}
r_B &= P_B \frac{\partial B}{\partial K_B} = P_B f'_B(\rho_B) \\
w_B &= P_B \frac{\partial B}{\partial L_B} \\
\Rightarrow P_B &= \frac{r_B}{\frac{\partial B}{\partial K_B}} = \frac{r_B}{f'_B(\rho_B)}
\end{aligned}$$

Since, the labor can move freely, $r_A = r_B$.

Hence the relative price is

$$\pi = \frac{P_B}{P_A} = \frac{\frac{r_B}{f'_B(\rho_B)}}{\frac{r_A}{f'_A(\rho_A)}} = \frac{f'_A(\rho_A)}{f'_B(\rho_B)} \quad (2.5)$$

Since

$$\omega_A = \frac{w_A}{r_A} = \frac{f_A(\rho_A)}{f'_A(\rho_A)} - \rho_A$$

We can see that ρ_A is a function of ω_A . And the firms will let their profit max, that is to make the marginal product of each factor on each product the same. Hence

$$\omega_A = \omega_B = \omega \quad (2.6)$$

Hence the relative price can be written as

$$\pi = \frac{P_B}{P_A} = \frac{f'_A(\rho_A(\omega))}{f'_B(\rho_B(\omega))} \quad (2.7)$$

Differentiating leads to the following result

$$\frac{d\pi}{d\omega} = \frac{\pi(\rho_A - \rho_B)}{(\omega + \rho_A)(\omega + \rho_B)} \quad (2.8)$$

Hence, if $\rho_A > \rho_B$, $\frac{d\pi}{d\omega} > 0$.

Plug into the wage-rental ratio equation

$$\omega_A = \frac{w_A}{r_A} = \frac{\frac{\partial A}{\partial L_A}}{\frac{\partial A}{\partial K_A}} = \frac{f_A(\rho_A) - \rho_A f'_A(\rho_A)}{f'_A(\rho_A)}$$

Calculation steps:

Relation between wage-rental-ratio $\omega = \frac{w}{r}$ and capital intensity

$$\omega = \frac{w}{r} = \frac{f_A - f'_A \cdot \rho_A}{f'_A} \quad (2.9)$$

$$= \frac{f_A}{f'_A} - \rho_A \quad (2.10)$$

Hence

$$\omega = \frac{f_A}{f'_A} - \rho_A$$

$$\frac{d\omega}{d\rho_A} = \frac{f'_A \cdot f_A - f_A \cdot f''_A}{(f'_A)^2} - 1 = -\frac{f_A f''_A}{(f'_A)^2} > 0$$

Then

$$\frac{d\rho_A}{d\omega} = -\frac{(f'_A)^2}{f_A f''_A} > 0$$

$$\frac{d\pi}{d\omega} = \frac{f'_B(\rho_B(\omega)) \cdot \frac{d}{d\omega} f'_A(\rho_A(\omega)) - f'_A(\rho_A(\omega)) \cdot \frac{d}{d\omega} f'_B(\rho_B(\omega))}{(f'_B(\rho_B(\omega)))^2}$$

Intermediate step:

$$\frac{d}{d\omega} f'_A(\rho_A(\omega)) = f''_A(\rho_A(\omega)) \cdot \frac{d\rho_A}{d\omega} = f''_A \cdot \frac{-(f'_A)^2}{f_A \cdot f''_A} = -\frac{(f'_A)^2}{f_A}$$

$$\frac{d\pi}{d\omega} = \frac{-f'_B \cdot \frac{(f'_A)^2}{f_A} + f'_A \cdot \frac{(f'_B)^2}{f_B}}{(f'_B)^2}$$

$$= \frac{f'_A}{f_B} - \frac{(f'_A)^2}{f_A f'_B} = \frac{f'_A}{f'_B} \left[\frac{f'_B}{f_B} - \frac{f'_A}{f_A} \right]$$

$$= \pi \cdot \left(\frac{1}{\omega + \rho_B} - \frac{1}{\omega + \rho_A} \right) = \pi \frac{\rho_A - \rho_B}{(\omega + \rho_A)(\omega + \rho_B)}$$

Note that $\omega = \frac{W_A}{r_A} = \frac{f_A(\rho_A) - \rho_A f'_A(\rho_A)}{f'_A(\rho_A)} = \frac{f_A}{f'_A} - \rho_A$. Then $\frac{f_A}{f'_A} = \omega + \rho_A$ and therefore $\frac{f'_A}{f_A} = \frac{1}{\omega + \rho_A}$.

The production function

We have 2 real wages here, i.e. $\frac{W_A}{P_A}$ and $\frac{W_B}{P_B}$.

Chapter 3

Specific Factor Model(3 Factor Model)

3.1 Set up

1. 2 goods A and B.
2. 3 production factors: K_A and K_B specifies to industries A and B and L labor, is homogenous of the first degree, can move between industries.
3. Perfect competition implies that the equilibrium condition value of *the marginal product of a factor = price of the factor*.

Since labor can move freely between the 2 industries, they will keep moving until the wage in these 2 countries are the same.

Mathematically, labor mobility implies that the wage rate is equalized between sectors. Hence we can write

$$p_A MPL_A = p_B MPL_B = p_L \quad (3.1)$$

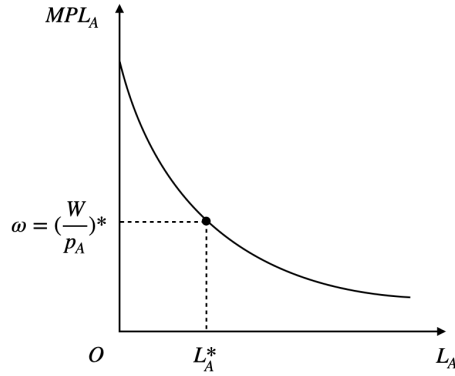


Figure 3.1: Real Wage Represented by A

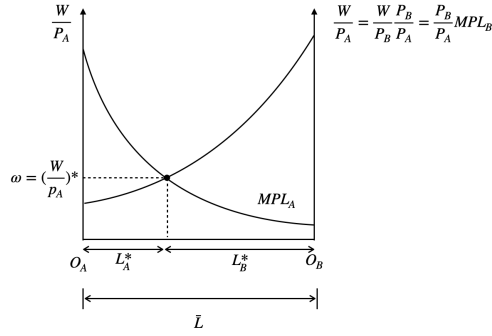


Figure 3.2: General Equilibrium

Where MPL_A , MPL_B are the (physical) marginal products of labor in the two sectors, and p_L is the nominal wage rate.

Define $w = \frac{p_L}{p_A}$ to denote the real wage rate in terms of commodity A, and $p = \frac{p_B}{p_A}$ the commodity price ratio.

Then (3.1) can be written as

$$MPL_A = pMPL_B = \omega \quad (3.2)$$

Combine industries A and B together, In the case of free trade, the relative price of these 2 goods $\pi = \frac{P_B}{P_A}$ will change, which leads to the upward line's situation change. This can be depicted by the following graph.

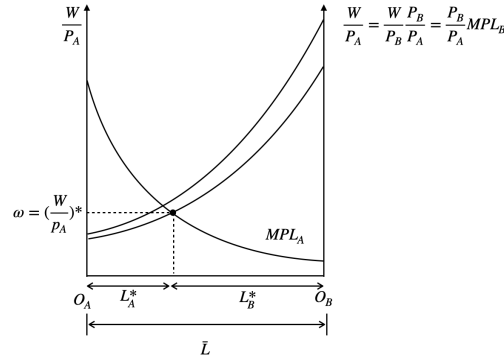


Figure 3.3: The Situation when Relative Price Changes

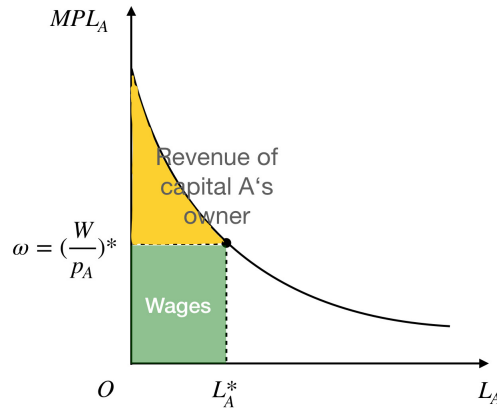


Figure 3.4: Revenue of Different People

Remark

It is important to note here that a change in the price ratio results in a change in the curve by a certain percentage. The slope therefore changes, rather than simply translating the curve upwards.

The shadow part shows the (physical) amount of good A produced in total.

Application to Distribution Effect of International Trade The relative price of the export good rises due to international trade, (compared and autarky). Hence, the specific factor of export good gains and the one for import goods losses.

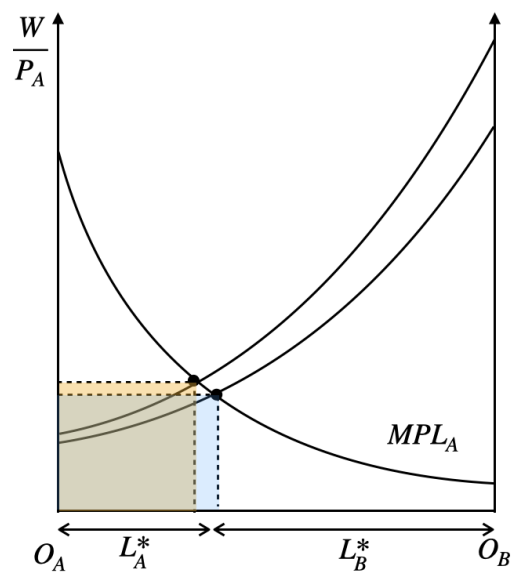


Figure 3.5: Change of Gain of Workers

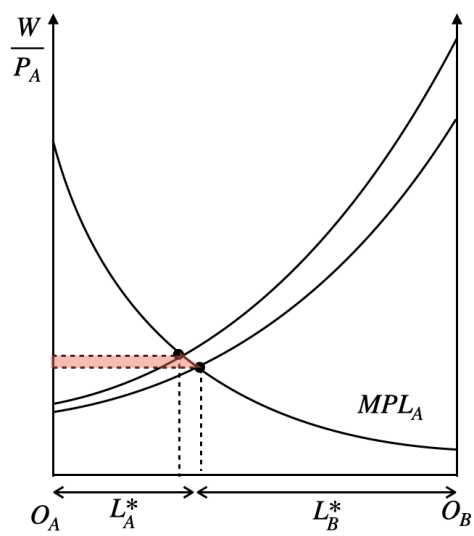


Figure 3.6: Change of Gain of Specific Factor Owners

The effect on the mobile factor is ambiguous. (Wages fall in terms of the export good and rises in terms of import good).

Chapter 4

Monopolistic competition (new trade theory)

The neoclassical trade theory explains the inter-industry trade by differences of countries. However, after world war II it was observed that a large share of international trade was intra-industry trade between similar countries (industrial countries.)

The new trade theory explains the trade between identical countries by imperfect competition: monopolistic competition and oligopoly.

In contrast to the general equilibrium usually used in neoclassical trade theory, here, in the new trade theory, we often use partial equilibrium models.

4.1 Assumptions

1. There are $i = 1, 2, \dots, N$ product varieties, where the number N will be endogenously determined.
2. There is fixed number L of consumers, each of whom receives the fol-

lowing utility from consuming c_i of each variety.

$$U = \sum_{i=1}^N v(c_i), v' > 0, v'' < 0. \quad (4.1)$$

Notice that this utility function is symmetric over the product varieties; that is the same function $v(c_i)$ applies to the consumption of each. Also notice that these consumers are homogenous, i.e. have the same preference.

3. Each consumer receives labor income of w . So the budget constraint is

$$w = \sum_{i=1}^N p_i c_i.$$

Consumers choose consumption c_i of each variety to maximize utility, subject to the budget constraint.

The first order conditions for this problem are

$$v'(c) = \lambda p_i, i = 1, \dots, N, \quad (4.2)$$

where λ is the Lagrange multiplier (i.e. the marginal utility of income).

Chapter 5

Reciprocal Dumping

(Duopoly, Partial Equilibrium Model)

Basic idea and result

The model explains intra-industry trade in a homogeneous product **in spite of transportation costs**.

The trade (and the transport of the goods) seems to be "pointless", but by competition effects, it may be welfare increasing.

5.1 Assumptions

- Partial equilibrium model, homogeneous model.
- 2 countries, Austria and Bolivia
- 1 Firm each country
- Cournot competition
- Segmented markets (also in case of trade - i.e. arbitrage is not possible for consumers; Price could be different in the 2 countries and firms set price for the 2 countries separately.)

- Linear demand $p_A = a - b(q_{AA} + q_{BA})$
- Constant marginal cost c (same for these 2 firms)
- Transport(export) costs for exports: iceberg transport costs $T > 1$.

Hence marginal costs for export firms:

$$Tc = c + t \quad (5.1)$$

$$t = (T - 1)c$$

In autarky, each firm is a monopolist on its domestic market. Due to the symmetry of the 2 countries, it is sufficient to consider the market of one country, Austria. (Bolivia will be a mirror image - with the Bolivian firm selling on its domestic market and the Austrian firm in the role of exporting).

Suppose the inverse demand curve of Austria market is

$$p_A = a - b(q_{AA} + q_{BA}) \quad (5.2)$$

q_{AB} quantity of Austrian firm in Bolivia

Then the profit function of firm A in Austria market is that

$$\pi_{AA} = (a - c - b(q_{AA} + q_{BA}))q_{AA} \quad (5.3)$$

$$= -bq_{AA}^2 + (a - c - bq_{BA})q_{AA} \quad (5.4)$$

Hence, the F.O.C is

$$-2bq_{AA} + (a - c - bq_{BA}) = 0$$

Rearrange the above equation , we have the reaction curve of firm A in Austria market,

$$\text{(reaction function of firm A in Austria market)} \quad q_{AA} = \frac{a - c - bq_{BA}}{2b} = -\frac{1}{2}q_{BA} + \frac{a - c}{2b} \quad (5.5)$$

Similarly, for firm B in Austria market,

$$(\text{reaction function of firm B in Austria market})q_{BA} = -\frac{1}{2}q_{AA} + \frac{a - c - t}{2b} \quad (5.6)$$

The transport cost can be seen as an fixed increase of marginal cost.

Combine these 2 functions together, we have

$$q_{AA} = \frac{a - c + t}{3b} \quad (5.7)$$

$$q_{BA} = \frac{a - c - 2t}{3b} \quad (5.8)$$

And therefore, we can calculate the market equilibrium price and quantity,

$$q_A^* = q_{AA} + q_{BA} = \frac{2a - 2c - t}{3b} \quad (5.9)$$

$$p_A^* = a - bq_A^* = \frac{a + 2c + t}{3} \quad (5.10)$$

Compared with the case of monopolist,

$$q_A^{\text{monopolist}} = \frac{a - c}{2b}$$

$$p_A^{\text{monopolist}} = \frac{a + c}{2}$$

Compare the monopolist equilibrium and the reciprocal dumping equilibrium

$$\Delta q_A = \frac{a - c - 2t}{6b}$$

$$\Delta p_A = -\frac{a - c - 2t}{6}$$

Since $q_{BA} = \frac{a-c-2t}{3b} \leq 0$, $\Delta q_A \leq 0$ and $\Delta p_A \leq 0$, i.e. in the case of reciprocal dumping model, we have higher production and lower price.

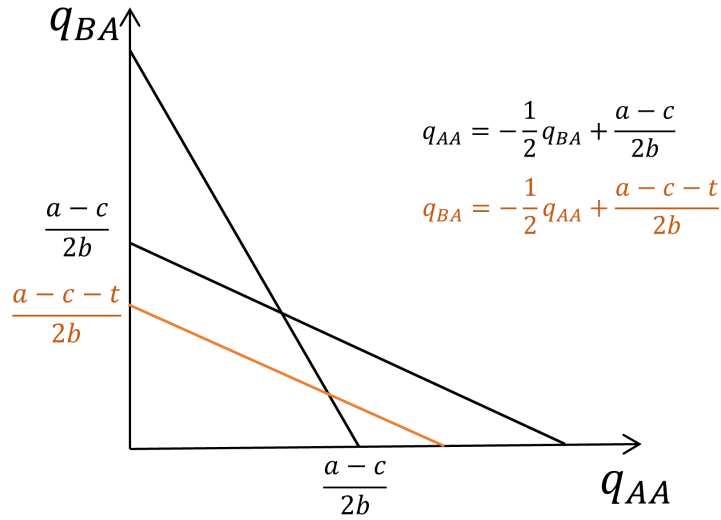


Figure 5.1: The reaction curves and the equilibrium point

1. The reaction curves of these 2 firms are shown above. The black lines describe the situation without transport fee. The horizontal and vertical intercepts are the same (i.e. $\frac{a-c}{2b}$) due to the symmetric assumption.
2. The horizontal and vertical intercepts describe the situation of monopolist market (only one firm produce, the production of the other firm is 0.)
3. If we introduce the transport fee (*only for one country. In our case, it is Bolivia*), denoted by t in the above figure, the reaction curve of Bolivia moves downwards. But the reaction curve of Austria is not effected since there are nothing related to t in the reaction curve of Austria.
4. But the intersection point of these 2 countries do affected by t .

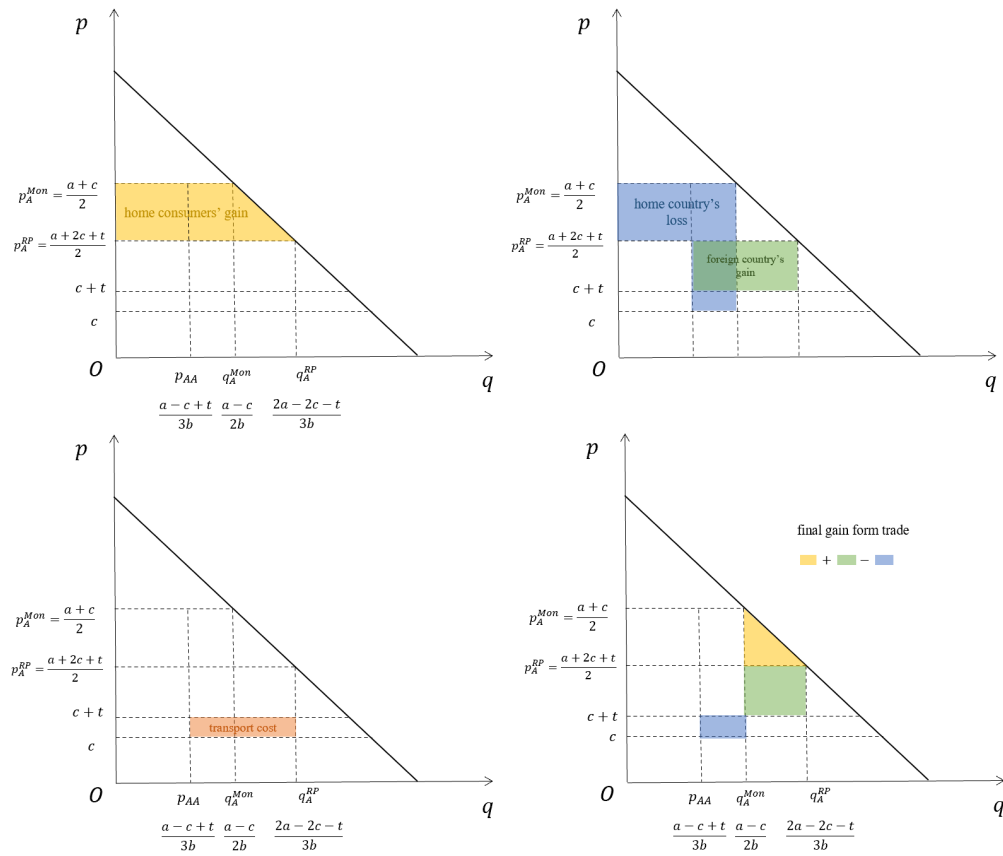


Figure 5.2: Redistribution Effect and Final Gain from Trade

5.2 The Final Gain form Trade and Transport Fee

Consider how final gain from trade will change as t (iceberg cost) increases.

To figure out the question, we can consider 2 extreme situations.

5.2.1 Case 1: $t \rightarrow 0$

$t \rightarrow 0$, then the situation is the same as classic Cournot model, i.e. both firms produce the same amount of goods. The reaction function of these 2 firms are

$$\begin{aligned} \text{(firm A)} \quad q_{AA} &= -\frac{1}{2}q_{BA} + \frac{a-c}{2b} \\ \text{(firm B)} \quad q_{BA} &= -\frac{1}{2}q_{AA} + \frac{a-c}{2b} \end{aligned}$$

Then the market equilibrium is,

$$\begin{aligned} q_{AA} &= q_{BA} = \frac{a-c}{3b} \\ q_A^{CN} &= \frac{2(a-c)}{3b} \\ p_A^{CN} &= \frac{a+2c}{3} \end{aligned}$$

Then the PS(producer surplus), CS(consumer surplus) and TS(total surplus) are

$$\begin{aligned} PS_A^{CN} &= \frac{(a-c)^2}{9b} \\ CS_A^{CN} &= \frac{4(a-c)^2}{9b} \\ TS_A^{CN} &= \frac{5(a-c)^2}{9b} \end{aligned}$$

5.2.2 Case 2: $t > \frac{a-c}{2}$ (i.e. no import, monopolist)

In this case, the market equilibrium is the monopolistic market equilibrium.

$$\begin{aligned} q_A^{monopolist} &= \frac{a-c}{2b} \\ p_A^{monopolist} &= \frac{a+c}{2} \end{aligned}$$

Then the PS(producer surplus), CS(consumer surplus) and TS(total surplus) are

$$\begin{aligned} PS^{monopolistic} &= \left(\frac{a+c}{2} - c \right) \times \frac{a-c}{2b} = \frac{(a-c)^2}{4b} \\ CS^{monopolistic} &= \left(a - \frac{a+c}{2} \right) \times \frac{a-c}{2b} = \frac{(a-c)^2}{4b} \\ TS^{monopolistic} &= PS^{monopolistic} + CS^{monopolistic} = \frac{(a-c)^2}{2b} \end{aligned}$$

The welfare in the case of $0 < t < \frac{a-c}{2}$ (i.e. Reciprocal Dumping Model)

$$TS^{RD} = \frac{7}{12b}t^2 - \frac{11a-9c}{24b}t + \frac{(2a-c)(a-c)}{24b}$$

Chapter 6

The Instruments of Trade Policy

The Learning Goals of This Chapter

1. [**Tariff**] Evaluate the costs and benefits of tariffs, their welfare effects, and winners and losers of tariff policies.
2. [**Subsidy**] Discuss what export subsidies and agricultural subsidies are, and explain how they affect trade in agriculture in the United States and the European Union.
3. [**Quota**] Evaluate the costs and benefits of quotas, their welfare effects, and winners and losers of quota policies.
4. [**Voluntary Export Restraints (VERs)**] Recognize the effect of voluntary export restraints (VERs) on both importing and exporting countries, and describe how the welfare effects of these VERs compare with tariff and quota policies.

Specific Tariff: Specific tariffs are levied as a fixed charge for each unit of goods imported.

Ad valorem tariff: Ad valorem tariffs are taxes that are levied as a fraction of the value of the imported goods.

In either case, the effect of the tariff is to raise the cost of shipping goods to a country.

The true purpose of tariff: both to provide revenue and to protect particular domestic sectors. (i.e. Corn Laws).

In the late 19th century, both the US and Germany protected their new industrial sectors by imposing tariffs on imports of manufactured goods,

Modern governments usually prefer to protect domestic industries through a variety of **non-tariff barriers**, such as **import quotas** (limitations on the quantity of imports) and **export restraints**.

For the most part, then, trade policy can be examined in a *partial equilibrium* framework.

6.1 Supply, Demand, and Trade in a Single Industry

Trade will arise in such a market if prices are different in the absence of trade. As the price of the good increases, Home consumers demand less, while Home producers supply more, so that the demand for imports declines.

As the price of the good rises, Foreign producers supply more while Foreign consumers demand less, so that the supply available for export rises.

The equilibrium world price is where Home import demand (MD curve) equals Foreign export supply (XS curve).

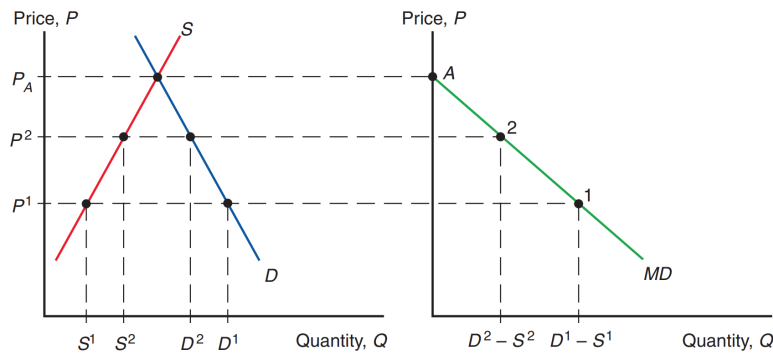


Figure 6.1: Deriving Home's Import Demand Curve



Figure 6.2: Deriving Foreign's Demand Curve

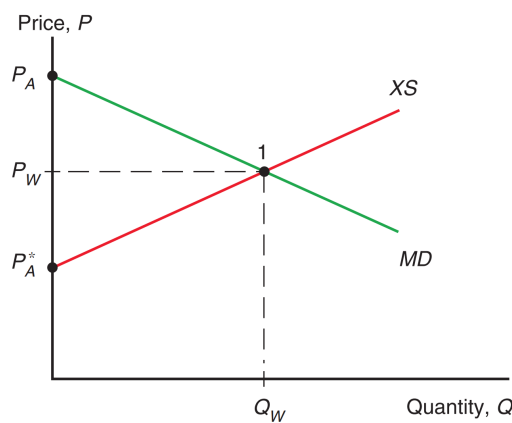


Figure 6.3: World Equilibrium

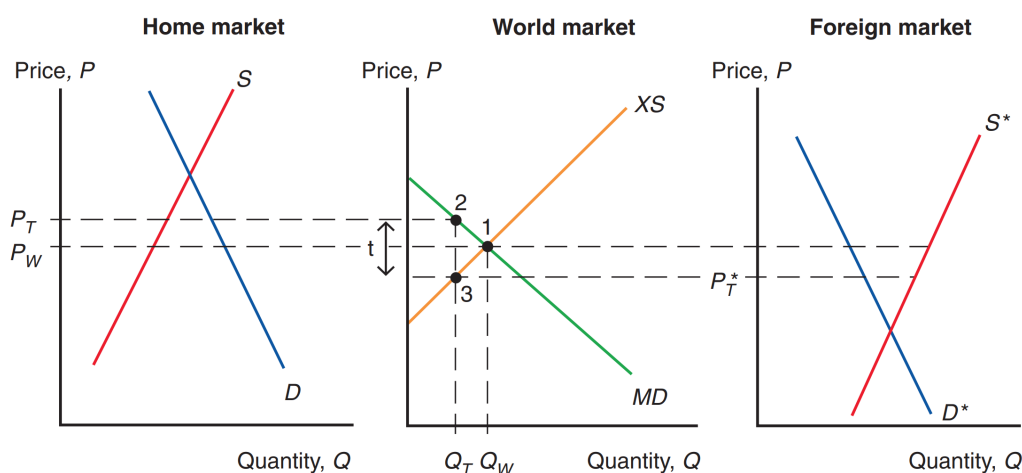


Figure 6.4: Effect of Tariff

6.2 Effects of Tariff

A tariff raises the price in Home while lowering the price in Foreign. The volume traded thus declines.

The effects of a tariff in the "small country" case where a country cannot affect foreign export prices are illustrated in the following figure.

In this case, a tariff raises the price of the imported good in the country imposing the tariff by the full amount of the tariff, from P_W to $P_W + t$.

Production of the imported good rises from S^1 to S^2 , while consumption of the good falls from D^1 to D^2 . As a result of the tariff, then, imports fall in the country imposing the tariff.

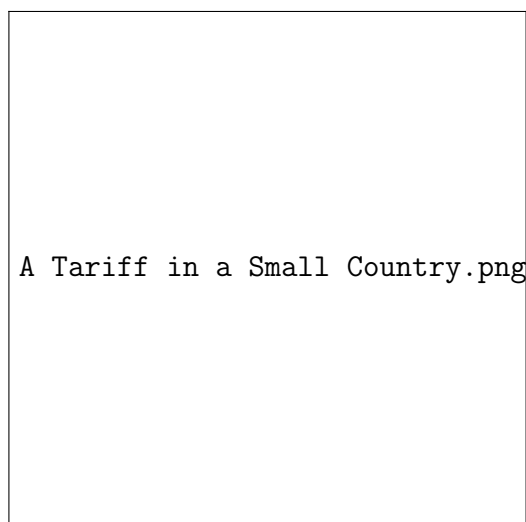


Figure 6.5: Tariff in a Small Country

6.2.1 Two Problems with trying to calculate the rate of protection

1. If the small country assumption is not a good approximation, part of the effect of a tariff will be to lower foreign export prices rather than to raise domestic prices.
2. Tariffs may have very different effects on different stages of production of a good. For example, a country imports intermediate goods and assembles them into final goods. Only the value added in the assembly process is the real value created by the industry in this country. For instance, the cost of intermediate goods are 10 and the price of the final good is 20. If we impose the tariff with rate 10% , then the effective rate of protection is

$$\frac{(22 - 10) - (20 - 10)}{20 - 10} = 20\%$$

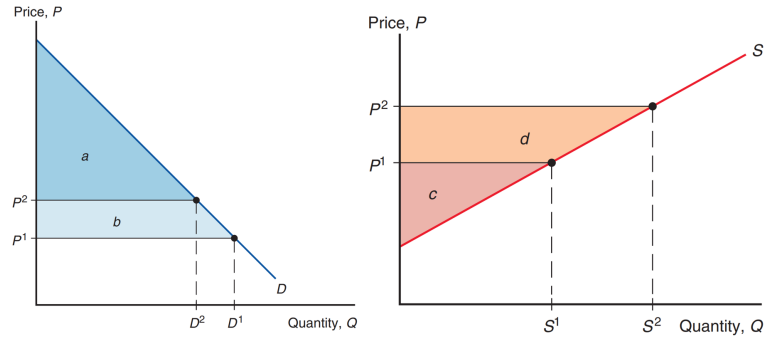


Figure 6.6: Consumer Surplus and Producer Surplus

6.2.2 The effective rate of protection

The effective rate of protection for a sector is formally defined as

$$\frac{V_T - V_W}{V_W}$$

where V_W is value added in the sector at world prices and V_T is value added in the presence of trade policies.

Suppose we impose tariff on both intermediate products and final products with tariff rates t_I and t_F respectively.

$$V_T = (1 + t_F)P_F - (1 + t_I)P_I$$

$$V_W = P_F - P_I$$

$$\frac{V_T - V_W}{V_W} = \frac{t_F P_F - t_I P_I}{P_F - P_I} = r_F + P_I \frac{t_F - t_I}{P_F - P_I}$$

The negative effects consist of the two triangles b and d .

The first triangle (triangle b) is the production distortion loss resulting from the fact that the tariff leads domestic producers to produce too much of this good.

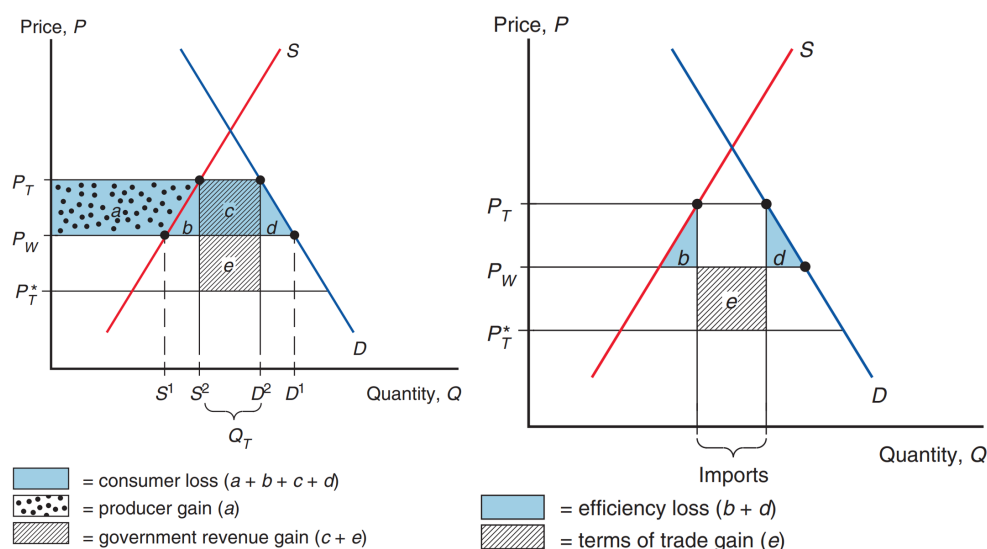


Figure 6.7: Costs and Benefits and Net effect of tariff

The second triangle (triangle d) is the domestic consumption distortion loss resulting from the fact that a tariff leads consumers to consume too little of the good.

6.3 Export Subsidy

An export subsidy is a payment to a firm or individual that ships a good abroad. An export subsidy raises prices in the exporting country while lowering them in the importing country.

6.4 Import Quota

An **import quota** is a direct restriction on the quantity of some good that may be imported.

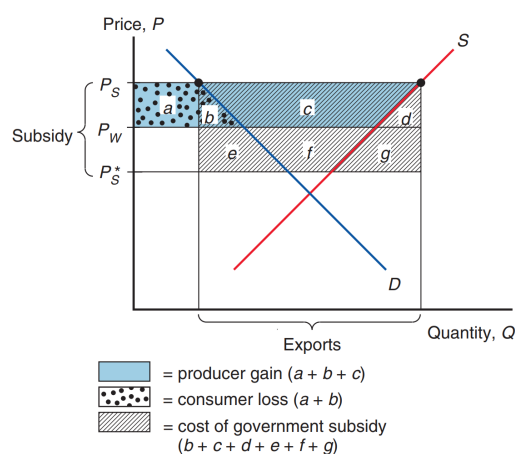


Figure 6.8: the welfare effect of export subsidy

The restriction is usually enforced by **issuing licenses** to some group of individuals or firms.

It is important to avoid having the misconception that import quotas somehow limit imports without raising domestic prices. The truth is that *an import quota always raises the domestic price of the imported good*.

The difference between a quota and a tariff is that *with a quota, the government receives no revenue*.

When a quota instead of a tariff is used to restrict imports, the sum of money that would have appeared with a tariff as government **revenue is collected by whoever receives the import licenses**. License holders are thus able to buy imports and resell them at a higher price in the domestic market.

The profits received by the holders of import licenses are known as **quota rents**.

6.5 Voluntary Export Restraints

A variant on the import quota is the **voluntary export restraint (VER)**, also known as a **voluntary restraint agreement (VRA)**.

A **VER** is a quota on trade imposed from the exporting country's side instead of the importer's. Voluntary export restraints are *generally imposed at the request of the importer and are agreed to by the exporter to forestall other trade restrictions*.

From an economic point of view, however, a voluntary export restraint is exactly like an import quota where the *licenses are assigned to foreign governments and is therefore very costly to the importing country*.

A VER is always more costly to the importing country than a tariff that limits imports by the same amount. The difference is that what would have been revenue under a tariff becomes rents earned by foreigners under the VER, so that the VER clearly produces a loss for the importing country.

6.5.1 A Voluntary Export Restraint in Practice: Japanese Autos

In 1979, however, sharp oil price increases and temporary gasoline shortages caused the U.S. market to shift abruptly toward smaller cars (i.e. Mostly are Japanese Autos).

- **Why American choose to use voluntary export restraint rather than tariff ?**

Rather than act unilaterally and **risk creating a trade war**, the U.S. government asked the Japanese government to limit its exports. The Japanese,

fearing unilateral U.S. protectionist measures if they did not do so, agreed to limit their sales.

- **The effects of this voluntary export restraint**

1. Japanese and U.S. cars were clearly not perfect substitutes.
2. The Japanese industry to some extent responded to the quota by upgrading its quality and selling larger autos with more features.
3. The auto industry is clearly not perfectly competition. The price of Japanese cars in the United States rose, with the rent captured by Japanese firms.

6.6 Other Trade Policy Instruments

1. Export credit subsidies: This is like an export subsidy except that it takes the form of a subsidized loan to the buyer.

2. National procurement: Purchases by the government or strongly regulated firms can be directed toward domestically produced goods even when these goods are more expensive than imports.

3.Red-tape barriers: Sometimes a government wants to restrict imports without doing so formally. Fortunately or unfortunately, it is easy to twist normal health, safety, and customs procedures in order to place substantial obstacles in the way of trade.

Chapter 7

Strategic Policy Model

7.1 Assumptions

1. 2 countries A and B, 1 firm in each country, producing only for the rest of the world (ROW) no consumption in country A and B.
2. Cournot Competition.
3. Linear demand $p = a - b(q_A + q_B)$
4. constant marginal cost c .
5. Country A may subsidize the export/production of firm A.

Welfare measure in countries A and B : Profits of the respective firm (possibly minus subsidy).

Welfare measure in the Row: consumer surplus.

*Note that "in the row" means "in other regions of the world".

7.2 The New New Trade Theory

Heterogeneous Firms - the Melitz Model (2003) - an Overview

7.2.1 Stylized facts

1. Most firms do not export, and also within an industry, only a small part of the firms exports.
2. Exporting firms are most productive and larger.
3. But the smaller, less productive firms do not bankrupt.

7.2.2 The Melitz Model

- Monopolistic competition with CES - utility functions.
- Firms differ by productivity.
- Firms entering the market get to know their productivity after paying the cost of market entry, **but before production**.
- There are fixed costs of entering the foreign market and iceberg trade costs.
- 2 identical countries which trade.

In equilibrium:

- Firms with very low productivity (below θ_D) do not produce. (i.e. $P_i < MC_i$)
- Firms with intermediate productivity (between θ_D and θ_X) produce for domestic market.

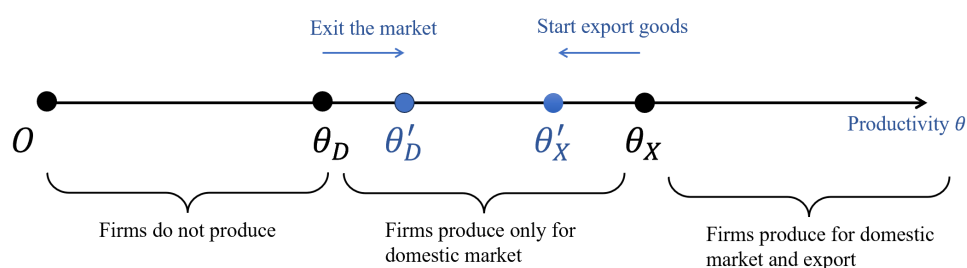


Figure 7.1: Productivity and Firms' Production Export Decision

- Firms with high productivity (above θ_X) produce for domestic market and export.

With trade liberalization, modelled by falling trade costs, θ_D **risks** and θ_X falls; e.g. low productivity firms exit market, and more firms export.

Thereby average productivity increases.

(1) Lower transport cost means the difference between domestic market and foreign cost becomes smaller. Imagine that if these 2 countries are identical, and transport cost is equal to 0, then these 2 markets can be seemed as a larger market. (2) **Why θ_X increases as the trade cost falls?**

Chapter 8

The Real World: Trade Agreements and WTO

8.1 General Agreement on Tariffs and Trade (GATT)

8.1.1 Principles and Instruments of the GATT

- **Liberalization**

- Quota: Quantitative restrictions for imports are forbidden.
- Tariff: Tariffs may not be increased above the binding negotiated tariff.
- Subsidy: Export subsidies are forbidden.

- **Non-Discrimination**

- Equal treatment of imported and domestic goods.
- Most favored national cause.

Any advantages, favor, privileges or immunity granted by any contracting party to any product originating in or destined for any other country shall be accorded immediately and unconditionally to the like product originating in or destined for the territories of all other contracting parties.

8.1.2 1944, GATT Exemption Regulations

1. The formation of **new free trade areas** and **customs unions** is allowed.
2. **Safeguard clauses** : In certain cases, e.g. in case of "market disturbances" or "unforeseen developments that seriously damage an industry" or "balance of payments-problems", **import quotas or increasing tariffs are allowed**. (**Making conditions harder to prove ban of VERs and all other "grey instruments"*)
3. **Anti-Dumping Tariffs** to confront "unfair practices" are allowed.
4. **Trade barriers** necessary to protect human, animal or plant life or health or relating to the conservation of exhaustible natural resources are allowed.
5. Broadening of **exemptions for development countries** (1965), in particular exemptions of **MFN** (Most Favored Nation) and of the principle of **reciprocity**.

8.2 General Agreement on Trade in Services (GATS)

- Applies to all services and both cross-boarder or affiliates.

- Non-Discrimination: MFN (most favored nation); national treatment.
- Ban of certain barriers to market entry.
- Sector specific agreements.

no fundamental liberalization yet, but a start.

8.3 Trade Related Aspects of Intellectual Property Right (TRIPS)

Each country is obligated to **have a law** to protect intellectual property rights with "**minimum standards**" (including administration and jurisdiction)

8.4 World Trade Organization (WTO)

Uruguay -Round of the GATT - Establishment of WTO (World Trade Organization). [established in 1995]

8.4.1 2001

1. In case of emergency (e.g. an epidemic), countries may grant compulsory licenses. *Also relevant for a medicine or the vaccination for COVID-19.*
2. 23 (rich) countries declare that they will not accept "grey or parallel imports", enabling firms to price discriminate and sell pharmaceuticals at lower prices in developing countries without having to lower the price in industrial countries.

8.4.2 2008

Most important controversial issues:

1. Trade in agricultural goods, reduction of (export) subsidies.
2. Further market access and tariff cuts for manufactures in emerging markets (China, India)

Problems 1. Negotiations have more complex, as the crucial issues are no more tariff cuts for manufactures of industrial countries, as until 1980.

-Further market access and tariff cuts for manufactures in emerging markets (China, India)

2. Ongoing integration beyond the multilateral negotiations in the WTO.
 - unilateral liberalization (Problem of non-crediting in the negotiations.)
 - Increasing regional integration.

8.4.3 2013, Bali Package

1. **Free market access** to emerging and industrial countries for poorest countries.
2. **Reduction of subsidies in agriculture** (food security programs; important for India)
3. **Cotton:** notice of intention : The US is the only industry country producing cotton, they heavily subsidize, and the other cotton producers call for a reduction of subsidies.

8.4.4 2022, Geneva Package

1. **Package on WTO response to Emergencies**

- Declaration on the emergency response to food security.
- Prohibit restrictions to sell food to the World Food Program.
- Partial waiver for patents for COVID-19 vaccines for 5 years (not for all COVID-19 related treatments and diagnostics).

2. Agreement on Fishery Subsidies

3. Extension of the moratorium (existing since 1998) **on e-commerce tariffs** (as music streaming and financial transactions)

8.5 Dispute Settlement Mechanism

1. In the first years, in particular EU and US were involved, later China and other emerging countries.
2. For each case, a panel (of judges) is formed. Strict deadlines for different steps.
3. The DSM (dispute settlement mechanism) was considered to be quite successful, BUT
 - Appellate body: 7 members, a group of 3 for one case.
 - Since 2017, the US blocks the appointment of new judges for the Appellate body.
 - Since Dec. 2019, only one member is left (meanwhile none), and the dispute settlement does not function anymore.
 - US wants to renegotiate the DSM.

8.6 Multiparty Interim Appeal Arbitration (MPIA) 2020.03

- The European Union and 15 other WTO members agreed to a Multiparty Interim Appeal Arrangement (MPIA).
- The created an alternative appellate body while the official WTO body is not functional.
- It mirrors the usual WTO appeal rules and can be voluntarily used between any WTO members to resolve disputes.

8.7 Japan-EU Free Trade Agreement (JEFTA)

The EPA is **the largest bilateral free trade agreement of the EU**, covering 30 percent of world' gross domestic product (GDP) and 40 percent of global trade.

8.8 Trans-Pacific Partnership (TPP)

Trade agreement signed 2016, between Australia, Brunei, Canada, Chile, Japan, Malaysia, New Zealand, Peru, Singapore, Vietnam - and until 2017 US.

TPP came into force in 2018.

8.9 Regional Comprehensive Economic Partnership (RCEP)

- Trade agreement between Asia-Pacific nations.

*Australia, Brunei, Cambodia, China, Indonesia, Japan, South Korea, Laos, Malaysia, Myanmar, New Zealand, the Philippines, Singapore, Thailand and Vietnam.

- signed November 2020, in force since 1.1.2022 for the ten countries which have ratified.
- (meanwhile all but Philippines)
-
- India negotiated in both agreements, but withdrew.

8.10 The US- China Trade War

2018.02 US impose tariff on solar panels and washing machines (mainly imported from China.)

2018.03 US impose tariffs on steel and aluminum imports referring to GATT Art. XXI (national security) This leads to retaliation tariffs of the EU on US-produced products like peanut butter, jeans, Bourbon Whiskey, orange juice and motorbikes.

2018.04 China imposes tariffs on 128 products which is imported from the US. This action lead to a "trade war" between the US and China. (Renegotiation of NAFTA → USMCA.)

NAFTA : north America free trade agreement.

USMCA: The US-Mexico-Canada Agreement.

2019.05 Ban of Huawei (→ Google stops cooperation with Huawei)

Catchword: "Forced transfer of intellectual Property rights by China".

2021 agreements between EU and US to abolish tariffs again; tariff-quota- regime for steel.