MAECO-502

International Economics –I

MA ECONOMICS

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INTERNATIONAL ECONOMICS - I

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SYLLABI-BOOK MAPPING TABLE

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INTERNATIONAL ECONOMICS

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INTRODUCTION OF BOOK

International economics relates to study of economics inclusive of the foreign sector. The domestic conditions of an economy are shaped by the economic interrelationship between countries. In other words, we can say that international economics deals with the economic activities of various countries and their consequences. Thus, the students of economics should have in-depth understanding about the international economic.

The book is divided into ten units, namely: 1. Comparative Cost and Opportunity Cost Models, 2. Trade, Factor Endowments and Factor Price, 3. Terms of Trade, 4. Tariff, 5. Trade and Economic Growth, 6.Balance of Payment, 7. Foreign Exchange Market, 8. Theory of Regional Blocks, 9. International Trade and Monetary Order, 10. Problems of Policy in an Open Economy.

The principle of comparative advantage has been the basis of international trade for over a century. When a country enters into trade with some other country, it will export those commodities in which its comparative costs of production are less, and will import those commodities in which its comparative costs of production are high. In the first unit, the book discusses Ricardo’s theory of international trade. The modified Ricardian model; on the basis of rectification of its drawbacks; Haberler's Opportunity Cost is undertaken.

The importance and impacts of factor endowment and factor price on trade and intensity is discussed in the second unit. This unit examines understands Leontief Paradox, Stolper-Samuelson Theorem: Factor Price Equalization Theorem and International Trade and Imperfect Competition.

The Terms of Trade is the ratio of export price to imports. By understanding the concept of Terms of Trade, we can easily calculate whether the terms of trade between the countries is favourable or unfavourable. Thus, in the third unit, we have discussed Terms of Trade comprehensively.

In fourth unit learners are expected to acquaint themselves with tariff, the argument fore and against it, along with the impact of tariff(both under partial and general equilibrium framework). The learner is also introduced with the concept of game theory and its applicability pertaining to the tariff.

The reader will learn about the relaxation in the assumption of factor constancy and its subsequent outcomes in the fifth unit. The Ryvczynski Theorem, Stolper-Samuelson theorem, immiserizing growth and finally technical changes have discussed in this unit.

A Balance of Payment Account is a systematic record of all economic transactions between residents of a country and the rest of the world carried out in a specific period. The sixth unit discussed about the meaning, component and importance of the Balance of Payment.

The foreign exchange market is the market in which domestic currencies are exchanged for foreign currency. The buyers and sellers include individuals, firms, foreign exchange brokers, commercial banks and the central bank. The transactions in this market are not confined to only one or a few foreign currencies. In fact, there are a large number of foreign currencies which are traded, converted and exchanged in the foreign exchange market. Thus, in the seventh unit book gives deliberation about the meaning of foreign exchange market, the concept of fixed and floating exchange rate, its advantage and disadvantages, how exchange rate is determined under purchasing power parity and interest rate parity and the concept of interest arbitrage, hedging, premium and discount.

In unit eight the meaning and concept of Regional Block, the stages of regional integration, meaning of trade creation and trade diversion elaborately discussed. Further, the concept of custom union and the common market is discussed.

A student of economics should know about the term international trade and the monetary order. Therefore, international trade and the monetary order are comprehensively discussed in unit nine.

Finally, in unit tenth book has discussed about the problems and policy of an open economy.

We hope that the students will find it easy to understand and helpful for institutional examination and also for competitive examination.

UNIT- I
COMPARATIVE COST AND OPPORTUNITY COST MODELS

Structure

1.0 Introduction

1.1 Objectives

1.2 Ricardo's Model of Comparative Advantages

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1.0 Introduction

Due to differences in climate, natural resources, geographical situation and efficiency of labour, a country can produce one commodity at a lower cost than the other because of these comparative advantages. When a country enters into trade with some other country, it

will export those commodities in which its comparative production costs are less, and will import those commodities in which its comparative production costs are high. The principle of comparative advantage has been the basis of international trade for over a century till the First World War. This is the basic of the Ricardian theory. The theory has been elaborated and modified by economists like J.S. Mill, Alfred Marshall and Taussig in regard of more than two countries and more than two commodities. Haberler also used the concept of opportunity cost of a commodity to explain the law of comparative advantage. The existence of comparative advantage in costs of production is the principal cause of emergence of international trade. It may be assumed that the opportunity cost is subject to constant cost, increasing cost and decreasing cost explaining with the help of production possibility curve.

1.1 Objectives

- To understand the Ricardo's theory of international trade in view of comparative advantages.
- To find out the modified Ricardian model on the basis of rectification of the drawbacks of Ricardo's theory of international trade.
- To know Haberler's Opportunity Cost Theory with the help of Production possibility curves.
- To define the trade under increasing, decreasing and constant cost conditions.

1.2 Ricardo's Model of Comparative Advantages

According to David Ricardo, it is not only the absolute but the comparative differences in costs that determine trade relations between two countries. Production costs differ in countries because of geographical division of labour and specialisation in production. Due to differences in climate, natural resources, geographical situation and efficiency of labour, a country can produce one commodity at a lower cost than the other because of these comparative advantages. In this way, each country specialises in the production of that commodity in which its comparative cost of production is the least. Therefore, when a country enters into trade with some other country, it will export those commodities in which its comparative production costs are less, and will import those commodities in which its comparative production costs are high. According to Ricardo, this

is the basis of international trade. It follows that each country will specialise in the production of those commodities in which it has the greatest comparative advantage or the least comparative disadvantage. Thus, a country will export those commodities in which its comparative advantage is the greatest and import those commodities in which its comparative disadvantage is the least.

Assumptions

The Ricardian theory of comparative advantage is based on the following assumptions:

1. There are only two countries, say England and Portugal.
2. They produce the same two commodities say, wine and cloth.
3. There are similar tastes in both countries.
4. Labour is the only factor of production.
5. The supply of labour is unchanged.
6. All units of labour are homogeneous.
7. Prices of two commodities are determined by labour cost, i.e, the number of labour-units employed to produce each.
8. Commodities are produced under the law of constant costs or returns.
9. Technological knowledge is unchanged.
10. Trade between the two countries takes place on the basis of the barter system.
11. Factors of production are perfectly mobile within each country, but are perfectly immobile between countries.
12. There is free trade between the two countries, there being no trade barriers or restrictions in the movement of commodities.
13. No transport costs are involved in carrying trade between the two countries.
14. All factors of production are fully employed in both the countries.
15. The international market is perfect so that the exchange ratio for the two commodities is the same.

1.2.1 Explanation of the Theory

Given these assumptions, Ricardo shows that trade is possible between two countries even when one country has an absolute advantage in the production of both commodities, but

the country has a comparative advantage in the production of one commodity than in the other. This is illustrated in terms of Ricardo's well-known example of trade between England and Portugal as shown in table 1.1.

Table 1.1: Labour Required For Producing One Unit

Country	Wine	Cloth
England	120	100
Portugal	80	90

The table 1.1 shows the production of a unit of wine in England requires 120 men for a year, while a unit of cloth requires 100 men for the same period. On the other hand, the production of the same quantities of wine and cloth in Portugal requires 80 and 90 men respectively. Thus, England uses more labour than Portugal in producing both wine and cloth. In other words, the Portuguese labour is more efficient than the English labour in producing both the products. So Portugal possesses an absolute advantage in both wine and cloth. But Portugal would benefit more by producing wine and exporting it to England because it possesses greater comparative advantage in it. This is because the cost of production of wine (80/120 men) is less than the cost of production of cloth (90/100 men). On the other hand, it is in England's interest to specialise in the production of cloth in which it has the least comparative disadvantage. This is because the cost of production of cloth in England in less (100/90 men) as compared with wine (120/80 men). Thus, trade is beneficial for both the countries. The comparative advantage position of both is illustrated in fig. 1.1 in terms of production possibility curves.

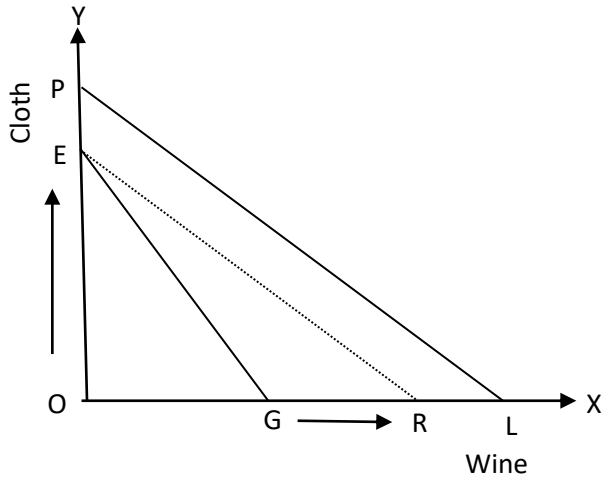

Fig. 1.1

PL is the production possibility curve of Portugal, and EG that of England. Portugal enjoys an absolute advantage in the production of both wine and cloth over England. It produces OL of wine and OP of cloth, as against OG of wine and OE of cloth produced by England. But the slope of ER (parallel to PL) reveals that Portugal has a greater comparative advantage in the production of wine because if it gives up the resources required to produce OE of cloth, it can produce OR of wine which is greater than OG of wine of England. On other hand England had the least comparative disadvantage in the production of OE of cloth. Thus, Portugal will export OR of wine to England in exchange for OE of cloth from her.

1.2.2 Gains from Trade and their Distribution

Ricardo does not discuss the actual ratio at which wine and cloth would exchange and how much the two countries gain from trade. Before trade, the domestic trade ratios in the two countries for wine and cloth are shown in Table 1.2. The cost of production of one unit of wine in England is 120 men and that of producing one unit of cloth is 100 men. It shows that the cost of producing wine is more as against cloth because one unit of wine can exchange for 1.2 units of cloth. On the other hand, the cost of producing one unit of wine in Portugal is 80 men and that of producing one unit of cloth is 90 men. It is clear that the cost of producing cloth is more than that of wine because one unit of wine can exchange for 0.89 unit of cloth. Suppose trade begins between the two countries. England will gain if it imports one unit of wine from Portugal in exchange for less than 1.2 units of cloth. Portugal will also gain if it imports more than 0.89 units of cloth from England in exchange for 1 unit of wine.

Table 1.2: Domestic Exchange Ratios

England	Portugal
Wine 120: 100 Cloth (6/5) 1: 1.2 Cloth 100: 120 Wine(5/6) 1: 0.83	Wine 80 : 90 Cloth (8/9) 1: 0. 89 Cloth 90: 80 Wine (9/8) 1: 1.125

The table shows that the domestic exchange ratio in England is one unit of cloth= 0.83 units of wine, and in Portugal one unit of wine= 0.89 unit of cloth. If we assume the exchange ratio between the two countries to be 1 unit of cloth = 1 unit of wine, England would gain 0.17 (1-0.83) unit of wine by exporting one unit of cloth to Portugal. Similarly, the gain to Portugal by exporting one unit of wine to England will be 0.11(1- 0.89) unit of cloth. Thus, trade is beneficial for both countries.

The gains from trade and their distribution are shown in Figure 1.2 where the line C_1 W_2 depicts the domestic exchange ratio 1 unit of cloth= 0.83 unit of wine of England, and the line W_1 C_2 that of Portugal at the domestic exchange ratio 1 unit of wine= 0.89 unit of cloth. The line C_1 W_1 shows the exchange rate of trade of 1 unit of cloth=1 unit of wine between the two countries. At this exchange rate England gains W_2W_1 (0.17 unit) of wine, while Portugal gains C_2 C_1 (0.11 unit) of cloth.

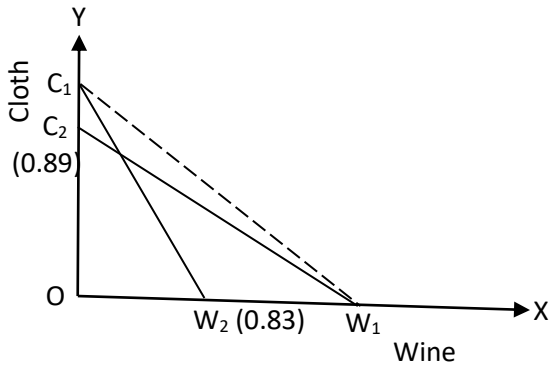

Fig. 1.2

Thus, both England and Portugal specialise in the production of one commodity on the basis of comparative costs. Each reallocates its factors accordingly and exports that commodity in which it has comparative advantage and imports that commodity in which it has a comparative disadvantage. Both gain through trade and can increase the consumption of the two commodities.

1.2.3 Criticisms

The principle of comparative advantage has been the basis of international trade for over a century till the First World War. Since then the critics have been able only to modify

and amplify the theory. In particular, it has been several times criticised by Bertin Ohlin and Frank D. Graham. We discuss here some of the important criticisms given below:

1. **Unrealistic Assumption of Labour Cost:** The most severe criticism of the comparative advantage doctrine is that it is based on the labour theory of value. In calculating production costs, it takes only labour costs and neglects non-labour costs involved in the production of commodities. This is highly unrealistic because it is money costs and not labour costs that are the basis of national and international transactions of goods. Further, the labour cost theory is based on the assumption of homogeneous labour. This is again unrealistic because labour is heterogeneous of different kinds and grades, some specific or specialized, and other non-specific or general.

2. **No Similar Tastes:** The assumption of similar tastes is unrealistic because tastes differ with different income brackets in a country. Moreover, they also change with the growth on an economy and with the development of its trade relations with other countries.

3. **Assumption of Fixed Proportions:** The theory of comparative costs is based on the assumption that labour is used in the same fixed proportions in the production of all commodities. This is essentially a static analysis and hence unrealistic. As a matter of fact, labour is used in varying proportions in the production of commodities. For instance, less labour is used per unit of capital in the production of textiles. Moreover, some substitution of labour for capital is always possible in production.

4. **Unrealistic Assumption of Constant Costs:** The theory is based on another weak assumption that an increase of output due to international specialisations if followed by constant costs. If the large-scale of production reduces costs, the comparative advantage will be increased. On the other hand, if increased output is the result of increased cost of production, the comparative advantage will be reduced, and in some cases it may even disappear.

5. **Ignores Transport Costs:** Ricardo ignores transport costs in determining comparative advantage in trade. This is highly unrealistic because transport costs play

an important role in determining the pattern of world trade. Like economies of scale, it is an independent factor of production. For instance, high transport costs may nullify the comparative advantage and the gain from international trade.

6. **Mobility of Factor:** The doctrine assumes that factors of production are perfectly mobile internally and wholly immobile internationally. This is not realistic because even within a country factors do not move freely from one industry to another or from one region to another. The greater the degree of specialisation in an industry, the less is the factor mobility from one industry to another. Thus, factor mobility influences costs and hence the pattern of international trade.

7. **Two-Country two- Commodity Model**: The Ricardian model is related to trade between two countries on the basis of two commodities. This is again unrealistic because in actuality, international trade is among many countries trading in many commodities.

8. **Unrealistic Assumption of Free Trade:** Another serious weakness of the doctrine is that it assumes perfect and free world trade. But in reality, world trade is not free. Every country applies restrictions on the free movement of goods to and from other countries. Thus, tariffs and other trade restrictions affect world imports and exports. Moreover, products are not homogeneous but differentiated. By neglecting these aspects, the Ricardian theory becomes unrealistic.

9. **Unrealistic Assumptions of Full Employment:** Like all classical theories, the theory of comparative advantage is based on the assumption of full employment. This assumption also makes the theory static. Keynes falsified the assumption of full employment and proved the existence of under-employment in an economy. Thus, the assumption of full employment makes the theory unrealistic.

10. **Self-Interest Hinders its Operation:** The doctrine does not operate if a country having a comparative disadvantage does not wish to import a commodity from the other country due to strategic, military or development considerations. Thus, often self-interest stands in the operation of the theory of comparative costs.

11. **Neglects the Role of Technology:** The theory neglects the role of technological innovation in international trade. This is unrealistic because technological changes help in increasing the supply of goods not only for the domestic market but also for international market. World trade has gained much from innovations and research and development.

12. **One–Sided Theory:** The Ricardian theory is one–sided because it considers only the supply side of international trade and neglects the demand side. Prof. Ohlin opined, "it is indeed nothing more than an abbreviated acccount of the conditions of supply."

13. **Impossibility of Complete Specialization:** Prof. Frank Graham has pointed out that complete specialisaton will be impossible on the basis of comparative advantage in producing commodities entering into international trade. He explains two cases in support of his argument: one, relating to a big country and a small county; and two, relating to a commodity of high value and low value.

Conclusion: Despite of the above criticisms, the theory has most important glimpse of truth. The theory has given many clues to develop the other theory of international trade.

Check Your Progress

1. Define Ricardo's Model of comparative advantages.
2. What do you mean by gains from trade?
3. What are the drawbacks of Ricardo's Model of comparative advantages?

1.3 Modified Ricardian Theory (Elaboration and Refinement)

The Ricardian theory of comparative costs was based on a number of simplifying assumptions. This, however, does not mean that the theory is valid only under the assumptions upon which it was originally formulated; the relaxation of the simplifications does not invalidate the law of comparative advantage. The theory has been elaborated and modified by economists like J.S. Mill, Alfred Marshall and Taussig.

Introduction of Money

One of the major criticisms of the comparative cost theory is that it expresses production cost in real terms and not in money terms. But as Haberler states, in a modern economy,… "goods are not exchanged directly against other goods, but goods are bought with money. People do not think of the exchange relations between goods in *natura* but money prices. The flow of international trade is determined directly by absolute differences in money prices and not by comparative differences in labour cost". To make the theory more realistic, labour cost should, therefore, be transformed into money price. The translation of comparative differences in cost into absolute differences in price in no way alters the real exchange relations between commodities which lie behind the money prices.

To illustrate the refinement of the comparative cost theory with introduction of money, let us take the hypothetical example of labour costs of wine and cloth in Portugal and England and assume that the wage per unit of labour is $1 in England and $1.3 in Portugal. Then, the price per unit of cloth will be $100 in England and $117 in Portugal and the price per unit of wine will be $120 in England $104 in Portugal (see Table 1.3). Therefore, England will import wine from Portugal instead of producing it at home at a higher cost. Similarly, Portugal will import cloth from England instead of producing it at a higher cost.

Table 1.3: Comparative Money Costs

County	No. of Units of labour required for one unit of		Wage per unit of labour ($)	Price per Unit of	
	Cloth	wine		Cloth ($)	wine ($)
Enland	100	120	1.00	100.00	120.00
Portugal	90	80	1.30	117	104.00

The above table clearly shows that the discarding of labour cost and the introduction of money does not invalidate the comparative cost theory. It should, however, be noted that if wages rise or fall below certain limits, it will distort the trade pattern. For example, while the

money wage remains stable in England, if it rises above $1.5 in Portugal, the price of wine will exceed $120 (the price in England) and, therefore, England will not import wine from Portugal. Similarly, a rise in wages beyond a certain level in England will make the English cloth more expensive than the Portuguese. A fall in the wage in a county beyond a certain limit will cause a similar situation. For example, if the wage level remains stable in England and if it falls to less than $1.11 in Portugal, English cloth will no longer be cheaper than that produced in Portugal.

1.3.1 Introduction of Transfer Costs

The Ricardian theory assumed that the transfer of goods between countries does not involve any cost. Quite obviously, certain transfer costs like the cost of transport are involved in international trade. It is not difficult to introduce the costs of transfer to the comparative cost theory. The introduction of transfer costs, however, decreases the extent of the international division of labour, because if the cost of transfer of a commodity is more than the difference in the costs of production between two countries, it will not be traded between them. For instance, with reference to our previous example, if the cost of the transfer of wine from Portugal to England is more than $16 per unit, England is not likely to import wine from Portugal because the landed cost of Portuguese wine in England will be more than $ 120 (which is the price of the domestic wine.)

In the absence of transfer costs, the condition for the establishment of trade between country A and B is that $X_a/X_b<Y_a/Y_b$ where Xa and Ya denote the number of units of the commodities X and Y which one unit of labour can produce in county A. X_b and Yb denote the number of units of the commodities X and Y which one unit of labour can produce in county B. Introduction of transfer costs requires the fulfillment of two more conditions for the establishment of trade, viz. $X_a/X_b^1 <Y_a/Y_b$ and $X_a/ X_b<Y_a^1<Ya^1/ Y_b$ where X_b^1 denotes the number of units of commodity X which can be produced and transferred to A with one unit of labour in B, and Y_a^1 denotes the number of unit of commodity Y which can be produced and transported to B with one unit of labour in A.

1.3.2 More than Two commodities

Though Ricardo considered only two commodities, the theory can be applied to cases in which not merely two commodities but any number of goods is produced in the two

countries. If Countries I and II exchange a number of commodities between them, according to the doctrine of comparative cost differences, Country I must be enjoying a comparative advantage over Country II in all its export commodities relatively to all its import commodities. Similarly, Country II must be enjoying a comparative advantage over Country I in all its export commodities relatively to all its import commodities.

To get an idea of which commodities a country exports and imports, we may arrange various goods in order of the comparative advantage of Country I over Country II, so that if we call them a,b,c,d,e,….$a_1/a_2 < b_1/b_2 < c_1/c_2 < d_1/d_2 < e_1/e_2$ … Country I will export commodities on the left side and import commodities on the right side. County II, On the other hand, specialises in the production of commodities on the right side and imports those on the left side. It is not possible that Country I exports a, b, d and imports c. If it imports c, it must necessarily be importing d (assuming, of course, that d has a demand in Country I).

Relying only on the cost data, we cannot determine the exact position of this dividing line. We can say only that it must be drawn in such a manner that Country I enjoys a comparative advantage in every commodity it exports relatively to every commodity it imports. The dividing line will be at a position at which the balance of payments will be in equilibrium. The point at which the balance of payments will be in equilibrium and determined by the reciprocal demand of the two countries for each other's product. An examination of Table 1.4 will make the meaning of the algebraic expression clear.

Table 1.4: Production Costs of Goods in two Countries

Kinds of Goods		A	B	C	D	E	F	G	H	I	J	K	L
Real cost per unit, expressed in units of labour	In country 1* ($a_1, b_1, c_1, \ldots$)	30	30	30	30	30	30	30	30	30	30	30	30
	In country II ($a_2, b_2, c_2, ..$)	55	50	46	40	32	30	27	25	20	15	12	10

*In this example, the units of quantity of various commodities are chosen in such a way that the cost per unit of every commodity in Country I is the same. Hence, the number of units of labour per unit of every commodity is equal (30).

If we assume that money wages are the same in both the countries, we can easily say which goods will be exported and which will be imported. Country I will export goods A to E and County II will export goods L to G. It depends upon the reciprocal demand whether or not this situation maintains equilibrium in balance of payments.

1.3.3 More than Two Countries

Though the Ricardian model consists of two countries only, the theory is equally applicable to a situation in which more than two countries participate. Each country will specialise in the commodity or commodities in the production of which it has comparative advantage over the other and import from other countries goods which can be produced domestically only at a comparative disadvantage.

A country may import a commodity from more than one country just as it may export a commodity to more than one country. Assume that the international price of commodity X is $ 100 per unit. Now, all countries who can produce at a cost of less than $100 per unit, can export X. However, the gains to the different exporting countries may vary. The country with the least production cost will gain the maximum (per unit of export) and vice versa. All countries with costs of production of over $ 100 per unit of X will gain by importing it rather than producing domestically at a higher cost. The extent of gain from import also may vary between the various importing countries. The gain (per unit) will be the maximum for the importing country with the highest domestic cost of production of X and vice versa.

Variable Costs of Production

Ricardo assumed a constant cost of production. The removal of the assumption of constant costs and the introduction of variable costs do not, however, change the substance of the comparative cost theory. It should, however, be noted that although the consideration of conditions of increasing costs calls for no basic modification of the theory, production under conditions of increasing costs does prevent international specialisation from developing, consequently reducing the potential gains from trade. Production under conditions of decreasing costs, on the other hand, tends to widen national costs differentials and also the limits of the terms of trade.

Non-Competing Groups

The Ricardian theory assumed that labour in each country is homogeneous and perfectly mobile within the country. But as a matter of fact, labour force in any county consists of many different groups, i.e., the technical, skilled, semi-skilled and unskilled, and mobility between these groups is far from perfect. These distinct categories of labour with rather well marked and enduring differences in wages are known as "non-competing" groups.

The mere existence of such groups would not affect the theory of international trade, provided that in each country the relative scale of wages was the same. But the relative scale of wages differs between countries due to factors like the relative abundance or scarcity of certain categories of labour, and this affects the pattern of trade. For instance, abnormally low wages for a particular category of labour in a country enables it to produce some commodity or commodities at a lower money cost than its competitors, even though it has no comparative advantage. The existence of non-competing groups within a country affects international trade only when the situation thus engendered is peculiar to that country.

Capital Charges

Taussig has pointed out that interest charges influence international trade when different quantities of capital are used in the production of different commodities. Hence, like non-competing groups of labour, interest charges may also affect the cost of production and pattern of trade. A low rate of interest tends to give a country a comparative advantage for those goods which are made with much capital; these tend to be exported from it. A high rate of interest correspondingly is a handicap on the export of these same goods and a stimulus to their import. However, high or low interest does not in itself act as an independent factor; it exercises an influence only so far as it enters to a greater degree in one commodity than in another. The conclusion is of the same sort as that reached with regard to non-competing groups and differences of wages.

Check Your Progress

1. Explain the modified Ricardian theory.
2. Why is modified Ricardian theory superior to Ricardian theory?
3. Define introduction of transfer costs in modified Ricardian theory.

1.4 Haberler's Opportunity Cost Theory

Opportunity cost of a commodity is defined as the amount of a second commodity that must be given up to release just enough resources to produce one additional unit of the first. Haberler used this concept to explain the law of comparative advantage. In this form, this law is referred to as the law of comparative cost. Consequently, the nation with the lower opportunity cost is said to have a comparative advantage in the production of that commodity and comparative disadvantage in the production of other commodity.

The existence of comparative advantage in costs of production is the principal cause of emergence of international trade. Ricardo has given an example of trade between England and Portugal shown in Table 1.5.

Table 1.5

Nations	One day of Labour	
	Units of Wine	Units of Cloth
England	60	80
Portugal	150	100

From the above table, it is clear that Portuguese labour is more efficient than English lobour in the production of wine as well as cloth. So Portugal has an absolute advantage in the production of wine and cloth.

The trade between England and Portugal can also be demonstrated by introducing the concept of opportunity cost. Table 1.6 gives the opportunity costs for producing wine and cloth in the two nations calculated on the basis of information given in Table 1.5.

Table 1.6

	Opportunity Costs for	
Nations	Wine	Cloth
England	60/80=3/4	80/60= 4/3
Portugal	150/100= 3/2	100/150= 2/3

This table shows that

In England, 1 unit of cloth = 3/4 units of wine. (Domestic exchange ratio of England)

In Portugal, 1 unit of wine= 2/3 units of cloth. (Domestic Exchange Ratio of Portugal)

Here, England has the lower opportunity cost of the two nations in producing cloth and Portugal has lower opportunity cost in producing wine. Thus, England has comparative advantage in producing cloth and Portugal has comparative advantage in producing wine. As long as the opportunity cost of production for a good differs in the two nations. One nation has a comparative advantage in the producing of one of the two goods, while the other nation has a comparative advantage in the production of the other good.

England will gain from trade if it can get more than 3/4 units of wine by exporting 1 unit of cloth. Likewise, Portugal gains from trade if it gets more than 2/3 unit of cloth by exporting 1 unit of wine. England gains from export so long it exports 80 units of cloth for more than 60 unit of wine. While Portugal gain if it gets 80 units of cloth for less than 120 units of wine.

Trade between two countries does not take place in case of equal cost differences. In this case, the opportunity cost of producing the two commodities is the same in both the countries. So, the production possibility curves will coincide with no possibility of gain from trade to either country. Here, the absolute advantage (or disadvantage) of each country with respect to the other is the same for both the commodities. Table 1.7 shows such situation. In this situation, the labour in county ‘A’ as well ‘B’ is twice as productive in commodity ‘X’ in comparison to production of commodity ‘Y’. As the internal cost and comparative cost are same in both the countries and there are no price differences, no mutually beneficial trade can take place.

Table 1.7

Commodities Countries	X	Y	Opportunity Cost Ratio
A	10	5	2:1
B	12	6	2:1

PRODUCTION POSSIBILITY CURVE

The production possibility curve (PPC) represents all the alternative combinations of two commodities that a nation can produce by fully utilizing all its factors of production. In other words, the production possibility curve shows the frontier beyond which production cannot be carried on with the available resources and technology.

Figure 1.3 depicts the production frontier of country A. With a given amount of productive resources, it can produce either 10 units of cloth (if it employs all resources in cloth production) or 20 units of wine (if all resources are used in wine production). Alternatively, it can have a combination of cloth and wine if resources are allocated for both. For example, it may have eight units of cloth and four units of wine, or six units of cloth and eight units of wine. If it reduces the output of cloth by one unit, it can increase the output of wine by two units because with the resources required to produce one unit of cloth, two units of wine can be produced.

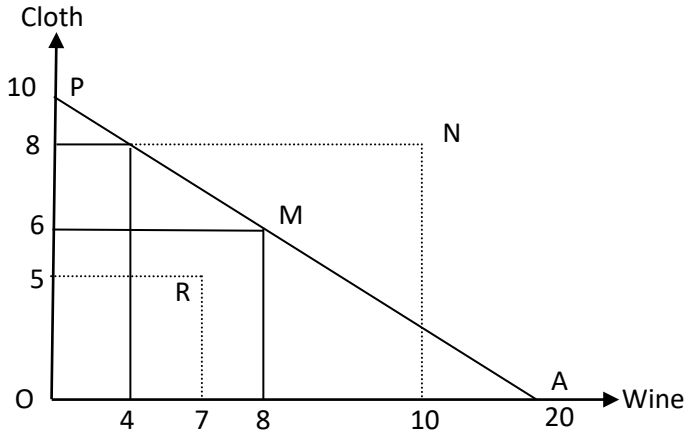

Fig. 1.3: PPC under Constant Costs

In short, any point on the production possibility curve (PPA) shows the combination of cloth and wine output when the productive resources are fully employed and allocated between cloth and wine in a certain production.

Any point above the PA line is beyond reach with the particular quantum of resources. For example, point N indicates a combination of eight units of cloth and ten units of wine which is impossible to obtain with the available resources. Again, when eight units of

cloth are produced, the remaining resources are sufficient to produce only four units of wine. Any point below the production possibility curve represents a combination of cloth and wine when the available resources are not fully employed. For example, point R represents a combination of five units of cloth and seven units of wine. When only five units of cloth are produced, the remaining resources if they are fully employed, can give an output of ten units of wine.

It may be clear from what has been explained above that we are measuring the cost of producing cloth in terms of the amount of wine foregone in order to produce one more unit of cloth and vice-versa. In other words, we are measuring the *opportunity cost* of producing a unit of the commodity.

The slope of the production possibility curve (PPA) represents the marginal rate of transformation (MRT) or the amount of the commodity that the nation must give up in order to get one more unit of the second commodity. If the nation faces constant costs or MRT, then its production possibility curve is a straight line as shown in Fig. 1.3 with slope equal to the constant opportunity costs or MRT and to the relative commodity prices in the nation.

In many cases, production is subject to the law of increasing opportunity costs or MRT. Under such conditions, the production possibility curve is concave to the origin as shown in Fig. 1.4.

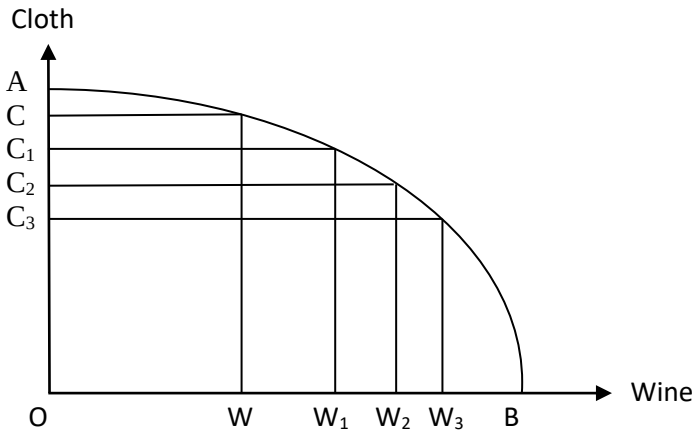

Fig. 1.4: PPC under Increasing Costs

In this figure 1.4: $AC=CC_1=C_1C_2=C_2C_3$ and $OW>WW_1>W_1W_2>W_2W_3$

Starting with OA output of cloth and zero of wine, if AC unit of cloth is given up, we can produce OW wine. But, if we give up further CC_1 output of cloth and reduce cloth production to C_1 level, the increase in wine output that can be achieved is WW_1, which is less than OW. The addition to the wine output that can be produced by giving up yet another equivalent amount of cloth is W_1W_2, which is still lower than WW_1 and so on. Thus, the amount of extra wine we can produce by decreasing production of cloth with a given amount of resources steadily decreases as we move downward along the PPC. This implies that opportunity cost of wine in terms of cloth is steadily increasing as we increase the production of wine and decrease the production of cloth. Conversely, for every additional unit of cloth, the amount of wine is to be given up. For the subsequent increases in the cloth output, the amount of wine to be given per unit of cloth increases from W_2W_3 to W_2W_1 and from W_1W to WO.

Under increasing costs, a nation will choose a combination of output at which the MRT will equal the equilibrium relative commodity price in the nation. The equilibrium relative commodity price in the nation is determined by the supply and demand conditions in the nation. This is presented in Fig. 1.5. If PP represents the price ratio in the country, production will be at point F, representing OC_1 cloth and OW_1 wine, because at F, PP, which represents the price ratio, is tangent to the PPC. When the price ratio is PP, if the country were to produce at some other point, for example A, the opportunity cost of producing more wine would be lower than its price which implies that producers could increase their profits by producing more wine. The profit will be maximum at point F at which the relative prices and opportunity costs are equal.

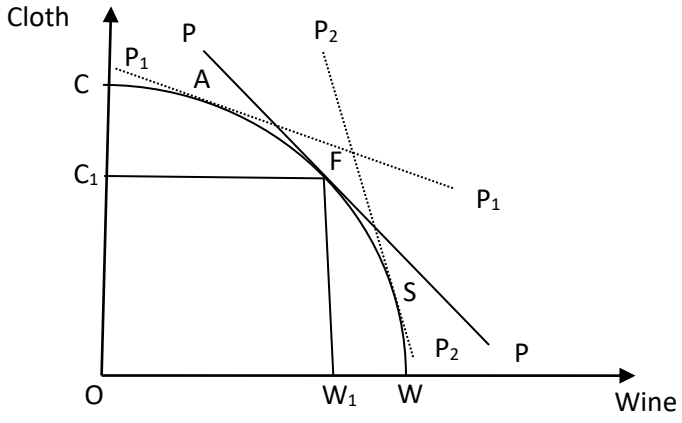

Fig. 1.5: PPC and Optimum Combination of Output

If the price of cloth increases and P_1P_1 becomes the new price ratio, producers will reallocate resources to produce more cloth and move to A at which the price line is tangent to

the production frontier. On the other hand, if the cloth price falls and price ratio changes to P_2P_2, production of wine will be increased by reducing the output of cloth and a new equilibrium will be established at point S.

Changes in factor supplies will cause a shift in the PPC of a nation, *ceteris paribus*. An increase in the factors of production will cause an outward shift and a decrease will cause an inward shift of the production frontier. In Fig. 1.6 given below, the X-axis represents labour intensive goods and the Y-axis represents capital intensive goods. In this figure, AA represents the original PPC. Supposing that all the factors of production increase in the same proportion, it will cause a shift of the PPC upward and the new PPC, A_1A_1 will be parallel to the old PPC, AA.

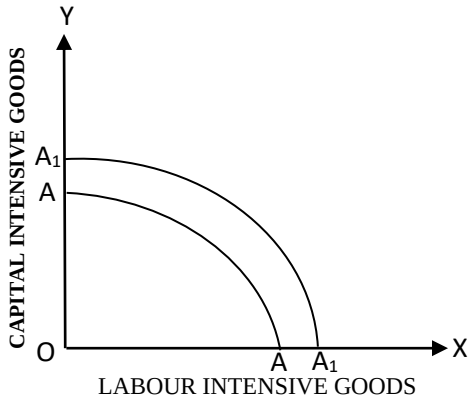

Fig. 1.6: Changes in Factor Supplies and Shift in PPC

If only one of the factors of production increases or if the increase in the factors of production is disproportionate, the shape of the new PPC will be different from that of the old one. Assume that in Fig. 1.7, the X-axis represents labour intensive goods and the Y-axis represents capital intensive goods. If only the supply of labour increases, the PPC will shift from AA to A_2A_2 as shown below in Fig. 1.7 implying that the country is now capable of producing a much larger amount of labour intensive commodities.

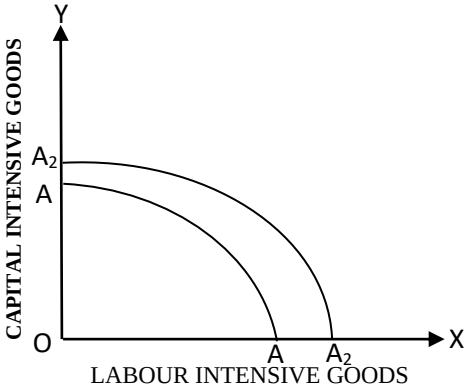

Fig. 1.7: Changes in Factor Supplies and Shift in PPC

Again, if only the supply of capital increases, the PPC will shift from AA to A_3A_3 as shown in Fig. 1.8. It implies that the country is now capable of producing a much larger amount of capital intensive commodities.

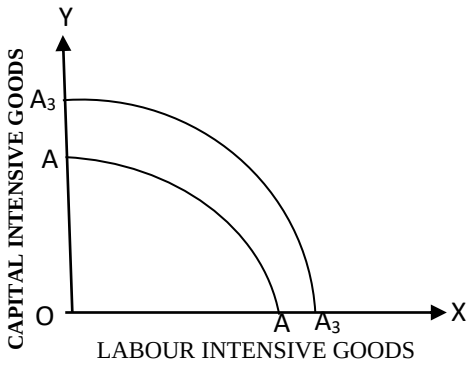

Fig. 1.8: Changes in Factor Supplies and Shift in PPC

Technological progress increases the productivity of a nation's factors of production and has the same general effect on the production possibilities as an increase in the supply of its factors of production. In respect of technological advances, we may consider the following three different cases.

Neutral Innovation: This refers to an innovation that increases the productivity of all factors by the same proportion. This will cause a uniform or symmetrical outward shift in the nation's PPC as shown in Fig. 1.6.

Labour Saving Innovation: This refers to an innovation that increases the labour productivity. *Ceteris paribus*, a labour saving innovation will cause the PPC to shift from AA to A_2A_2 as shown in Fig. 1.7.

Capital Saving Innovation: A capital saving innovation increases the productivity of capital and causes the PPC curve to shift from AA to A_3A_3 as shown in 1.8.

Check Your Progress

1. Explain the Haberler's opportunity cost theory
2. Define the production possibility curve.

1.5 Trade under Increasing, Decreasing and Constant Cost Conditions

A production-possibility curve (Samuelson) in the international trader literature is also known as the substitution curve (Haberler), production indifference curve (Lerner) and transformation curve. It is a simple device for depicting all possible combinations of two goods which a nation might produce with a given resources. The slope of the curve at any point represents the ratio of the marginal opportunity costs of the two commodities. That is, the marginal opportunity cost of an extra unit of one commodity is the necessary reduction in the output of the other. The shape of the curve depends on the assumptions made about the opportunity costs. It may be assumed that opportunity cost is constant. In this case the amount of G given up to allow additional production of D is the same regardless of the amount of G and D being produced.

In contrast, it may be assumed that the opportunity cost is one of increasing cost; this means that every time an additional unit of D is produced, ever increasing amount of G must be given up in order to provide the resources for expanding D's output. Therefore, it may be assumed that the opportunity cost is one of constant cost, increasing cost and decreasing cost.

Constant cost means that the MRT is constant. It is the result of each factor of production being equally effective in producing both goods, i.e., a factor of production is not more suited to the production of one good than two other.

In analysing the problem of international trade under decreasing costs, Professor F. B. Graham subscribes to an opposite view in the classical dogma that specialisation based on comparative cost advantage leads to an increase in the volume of output of the trading countries.

1.5.1 Trade under Constant Costs

The marginal rate of transformation (MRT) is the amount of one good G which must be given up in order to release resources necessary to produce an additional unit of second good D.

Table 1.8: Alternative Outputs of G and D when all world's Resources are utilized

Combination	G	D	MRT
a	40	0	8/1
b	32	1	8/1
c	24	2	8/1
d	16	3	8/1
e	8	4	8/1
f	0	5	8/1

The figures of the table 1.8 are illustrated in the Fig. 1.9.

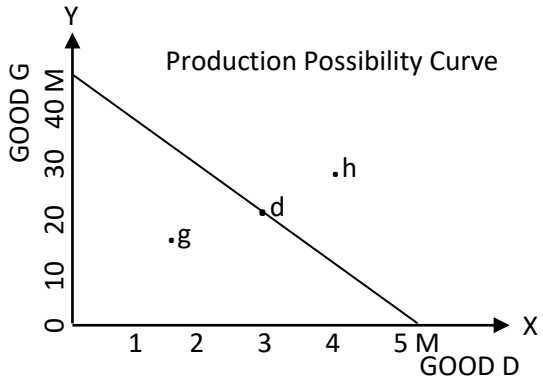

Fig. 1.9

In the table, each additional unit of D has the same cost in terms of G, resources capable of producing 8 units of G must be diverted to increase output of D by one unit, regardless of the level of production of G and D. Constant cost means that the MRT is constant. It is the result of each factor of production being equally effective in producing both goods, i.e., a factor of production is not more suited to the production of one good than two other.

The production possibilities curve (MM) then shows all possible combinations of two commodities which country W might produce. The particular combination to be chosen lies on the curve. Points inside the curve such as (g) -represent outputs of less than full employment and are therefore not considered. Points beyond the curve, such as (h), require more resources than the country possesses and are therefore also beyond consideration.

The full employment output under consideration must be on the production possibilities curve. The slope of the production possibilities curve is the marginal rate of transformation. The slope shows the reduction required in one commodity in order to increase the output of the second commodity. Since the MRT is constant the slope must be constant and thus the production possibilities curve must be straight line. It can be seen that the MRT of G for D is 8 to 1; reducing the output of D by one unit will provide resources sufficient to expand output of G by 8 units.

Country, Z has a comparative advantage in the production of D; less G has to be given up for each additional unit of D. On the other hand, country W has the comparative advantage in the production of G and less D, which has to be given up to produce an additional unit G.

With constant returns to scale, trade can take place only when each nation has a different MRT. The gains from trade for a particular nation depend on how much the international exchange rates differ from that nation's MRT. The greater the difference, the greater is the gains from trade. The gains from trade rest further upon the amount of trade taking place. Obviously a larger volume of trade allows larger gains from trade and a greater increase in the standard of living.

Under constant cost, the exchange ratio is determined solely by costs; the demand determines only the allocation of available factors between the two branches of production, and hence the relative quantities of G and D which are produced. In this case, demand has nothing to be with the price.

1.5.2 Trade under Increasing Costs

It would seem unlikely that most nations would be confronted with constant costs over the substantial range of production. Constant costs imply that all resources are of equal quality and that they are all equally suited to the production of both commodities.

Increasing opportunity costs mean that for each additional unit of G produced, ever-increasing amounts of D must be given up. At first as production G is increased, resources suited to G but not to D are used to increase greatly the output of G and reduce the output of

D by little. But eventually, the resources being transferred are not well-suited to G but highly suited to D and consequently G's production increases by little and D's fall by a great deal. Increasing opportunity costs can be explained by the use of a table 1.9 and Fig. 1.10.

Table 1.9: Alternative Combinations of G and D with All Resources Fully Employed

G	D	MRT
40	0	-
36	1	4/1
30	2	6/1
20	3	10/1
0	4	20/1

Suppose we take a given amount of land, labour and capital and experimentally find out how much G and D we can produce as shown in Table 1.9. If all our resources are devoted to the production of G, we find that we can produce 40 units of G. if we want 36 units of G; we find that we can have one unit of D, with all our resources fully employed. If we want two units of D, we can have only 30 units of G. With 3 units of D, we can have only 20 units of G. The first unit of D costs 4 units of G, the second 6 and the third 10.

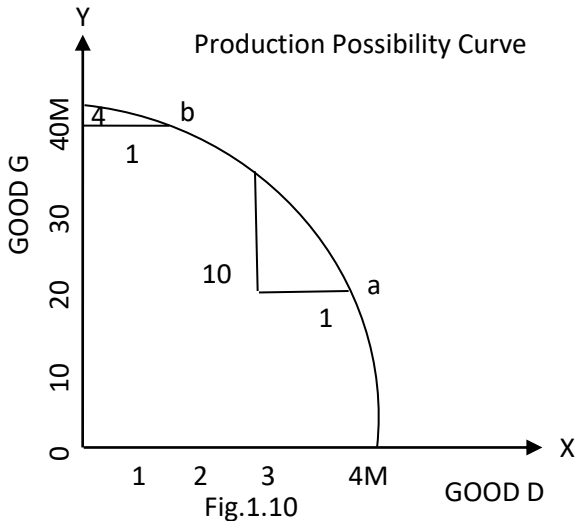

Fig.1.10

The MRT of G for D is increasing; larger amounts of G must be given up for additional units of D. This is what is meant by increasing opportunity costs. When costs are increasing, the demand affects the exchange ratio also, since the relative costs the substitution

ratio will vary with the relative demand for G and D. Given the combination of G and D which is demanded, the exchange ratio between them will equal their substitution ratio at that point. In other words, the ratio at which G and D will exchange against one another in the market will be equal to the ratio of their marginal costs. Any other situation would be one of disequilibrium: there will be an incentive to produce more G and less D or conversely. The data in the table 1.9 may be represented graphically as a transformation curve as shown in Fig. 1.10.

First, in this Fig. 1.10, combinations of 40G & 0D, 36G & 1D, 30G & 2D, 20G & 3D and 0G & 4D are plotted; the connected points yield a production possibilities curve, the slope of which is the MRT. The production possibilities curve is concave toward the origin, showing that the substitution rate is not constant but increasing.

At a combination of 20 G and 3 D, represented by point a in this figure, one unit of D may be substituted in production for 10 of G. But at the combination of 36 G and 1 D, represented by point b in the figure, the resources required to produce 1 D can be used alternatively to produce 4 additional unit of G. Now, the production possibilities curve shows all possible combination of G and D which can be produced at full employment. To be inside the curve is to be at less than full employment. There are not sufficient resources to go beyond the curve.

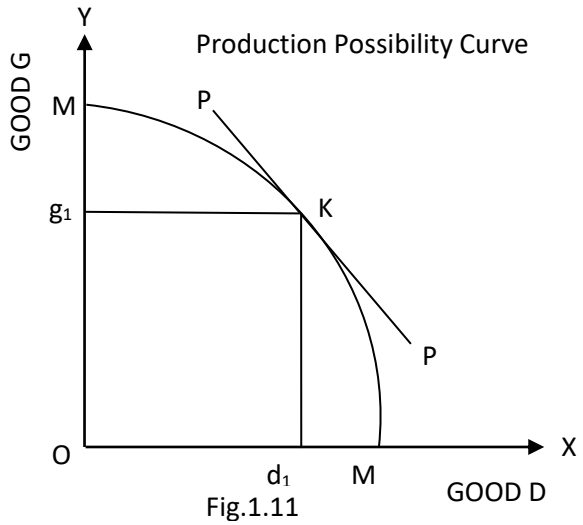

Fig.1.11

A price ratio must be introduced in the graph of production possibilities curve in order to determine the output of two commodities. With the assumption, that nation W has a closed

economy the domestic price-ratio is drawn tangent to the production possibilities curve in the Fig. 1.11. The equilibrium point is at (K), where og_1 of G and od_1 of D are produced and consumed.

'A straight line tangent to the transformation curve indicates the ratio of market prices of the two commodities, and the condition of tangency expresses equilibrium in production, that is, equality between prices and marginal costs stated in opportunity terms. Domestic demand conditions enter into this construction via community indifference curves, or simply as a consumption point determined by a given arrangement of production and income distribution." In an open economy, the world price ratios enter to reveal the possible positions of equilibrium with international trade.

Finally, tangency of a line representing the equilibrium international price ratio to both transformation function and community indifference curve indicates equilibrium in exchange, that is:

(i) Equality domestically between the marginal rate of substitution in consumption and marginal rate of transformation in production, and

(ii) Equality of the value of exports and the value of imports.

1.5.3 Trade under Conditions of Decreasing Costs

Decreasing costs refer to a fall in average or marginal costs as output expands. In a pure theoretical sense, Haberler contends that, decreasing costs are the consequence of increase in demand for the product led by foreign trade. In fact, the decreasing costs result when increasing returns tend to operate on account of internal and external economies of large-scale production.

Graham's Thesis

In analysing the problem of international trade under decreasing costs, Professor F. B. Graham subscribes to an opposite view in the classical dogma that specialisation based on

comparative cost advantage leads to an increase in the volume of output of the trading countries.

His contention is that under free trade conditions, when a country is induced to specialisation on the basis of comparative cost industries and give up decreasing-cost industries, its aggregate real income will be less than before trade. Suppose two goods, wine and cloth, are produced and wine is subject to diminishing returns or increasing cost while cloth has increasing returns or decreasing costs.

Now the country having comparative cost advantage in wine, when it specialises in producing wine, shifts its resources from increasing returns industry to diminishing returns industry and to that extent its total real income will be reduced after specialisation under free trade, while, the other country specialising in decreasing cost industry (in producing cloth) will be benefited in the process.

To illustrate the point, say England and Portugal produce cloth and wine. Before trade, the price ratio in England is 100 units of wine to 100 units of cloth, and that in Portugal it is 100 units of wine to 80 units of cloth. Thus, England has a comparative cost advantage in producing cloth and Portugal has in wine. Let us assume that the international exchange ratio is set as: 100 units of wine to 100 units of cloth.

Now, when Portugal concentrates on wine production, her cloth production contracts, say by 8,000 units. The diversified factors from cloth to wine will produce less than 10,000 units of wine, say 8,500 units on account of diminishing returns.

Exchange ratio being 1: 1.8,500 units of wine will get in exchange 8,500 units of cloth from England. Now, again if Portugal contracts her cloth production by shifting the same amount of the factors as before for employing them in wine production, the cloth output this time may be curtailed by 7,000 units because cost increases in the contracting decreasing cost industry (cloth industry).

On the other hand, wine output rises only to 7,300 units due to the operation of law of diminishing returns. Under trade these 7,300 units of wine will get 7,30(1 units of English cloth in exchange. Hence, Portugal's after trade position is: 8,500 + 7,300 = 15,800 (11 units

of cloth, while before trade, for the same efforts it was originally producing 8,000 + 8,000= 16,000 units of cloth domestically. That means, under foreign trade Portugal loses 200 units of cloth,

From the above example, it follows thus, that guided by the comparative cost doctrine, an unfortunate country which specialises in increasing cost industries against the decreasing coat industries becomes worse off with the expansion of trade, its real income would decline in terms of both goods than in the absence of trade. For this reason, Graham strongly advocates for the protection policy rather than free trade for such an unfortunate country.

Haberler, however, vehemently criticised Graham's contention of decreasing costs. Graham' conclusion would be valid only if his assumption that cost decreases with expansion of output and increases with contraction in the decreasing cost industry is acceptable. Graham's conclusion that decreasing cost industry contracts due to foreign competition rests on the assumption that there is perfect competition in that industry.

Haberler regards this as an impossible phenomenon, as the industry subject to decreasing cost will tend to have monopoly rather than competition. And when there is monopoly in an industry, the monopolist has full control over his supply, so he will expand his output to lower his marginal cost, under a situation of falling price, and not contract the output, as visualised by Graham.

Moreover, Graham has failed to distinguish between average and marginal relationship, while setting out his analysis. It is the marginal and not the average cost which is the main determinant of equilibrium output and price. Hence, no resources will be transferred from one industry to another, when a loss in the marginal revenue product results thereby. It is impossible to see under profit maximising rule followed by the producer that he transfers resources and forgoes production of Q units of cloth to get Z units of wine, when Z is less than Q.

Haberler, however, contends that Graham's thesis has some validity when decreasing costs is the outcome of external economies enjoyed by all the firms, which are internal to the industry as a whole.

In this case only, each firm will not be induced to expand even though, industry may gain by further expansion. And when there is increasing foreign competition, the industry may even contract its output which would deprive the firm of its previous external economies, so costs will rise with the contraction of industry. Under this situation, protection is essential. But, here too, it is difficult to have an empirical measurement of external economies to devise an appropriate protection policy.

Most of the modern economists, however, do not subscribe to Graham's thesis and affirm that, decreasing costs tend to strengthen rather than weaken the case of international trade, which leads to complete specialisation in due course.

It has been said that when monopoly emerges under decreasing costs condition, protection will only strengthen the monopolistic position; a free trade, which will encourage competition, will help in preventing the growth of undue monopoly. For this reason, decreasing costs due to internal economies becomes the most commendable argument for advocating free trade rather than protection.

Check Your Progress

1. Define trade under conditions of increasing costs.
2. Define trade under conditions of constant costs.
3. Define trade under conditions of decreasing costs.

1.6 Summary

Due to differences in climate, natural resources, geographical situation and efficiency of labour, a country can produce one commodity at a lower cost than the other because of these comparative advantages.

A country will export those commodities in which its comparative production costs are less, and will import those commodities in which its comparative production costs are high.

The Ricardian theory of comparative costs was based on a number of simplifying assumptions. The theory has been elaborated and modified by economists like J.S. Mill,

Alfred Marshall and Taussig considering more than two commodities and more than two countries.

Opportunity cost of a commodity is defined as the amount of a second commodity that must be given up to release just enough resources to produce one additional unit of the first. Haberler used this concept to explain the law of comparative advantage.

The production possibility curve (PPC) represents all the alternative combinations of two commodities that a nation can produce by fully utilizing all its factors of production. In other words, the production possibility curve shows the frontier beyond which production cannot be carried on with the available resources and technology.

1.7 Key Wods

Comparative advantages: A country can produce one commodity at a lower cost than the other because of comparative advantages such as favourable climate, natural resources, geographical situation and efficiency of labour.

Opportunity cost: Opportunity cost of a commodity is defined as the amount of a second commodity that must be given up to release just enough resources to produce one additional unit of the first.

Production Possibility Curve: The production possibility curve (PPC) represents all the alternative combinations of two commodities that a nation can produce by fully utilizing all its factors of production.

Innovation: Innovation is the creation, development and implementation of a new product, process or service, with the aim of improving efficiency, effectiveness or competitive advantage. Innovation is the creation of something that improves the way we live our lives.

Neutral Innovation: This refers to an innovation that increases the productivity of all factors by the same proportion.

Labour Saving Innovation: This refers to an innovation that increases the labour productivity.

Capital Saving Innovation: A capital saving innovation increases the productivity of capital and causes the PPC curve to shift.

1.8 Answer to check your progress

a) Define trade under conditions of increasing costs.
b) Define trade under conditions of constant costs.
c) Define trade under conditions of decreasing costs.
d) Explain the Haberler's opportunity cost theory
e) Define the production possibility curve.
f) Explain the modified Ricardian theory.
g) Why is modified Ricardian theory superior to Ricardian theory?
h) Define introduction of transfer costs in modified Ricardian theory.
i) Define Ricardo's Model of comparative advantages.
j) What do you mean by gains from trade?
k) What are the drawbacks of Ricardo's Model of comparative advantages?

1.9 Questions and Answers

1.9.1 Short-Answer Questions (5 Marks)

1. What are the criticisms of Ricardo's Model of Comparative Advantages?

1. **Unrealistic Assumption of Labour Cost:** The most severe criticism of the comparative advantage doctrine is that it is based on the labour theory of value. In calculating production costs, it takes only labour costs and neglects non-labour costs involved in the production of commodities. This is highly unrealistic because it is money costs and not labour costs that are the basis of national and international transactions of goods. Further, the labour cost theory is based on the assumption of homogeneous labour. This is again unrealistic because labour is heterogeneous of different kinds and grades, some specific or specialized, and other non-specific or general.

2. **No Similar Tastes:** The assumption of similar tastes is unrealistic because tastes differ with different income brackets in a country. Moreover, they also change with the growth on an economy and with the development of its trade relations with other countries.
3. **Assumption of Fixed Proportions:** The theory of comparative costs is based on the assumption that labour is used in the same fixed proportions in the production of all commodities. This is essentially a static analysis and hence unrealistic. As a matter of fact, labour is used in varying proportions in the production of commodities. For instance, less labour is used per unit of capital in the production of textiles. Moreover, some substitution of labour for capital is always possible in production.
4. **Unrealistic Assumption of Constant Costs:** The theory is based on another weak assumption that an increase of output due to international specialisations if followed by constant costs. If the large-scale of production reduces costs, the comparative advantage will be increased. On the other hand, if increased output is the result of increased cost of production, the comparative advantage will be reduced, and in some cases it may even disappear.
5. **Ignores Transport Costs:** Ricardo ignores transport costs in determining comparative advantage in trade. This is highly unrealistic because transport costs play an important role in determining the pattern of world trade. Like economies of scale, it is an independent factor of production. For instance, high transport costs may nullify the comparative advantage and the gain from international trade.
6. **Mobility of Factor:** The doctrine assumes that factors of production are perfectly mobile internally and wholly immobile internationally. This is not realistic because even within a country factors do not move freely from one industry to another or from one region to another. The greater the degree of specialisation in an industry, the less is the factor mobility from one industry to another. Thus, factor mobility influences costs and hence the pattern of international trade.
7. **Two-Country two- Commodity Model**: The Ricardian model is related to trade between two countries on the basis of two commodities. This is again unrealistic because in actuality, international trade is among many countries trading in many commodities.
8. **Unrealistic Assumption of Free Trade:** Another serious weakness of the doctrine is that it assumes perfect and free world trade. But in reality, world trade is not free.

Every country applies restrictions on the free movement of goods to and from other countries. Thus, tariffs and other trade restrictions affect world imports and exports. Moreover, products are not homogeneous but differentiated. By neglecting these aspects, the Ricardian theory becomes unrealistic.

9. **Unrealistic Assumptions of Full Employment:** Like all classical theories, the theory of comparative advantage is based on the assumption of full employment. This assumption also makes the theory static. Keynes falsified the assumption of full employment and proved the existence of under-employment in an economy. Thus, the assumption of full employment makes the theory unrealistic.
10. **Self-Interest Hinders its Operation:** The doctrine does not operate if a country having a comparative disadvantage does not wish to import a commodity from the other country due to strategic, military or development considerations. Thus, often self-interest stands in the operation of the theory of comparative costs.

2. What is the introduction of transfer costs in modified Ricardian Theory?

The Ricardian theory assumed that the transfer of goods between countries does not involve any cost. Quite obviously, certain transfer costs like the cost of transport are involved in international trade. It is not difficult to introduce the costs of transfer to the comparative cost theory. The introduction of transfer costs, however, decreases the extent of the international division of labour, because if the cost of transfer of a commodity is more than the difference in the costs of production between two countries, it will not be traded between them. For instance, with reference to our previous example, if the cost of the transfer of wine from Portugal to England is more than $16 per unit, England is not likely to import wine from Portugal because the landed cost of Portuguese wine in England will be more than $ 120 (which is the price of the domestic wine.)

In the absence of transfer costs, the condition for the establishment of trade between country A and B is that $X_a/X_b<Y_a/Y_b$ where Xa and Ya denote the number of units of the commodities X and Y which one unit of labour can produce in county A. X_b and Yb denote the number of units of the commodities X and Y which one unit of labour can produce in county B. Introduction of transfer costs requires the fulfillment of two more conditions for the establishment of trade, viz. $X_a/X_b^1 <Y_a/Y_b$ and $X_a/ X_b<Y_a^1<Ya^1/ Y_b$ where X_b^1 denotes the number of units of commodity X which can be produced and transferred to A with one

unit of labour in B, and Y_a^1 denotes the number of unit of commodity Y which can be produced and transported to B with one unit of labour in A.

3. How are more than two commodities considered in Modified Ricardian Theory?

Though Ricardo considered only two commodities, the theory can be applied to cases in which not merely two commodities but any number of goods is produced in the two countries. If Countries I and II exchange a number of commodities between them, according to the doctrine of comparative cost differences, Country I must be enjoying a comparative advantage over Country II in all its export commodities relatively to all its import commodities. Similarly, Country II must be enjoying a comparative advantage over Country I in all its export commodities relatively to all its import commodities.

To get an idea of which commodities a country exports and imports, we may arrange various goods in order of the comparative advantage of Country I over Country II, so that if we call them a,b,c,d,e,….$a_1/a_2 < b_1/b_2 < c_1/c_2 < d_1/d_2 < e_1/e_2$ … Country I will export commodities on the left side and import commodities on the right side. County II, On the other hand, specialises in the production of commodities on the right side and imports those on the left side. It is not possible that Country I exports a, b, d and imports c. If it imports c, it must necessarily be importing d (assuming, of course, that d has a demand in Country I).

Relying only on the cost data, we cannot determine the exact position of this dividing line. We can say only that it must be drawn in such a manner that Country I enjoys a comparative advantage in every commodity it exports relatively to every commodity it imports. The dividing line will be at a position at which the balance of payments will be in equilibrium. The point at which the balance of payments will be in equilibrium and determined by the reciprocal demand of the two countries for each other's product. An examination of Table 1.4 will make the meaning of the algebraic expression clear.

Table 1.4: Production Costs of Goods in two Countries

Kinds of Godds		A	B	C	D	E	F	G	H	I	J	K	L
Real cost per unit, expressed in units of labour	In country 1* ($a_1, b_1, c_1, \ldots$)	30	30	30	30	30	30	30	30	30	30	30	30
	In country II ($a_2, b_2, c_2, ..$)	55	50	46	40	32	30	27	25	20	15	12	10

*in this example, the units of quantity of various commodities are chosen in such a way that the cost per unit of every commodity in Country I is the same. Hence, the number of units of labour per unit of every commodity is equal (30).

If we assume that money wages are the same in both the countries, we can easily say which goods will be exported and which will be imported. Country I will export goods A to E and County II will export goods L to G. It depends upon the reciprocal demand whether or not this situation maintains equilibrium in balance of payments.

4. How are more than two countries considered in Modified Ricardian Theory?

Though the Ricardian model consists of two countries only, the theory is equally applicable to a situation in which more than two countries participate. Each country will specialise in the commodity or commodities in the production of which it has comparative advantage over the other and import from other countries goods which can be produced domestically only at a comparative disadvantage.

A country may import a commodity from more than one country just as it may export a commodity to more than one country. Assume that the international price of commodity X is $ 100 per unit. Now, all countries who can produce at a cost of less than $100 per unit, can export X. However, the gains to the different exporting countries may vary. The country with the least production cost will gain the maximum (per unit of export) and vice versa. All countries with costs of production of over $ 100 per unit of X will gain by importing it rather than producing domestically at a higher cost. The extent of gain from import also may vary between the various

importing countries. The gain (per unit) will be the maximum for the importing country with the highest domestic cost of production of X and vice versa.

5. What is Production Possibility Curve? Explain

The production possibility curve (PPC) represents all the alternative combinations of two commodities that a nation can produce by fully utilizing all its factors of production. In other words, the production possibility curve shows the frontier beyond which production cannot be carried on with the available resources and technology.

Figure 1.3 depicts the production frontier of country A. With a given amount of productive resources, it can produce either 10 units of cloth (if it employs all resources in cloth production) or 20 units of wine (if all resources are used in wine production). Alternatively, it can have a combination of cloth and wine if resources are allocated for both. For example, it may have eight units of cloth and four units of wine, or six units of cloth and eight units of wine. If it reduces the output of cloth by one unit, it can increase the output of wine by two units because with the resources required to produce one unit of cloth, two units of wine can be produced.

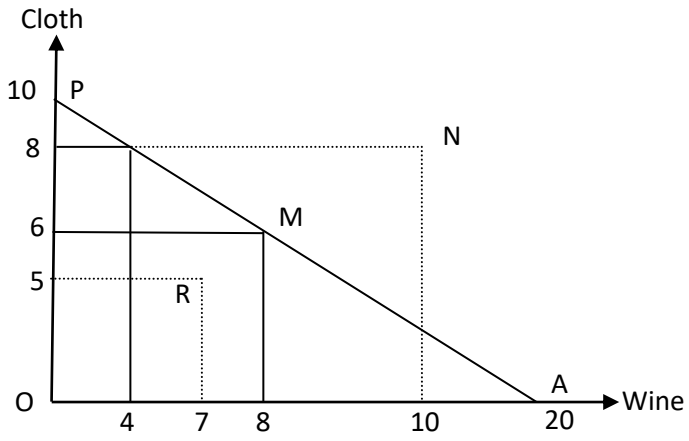

Fig. 1.3: PPC under Constant Costs

In short, any point on the production possibility curve (PPA) shows the combination of cloth and wine output when the productive resources are fully employed and allocated between cloth and wine in a certain production.

Any point above the PA line is beyond reach with the particular quantum of resources. For example, point N indicates a combination of eight units of cloth and ten units of wine which is impossible to obtain with the available resources. Again, when eight units of cloth are produced, the remaining resources are sufficient to produce only four units of wine. Any point below the production possibility curve represents a combination of cloth and wine when the available resources are not fully employed. For example, point R represents a combination of five units of cloth and seven units of wine. When only five units of cloth are produced, the remaining resources if they are fully employed, can give an output of ten units of wine.

6. Explain Trade under Constant Costs

The marginal rate of transformation (MRT) is the amount of one good G which must be given up in order to release resources necessary to produce an additional unit of second good D.

Table 1.8: Alternative Outputs of G and D when all world's Resources are utilized

Combination	G	D	MRT
a	40	0	8/1
b	32	1	8/1
c	24	2	8/1
d	16	3	8/1
e	8	4	8/1
f	0	5	8/1

The figures of the table 1.8 are illustrated in the Fig. 1.9.

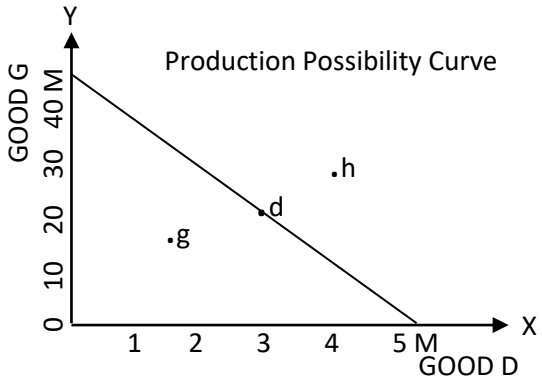

Fig. 1.9

In the table, each additional unit of D has the same cost in terms of G, resources capable of producing 8 units of G must be diverted to increase output of D by one unit, regardless of the level of production of G and D. Constant cost means that the MRT is constant. It is the result of each factor of production being equally effective in producing both goods, i.e., a factor of production is not more suited to the production of one good than two other.

The production possibilities curve (MM) then shows all possible combinations of two commodities which country W might produce. The particular combination to be chosen lies on the curve. Points inside the curve such as (g) -represent outputs of less than full employment and are therefore not considered. Points beyond the curve, such as (h), require more resources than the country possesses and are therefore also beyond consideration.

The full employment output under consideration must be on the production possibilities curve. The slope of the production possibilities curve is the marginal rate of transformation. The slope shows the reduction required in one commodity in order to increase the output of the second commodity. Since the MRT is constant the slope must be constant and thus the production possibilities curve must be straight line. It can be seen that the MRT of G for D is 8 to 1; reducing the output of D by one unit will provide resources sufficient to expand output of G by 8 units.

Country, Z has a comparative advantage in the production of D; less G has to be given up for each additional unit of D. On the other hand, country W has the comparative advantage in the production of G and less D, which has to be given up to produce an additional unit G.
With constant returns to scale, trade can take place only when each nation has a different MRT. The gains from trade for a particular nation depend on how much the international exchange rates differ from that nation's MRT. The greater the difference, the greater is the gains from trade. The gains from trade rest further upon the amount of trade taking place. Obviously a larger volume of trade allows larger gains from trade and a greater increase in the standard of living.

Under constant cost, the exchange ratio is determined solely by costs; the demand determines only the allocation of available factors between the two branches of production, and hence the relative quantities of G and D which are produced. In this case, demand has nothing to be with the price.

7. Explain Trade under Increasing Costs.

It would seem unlikely that most nations would be confronted with constant costs over the substantial range of production. Constant costs imply that all resources are of equal quality and that they are all equally suited to the production of both commodities.

Increasing opportunity costs mean that for each additional unit of G produced, ever-increasing amounts of D must be given up. At first as production G is increased, resources suited to G but not to D are used to increase greatly the output of G and reduce the output of D by little. But eventually, the resources being transferred are not well-suited to G but highly suited to D and consequently G's production increases by little and D's fall by a great deal. Increasing opportunity costs can be explained by the use of a table 1.9 and Fig. 1.10.

Table 1.9: Alternative Combinations of G and D with All Resources Fully Employed

G	D	MRT
40	0	-
36	1	4/1
30	2	6/1
20	3	10/1
0	4	20/1

Suppose we take a given amount of land, labour and capital and experimentally find out how much G and D we can produce as shown in Table 1.9. If all our resources are devoted to the production of G, we find that we can produce 40 units of G. if we want 36 units of G; we find that we can have one unit of D, with all our resources fully employed. If we want two units of D, we can have only 30 units of G. With 3 units of D, we can have only 20 units of G. The first unit of D costs 4 units of G, the second 6 and the third 10.

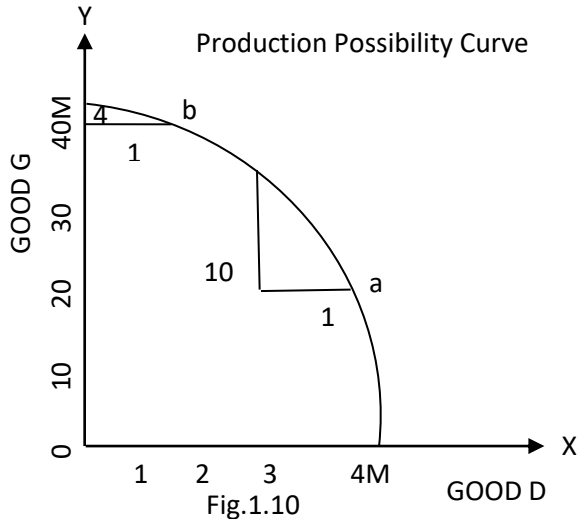

Fig.1.10

The MRT of G for D is increasing; larger amounts of G must be given up for additional units of D. This is what is meant by increasing opportunity costs. When costs are increasing, the demand affects the exchange ratio also, since the relative costs the substitution ratio will vary with the relative demand for G and D. Given the combination of G and D which is demanded, the exchange ratio between them will equal their substitution ratio at that point. In other words, the ratio at which G and D will exchange against one another in the market will be equal to the ratio of their marginal costs. Any other situation would be one of disequilibrium: there will be an incentive to produce more G and less D or conversely. The data in the table 1.9 may be represented graphically as a transformation curve as shown in Fig. 1.10.

First, in this Fig. 1.10, combinations of 40G & 0D, 36G& 1D, 30G & 2D, 20G & 3D and 0G & 4D are plotted; the connected points yield a production possibilities curve, the slope of which is the MRT. The production possibilities curve is concave toward the origin, showing that the substitution rate is not constant but increasing.

At a combination of 20 G and 3 D, represented by point a in this figure, one unit of D may be substituted in production for 10 of G. But at the combination of 36 G and 1 D, represented by point b in the figure, the resources required to produce 1 D can be used alternatively to produce 4 additional unit of G. Now, the production possibilities curve shows all possible combination of G and D which can be produced at full employment. To be inside the curve is to be at less than full employment. There are not sufficient resources to go beyond the curve.

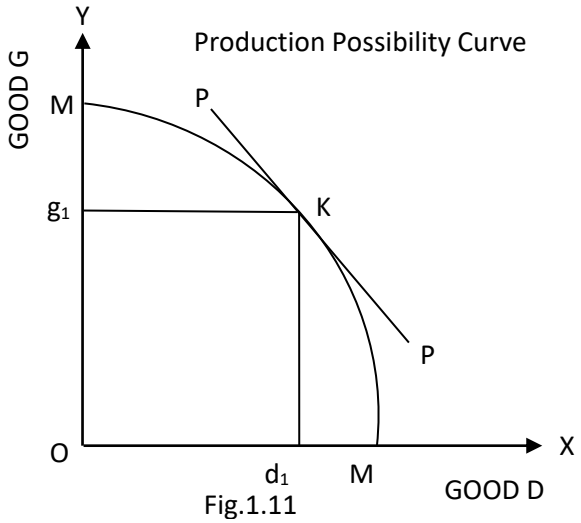

Fig.1.11

A price ratio must be introduced in the graph of production possibilities curve in order to determine the output of two commodities. With the assumption, that nation W has a closed economy the domestic price-ratio is drawn tangent to the production possibilities curve in the Fig. 1.11. The equilibrium point is at (K), where og_1 of G and od_1 of D are produced and consumed.

'A straight line tangent to the transformation curve indicates the ratio of market prices of the two commodities, and the condition of tangency expresses equilibrium in production, that is, equality between prices and marginal costs stated in opportunity terms. Domestic demand conditions enter into this construction via community indifference curves, or simply as a consumption point determined by a given arrangement of production and income distribution." In an open economy, the world price ratios enter to reveal the possible positions of equilibrium with international trade.

Finally, tangency of a line representing the equilibrium international price ratio to both transformation function and community indifference curve indicates equilibrium in exchange, that is:

(i) Equality domestically between the marginal rate of substitution in consumption and marginal rate of transformation in production, and

(ii) Equality of the value of exports and the value of imports.

8. Explain Trade under Conditions of Decreasing Costs.

Decreasing costs refer to a fall in average or marginal costs as output expands. In a pure theoretical sense, Haberler contends that, decreasing costs are the consequence of increase in demand for the product led by foreign trade. In fact, the decreasing costs result when increasing returns tend to operate on account of internal and external economies of large-scale production.

In analysing the problem of international trade under decreasing costs, Professor F. B. Graham subscribes to an opposite view in the classical dogma that specialisation based on comparative cost advantage leads to an increase in the volume of output of the trading countries.

His contention is that under free trade conditions, when a country is induced to specialisation on the basis of comparative cost industries and give up decreasing-cost industries, its aggregate real income will be less than before trade. Suppose two goods, wine and cloth, are produced and wine is subject to diminishing returns or increasing cost while cloth has increasing returns or decreasing costs.

Now the country having comparative cost advantage in wine, when it specialises in producing wine, shifts its resources from increasing returns industry to diminishing returns industry and to that extent its total real income will be reduced after specialisation under free trade, while, the other country specialising in decreasing cost industry (in producing cloth) will be benefited in the process.

To illustrate the point, say England and Portugal produce cloth and wine. Before trade, the price ratio in England is 100 units of wine to 100 units of cloth, and that in Portugal it is 100 units of wine to 80 units of cloth. Thus, England has a comparative cost advantage in producing cloth and Portugal has in wine. Let us assume that the international exchange ratio is set as: 100 units of wine to 100 units of cloth.

Now, when Portugal concentrates on wine production, her cloth production contracts, say by 8,000 units. The diversified factors from cloth to wine will produce less than 10,000 units of wine, say 8,500 units on account of diminishing returns.

Exchange ratio being 1: 1.8,500 units of wine will get in exchange 8,500 units of cloth from England. Now, again if Portugal contracts her cloth production by shifting the same amount of the factors as before for employing them in wine production, the cloth output this time may be curtailed by 7,000 units because cost increases in the contracting decreasing cost industry (cloth industry).

1.9.2 Long-Answer Questions

1. Explain the Ricardo's Model of Comparative Advantages.

Assumptions

The Ricardian theory of comparative advantage is based on the following assumptions:

1. There are only two countries, say England and Portugal.
2. They produce the same two commodities say, wine and cloth.
3. There are similar tastes in both countries.
4. Labour is the only factor of production.
5. The supply of labour is unchanged.
6. All units of labour are homogeneous.
7. Prices of two commodities are determined by labour cost, i.e, the number of labour-units employed to produce each.
8. Commodities are produced under the law of constant costs or returns.
9. Technological knowledge is unchanged.
10. Trade between the two countries takes place on the basis of the barter system.
11. Factors of production are perfectly mobile within each country, but are perfectly immobile between countries.
12. There is free trade between the two countries, there being no trade barriers or restrictions in the movement of commodities.
13. No transport costs are involved in carrying trade between the two countries.
14. All factors of production are fully employed in both the countries.

15. The international market is perfect so that the exchange ratio for the two commodities is the same.

Explanation of the Theory

Given these assumptions, Ricardo shows that trade is possible between two countries when one country has an absolute advantage in the production of both commodities, but the country has a comparative advantage in the production of one commodity than in the other. This is illustrated in terms of Ricardo's well-known example of trade between England and Portugal as shown in table 1.1.

Table 1.1: Man–Years of Labour Required For Producing One Unit

Country	Wine	Cloth
England	120	100
Portugal	80	90

The table 1.1 shows the production of a unit of wine in England requires 120 men for a year, while a unit of cloth requires 100 men for the same period. On the other hand, the production of the same quantities of wine and cloth in Portugal requires 80 and 90 men respectively. Thus, England uses more labour than Portugal in producing both wine and cloth. In other words, the Portuguese labour is more efficient than the English labour in producing both the products. So Portugal possesses an absolute advantage in both wine and cloth. But Portugal would benefit more by producing wine and exporting it to England because it possesses greater comparative advantage in it. This is because the cost of production of wine (80/120 men) is less than the cost of production of cloth (90/100 men). On the other hand, it is in England's interest to specialise in the production of cloth in which it has the least comparative disadvantage. This is because the cost of production of cloth in England in less (100/90 men) as compared with wine (120/80 men). Thus, trade is beneficial for both the countries. The comparative advantage position of both is illustrated in fig. 1.1 in terms of production possibility curves.

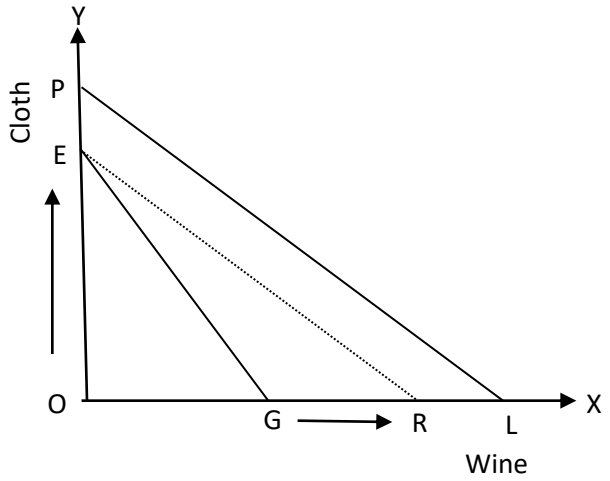

Fig. 1.1

PL is the production possibility curve of Portugal, and EG that of England. Portugal enjoys an absolute advantage in the production of both wine and cloth over England. It produces OL of wine and OP of cloth, as against OG of wine and OE of cloth produced by England. But the slope of ER (parallel to PL) reveals that Portugal has a greater comparative advantage in the production of wine because if it gives up the resources required to produce OE of cloth, it can produce OR of wine which is greater than OG of wine of England. On other hand England had the least comparative disadvantage in the production of OE of cloth. Thus, Portugal will export OR of wine to England in exchange for OE of cloth from her.

Gains from Trade and their Distribution

Ricardo does not discuss the actual ratio at which wine and cloth would exchange and how much the two countries gain from trade. Before trade, the domestic trade ratios in the two countries for wine and cloth are shown in Table 1.2. The cost of production of one unit of wine in England is 120 men and that of producing one unit of cloth is 100 men. It shows that the cost of producing wine is more as against cloth because one unit of wine can exchange for 1.2 units of cloth. On the other hand, the cost of producing one unit of wine in Portugal is 80 men and that of producing one unit of cloth is 90 men. It is clear that the cost of producing cloth is more than that of wine because one unit of wine can exchange for 0.89 unit of cloth. Suppose trade begins between the two countries. England will gain if it imports one unit of wine from Portugal in exchange for less than 1.2 units of cloth. Portugal will also gain if it imports one unit of cloth from England in exchange for more than 0.89 units of wine.

Table 1.2: Domestic Exchange Ratios

England	Portugal
Wine 120: 100 Cloth (6/5) 1: 1.2 Cloth 100: 120 Wine(5/6) 1: 0.83	Wine 80 : 90 Cloth (8/9) 1: 0. 89 Cloth 90: 80 Wine (9/8) 1: 0.83

The table shows that the domestic exchange ratio in England is one unit of cloth= 0.83 units of wine, and in Portugal one unit of wine= 0.89 unit of cloth. If we assume the exchange ratio between the two countries to be 1 unit of cloth = 1 unit of wine, England would gain 0.17 (1-0.83) unit of wine by exporting one unit of cloth to Portugal. Similarly, the gain to Portugal by exporting one unit of wine to England will be 0.11(1- 0.89) unit of cloth. Thus, trade is beneficial for both countries.

The gains from trade and their distribution are shown in Figure 1.2 where the line C_1 W_2 depicts the domestic exchange ratio 1 unit of cloth= 0.83 unit of wine of England, and the line W_1 C_2 that of Portugal at the domestic exchange ratio 1 unit of wine= 0.89 unit of cloth. The line C_1 W_1 shows the exchange rate of trade of 1 unit of cloth=1 unit of wine between the two countries. At this exchange rate England gains W_2W_1 (0.17 unit) of wine, while Portugal gains C_2 C_1 (0.11 unit) of cloth.

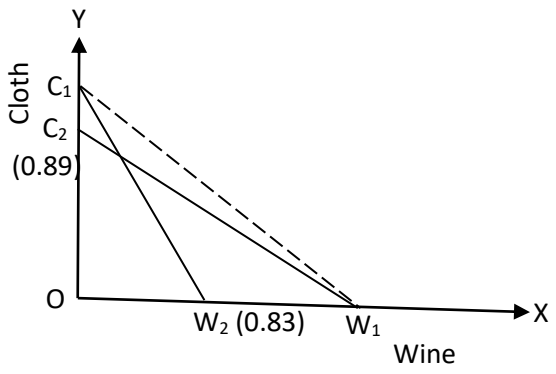

Fig. 1.2

Thus, both England and Portugal specialise in the production of one commodity on the basis of comparative costs. Each reallocates its factors accordingly and exports that commodity in which it has comparative advantage and imports that commodity in which it has a comparative disadvantage. Both gain through trade and can increase the consumption of the two commodities.

9. Explain the Modified Ricardian Theory.

The Ricardian theory assumed that the transfer of goods between countries does not involve any cost. Quite obviously, certain transfer costs like the cost of transport are involved in international trade. It is not difficult to introduce the costs of transfer to the comparative cost theory. The introduction of transfer costs, however, decreases the extent of the international division of labour, because if the cost of transfer of a commodity is more than the difference in the costs of production between two countries, it will not be traded between them. For instance, with reference to our previous example, if the cost of the transfer of wine from Portugal to England is more than $16 per unit, England is not likely to import wine from Portugal because the landed cost of Portuguese wine in England will be more than $ 120 (which is the price of the domestic wine.)

In the absence of transfer costs, the condition for the establishment of trade between country A and B is that $X_a/X_b<Y_a/Y_b$ where Xa and Ya denote the number of units of the commodities X and Y which one unit of labour can produce in county A. X_b and Yb denote the number of units of the commodities X and Y which one unit of labour can produce in county B. Introduction of transfer costs requires the fulfillment of two more conditions for the establishment of trade, viz. $X_a/X_b^1 <Y_a/Y_b$ and $X_a/ X_b<Y_a^1<Ya^1/ Y_b$ where X_b^1 denotes the number of units of commodity X which can be produced and transferred to A with one unit of labour in B, and Y_a^1 denotes the number of unit of commodity Y which can be produced and transported to B with one unit of labour in A.

More than Two commodities

Though Ricardo considered only two commodities, the theory can be applied to cases in which not merely two commodities but any number of goods is produced in the two countries. If Countries I and II exchange a number of commodities between them, according

to the doctrine of comparative cost differences, Country I must be enjoying a comparative advantage over Country II in all its export commodities relatively to all its import commodities. Similarly, Country II must be enjoying a comparative advantage over Country I in all its export commodities relatively to all its import commodities.

To get an idea of which commodities a country exports and imports, we may arrange various goods in order of the comparative advantage of Country I over Country II, so that if we call them a,b,c,d,e,….a_1/a_2 < b_1/b_2< c_1/c_2 < d_1/d_2 < e_1/e_2 … Country I will export commodities on the left side and import commodities on the right side. County II, On the other hand, specialises in the production of commodities on the right side and imports those on the left side. It is not possible that Country I exports a, b, d and imports c. If it imports c, it must necessarily be importing d (assuming, of course, that d has a demand in Country I).

Relying only on the cost data, we cannot determine the exact position of this dividing line. We can say only that it must be drawn in such a manner that Country I enjoys a comparative advantage in every commodity it exports relatively to every commodity it imports. The dividing line will be at a position at which the balance of payments will be in equilibrium. The point at which the balance of payments will be in equilibrium and determined by the reciprocal demand of the two countries for each other's product. An examination of Table 1.4 will make the meaning of the algebraic expression clear.

Table 1.4: Production Costs of Goods in two Countries

Kinds of Godds		A	B	C	D	E	F	G	H	I	J	K	L
Real cost per unit, expressed in units of labour	In country 1* ($a_1, b_1, c_1, \ldots$)	30	30	30	30	30	30	30	30	30	30	30	30
	In country II ($a_2, b_2, c_2, ..$)	55	50	46	40	32	30	27	25	20	15	12	10

*in this example, the units of quantity of various commodities are chosen in such a way that the cost per unit of every commodity in Country I is the same. Hence, the number of units of labour per unit of every commodity is equal (30).

If we assume that money wages are the same in both the countries, we can easily say which goods will be exported and which will be imported. Country I will export goods A to E and County II will export goods L to G. It depends upon the reciprocal demand whether or not this situation maintains equilibrium in balance of payments.

More than Two Countries

Though the Ricardian model consists of two countries only, the theory is equally applicable to a situation in which more than two countries participate. Each country will specialise in the commodity or commodities in the production of which it has comparative advantage over the other and import from other countries goods which can be produced domestically only at a comparative disadvantage.

A country may import a commodity from more than one country just as it may export a commodity to more than one country. Assume that the international price of commodity X is $ 100 per unit. Now, all countries who can produce at a cost of less than $100 per unit, can export X. However, the gains to the different exporting countries may vary. The country with the least production cost will gain the maximum (per unit of export) and vice versa. All countries with costs of production of over $ 100 per unit of X will gain by importing it rather than producing domestically at a higher cost. The extent of gain from import also may vary between the various importing countries. The gain (per unit) will be the maximum for the importing country with the highest domestic cost of production of X and vice versa.

Variable Costs of Production

Ricardo assumed a constant cost of production. The removal of the assumption of constant costs and the introduction of variable costs do not, however, change the substance of the comparative cost theory. It should, however, be noted that although the consideration of conditions of increasing costs calls for no basic modification of the theory, production under conditions of increasing costs does prevent international specialisation from developing, consequently reducing the potential gains from trade. Production under conditions of decreasing costs, on the other hand, tends to widen national costs differentials and also the limits of the terms of trade.

Non-Competing Groups

The Ricardian theory assumed that labour in each country is homogeneous and perfectly mobile within the country. But as a matter of fact, labour force in any county consists of many different groups, i.e., the technical, skilled, semi-skilled and unskilled, and mobility between these groups is far from perfect. These distinct categories of labour with rather well marked and enduring differences in wages are known as "non-competing" groups.

The mere existence of such groups would not affect the theory of international trade, provided that in each country the relative scale of wages was the same. But the relative scale of wages differs between countries due to factors like the relative abundance or scarcity of certain categories of labour, and this affects the pattern of trade. For instance, abnormally low wages for a particular category of labour in a country enables it to produce some commodity or commodities at a lower money cost than its competitors, even though it has no comparative advantage. The existence of non-competing groups within a country affects international trade only when the situation thus engendered is peculiar to that country.

Capital Charges

Taussig has pointed out that interest charges influence international trade when different quantities of capital are used in the production of different commodities. Hence, like non-competing groups of labour interest charges may also affect the cost of production and pattern of trade. A low rate of interest tends to give a country a comparative advantage for those goods which are made with much capital; these tend to be exported from it. A high rate of interest correspondingly is a handicap on the export of these same goods and a stimulus to their import. However, high or low interest does not in itself act as an independent factor; it exercises an influence only so far as it enters to a greater degree in one commodity than in another. The conclusion is of the same sort as that reached with regard to non-competing groups and differences of wages.

10. Define elaborately Haberler's Opportunity Cost Theory

Opportunity cost of a commodity is defined as the amount of a second commodity that must be given up to release just enough resources to produce one additional unit of the

first. Haberler used this concept to explain the law of comparative advantage. In this form, this law is referred to as the law of comparative cost. Consequently, the nation with the lower opportunity cost is said to have a comparative advantage in the production of that commodity and comparative disadvantage in the production of other commodity.

The existence of comparative advantage in costs of production is the principal cause of emergence of international trade. Ricardo has given an example of trade between England and Portugal shown in Table 1.5.

Table 1.5

Nations	One day of Labour	
	Units of Wine	Units of Cloth
England	60	80
Portugal	150	100

From the above table, it is clear that Portuguese labour is more efficient than English labour in the production of wine as well as cloth. So Portugal has an absolute advantage in the production of wine and cloth.

The trade between England and Portugal can also be demonstrated by introducing the concept of opportunity cost. Table 1.6 gives the opportunity costs for producing wine and cloth in the two nations calculated on the basis of information given in Table 1.5.

Table 1.6

	Opportunity Costs for	
Nations	Wine	Cloth
England	60/80=3/4	80/60= 4/3
Portugal	150/100= 3/2	100/150= 2/3

This table shows that

In England, 1 unit of cloth = 3/4 units of wine. (Domestic exchange ratio of England)

In Portugal, 1 unit of wine= 2/3 units of cloth. (Domestic Exchange Ratio of Portugal)

Here, England has the lower opportunity cost of the two nations in producing cloth and Portugal has lower opportunity cost in producing wine. Thus, England has comparative advantage in producing cloth and Portugal has comparative advantage in producing wine. As long as the opportunity cost of production for a good differs in the two nations. One nation has a comparative advantage in the producing of one of the two goods, while the other nation has a comparative advantage in the production of the other good.

England will gain from trade if it can get more than 3/4 units of wine by exporting 1 unit of cloth. Likewise, Portugal gains from trade if it gets more than 2/3 unit of cloth by exporting 1 unit of wine. England gains from export so long it exports 80 units of cloth for more than 60 unit of wine. While Portugal gain if it gets 80 units of cloth for less than 120 units of wine.

Trade between two countries does not take place in case of equal cost differences. In this case, the opportunity cost of producing the two commodities is the same in both the countries. So, the production possibility curves will coincide with no possibility of gain from trade to either country. Here, the absolute advantage (or disadvantage) of each country with respect to the other is the same for both the commodities. Table 1.7 shows such situation. In this situation, the labour in county ‘A’ as well ‘B’ is twice as productive in commodity ‘X’ in comparison to production of commodity ‘Y’. As the internal cost and comparative cost are same in both the countries and there are no price differences, no mutually beneficial trade can take place.

Table 1.7

Commodities Countries	X	Y	Opportunity Cost Ratio
A	10	5	2.1
B	12	6	2.1

PRODUCTION POSSIBILITY CURVE

The production possibility curve (PPC) represents all the alternative combinations of two commodities that a nation can produce by fully utilizing all its factors of production. In

other words, the production possibility curve shows the frontier beyond which production cannot be carried on with the available resources and technology.

Figure 1.3 depicts the production frontier of country A. With a given amount of productive resources, it can produce either 10 units of cloth (if it employs all resources in cloth production) or 20 units of wine (if all resources are used in wine production). Alternatively, it can have a combination of cloth and wine if resources are allocated for both. For example, it may have eight units of cloth and four units of wine, or six units of cloth and eight units of wine. If it reduces the output of cloth by one unit, it can increase the output of wine by two units because with the resources required to produce one unit of cloth, two units of wine can be produced.

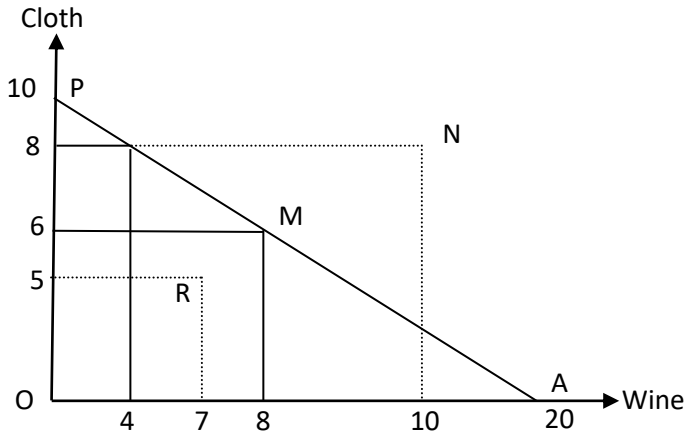

Fig. 1.3: PPC under Constant Costs

In short, any point on the production possibility curve (PPA) shows the combination of cloth and wine output when the productive resources are fully employed and allocated between cloth and wine in a certain production.

Any point above the PA line is beyond reach with the particular quantum of resources. For example, point N indicates a combination of eight units of cloth and ten units of wine which is impossible to obtain with the available resources. Again, when eight units of cloth are produced, the remaining resources are sufficient to produce only four units of wine. Any point below the production possibility curve represents a combination of cloth and wine when the available resources are not fully employed. For example, point R represents a combination of five units of cloth and seven units of wine. When only five units of cloth are

produced, the remaining resources if they are fully employed, can give an output of ten units of wine.

It may be clear from what has been explained above that we are measuring the cost of producing cloth in terms of the amount of wine foregone in order to produce one more unit of cloth and vice-versa. In other words, we are measuring the *opportunity cost* of producing a unit of the commodity.

The slope of the production possibility curve (PPA) represents the marginal rate of transformation (MRT) or the amount of the commodity that the nation must give up in order to get one more unit of the second commodity. If the nation faces constant costs or MRT, then its production possibility curve is a straight line as shown in Fig. 1.3 with slope equal to the constant opportunity costs or MRT and to the relative commodity prices in the nation.

In many cases, production is subject to the law of increasing opportunity costs or MRT. Under such conditions, the production possibility curve is concave to the origin as shown in Fig. 1.4.

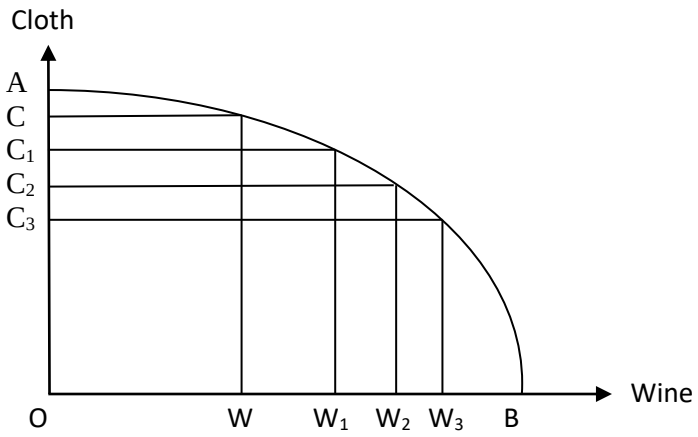

Fig. 1.4: PPC under Increasing Costs

In this figure 1.4: $AC=CC_1=C_1C_2=C_2C_3$ and $OW>WW_1>W_1W_2>W_2W_3$

Starting with OA output of cloth and zero of wine, if AC unit of cloth is given up, we can produce OW wine. But, if we give up further CC_1 output of cloth and reduce cloth production to C_1 level, the increase in wine output that can be achieved is WW_1, which is less than OW. The addition to the wine output that can be produced by giving up yet another equivalent amount of cloth is W_1W_2, which is still lower than WW_1 and so on. Thus, the amount of extra wine we can produce by decreasing production of cloth with a given amount of resources

steadily decreases as we move downward along the PPC. This implies that opportunity cost of wine in terms of cloth is steadily increasing as we increase the production of wine and decrease the production of cloth. Conversely, for every additional unit of cloth, the amount of wine is to be given up. For the subsequent increases in the cloth output, the amount of wine to be given per unit of cloth increases from W_2W_3 to W_2W_1 and from W_1W to WO.

Under increasing costs, a nation will choose a combination of output at which the MRT will equal the equilibrium relative commodity price in the nation. The equilibrium relative commodity price in the nation is determined by the supply and demand conditions in the nation. This is presented in Fig. 1.5. If PP represents the price ratio in the country, production will be at point F, representing OC_1 cloth and OW_1 wine, because at F, PP, which represents the price ratio, is tangent to the PPC. When the price ratio is PP, if the country were to produce at some other point, for example A, the opportunity cost of producing more wine would be lower than its price which implies that producers could increase their profits by producing more wine. The profit will be maximum at point F at which the relative prices and opportunity costs are equal.

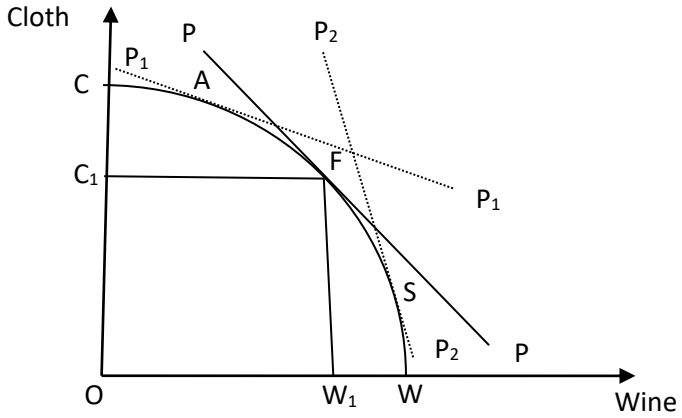

Fig. 1.5: PPC and Optimum Combination of Output

If the price of cloth increases and P_1P_1 becomes the new price ratio, producers will reallocate resources to produce more cloth and move to A at which the price line is tangent to the production frontier. On the other hand, if the cloth price falls and price ratio changes to P_2P_2, production of wine will be increased by reducing the output of cloth and a new equilibrium will be established at point S.

Changes in factor supplies will cause a shift in the PPC of a nation, *ceteris paribus*. An increase in the factors of production will cause an outward shift and a decrease will cause an inward shift of the production frontier. In Fig. 1.6 given below, the X-axis represents labour intensive goods and the Y-axis represents capital intensive goods. In this figure, AA

represents the original PPC. Supposing that all the factors of production increase in the same proportion, it will cause a shift of the PPC upward and the new PPC, A_1A_1 will be parallel to the old PPC, AA.

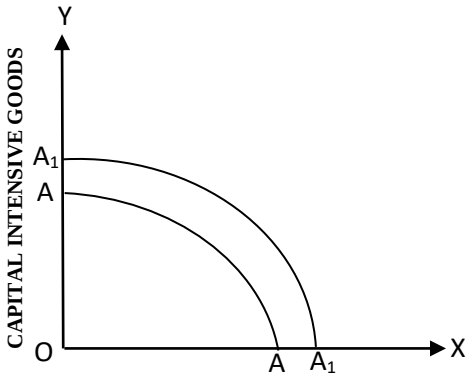

Fig. 1.6: Changes in Factor Supplies and Shift in PPC

If only one of the factors of production increases or if the increase in the factors of production is disproportionate, the shape of the new PPC will be different from that of the old one. Assume that in Fig. 1.7, the X-axis represents labour intensive goods and the Y-axis represents capital intensive goods. If only the supply of labour increases, the PPC will shift from AA to A_2A_2 as shown below in Fig. 1.7 implying that the country is now capable of producing a much larger amount of labour intensive commodities.

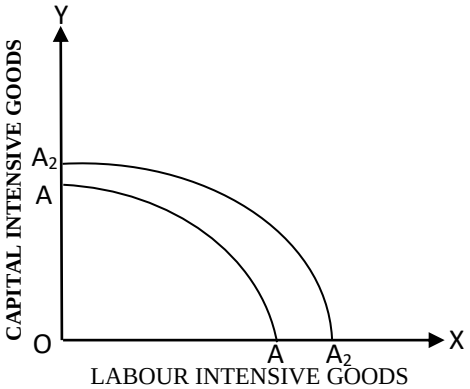

Fig. 1.7: Changes in Factor Supplies and Shift in PPC

Again, if only the supply of capital increases, the PPC will shift from AA to A_3A_3 as shown in Fig. 1.8. It implies that the country is now capable of producing a much larger amount of capital intensive commodities.

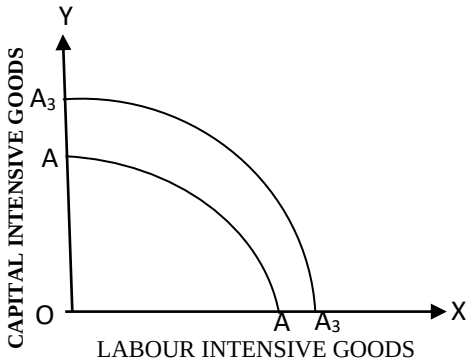

Fig. 1.8: Changes in Factor Supplies and Shift in PPC

Technological progress increases the productivity of a nation's factors of production and has the same general effect on the production possibilities as an increase in the supply of its factors of production. In respect of technological advances, we may consider the following three different cases.

1.10 Suggested Readings

D. Salvatore (2011): International Economics, Wiley, John, Tenth Edition, Delhi.

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UNIT-II

TRADE, FACTOR ENDOWMENTS AND FACTOR PRICE

Structure

2.0Introduction

2.1 Objectives

2.2 Leontief Paradox

2.3 Stolper-Samuelson Theorem: Factor Price Equalization Theorem

2.3.1 Criticism

2.3.2 Factor Price Equalisation Theory

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2.9. Suggested Readings

2.0 Introduction

Heckscher-Ohlin theory assumes that relative factor prices reflect the relative supplies of factors.

According to Leontief, Heckscher-Ohlin model is essentially static, applies to a point of time, given factor endowments and techniques of production. It may not hold well in the real world subject to continuous changes. It was found that the income elasticity of demand for food, clothing, housing and other classes of goods was remarkably similar across the nations. Thus, this explanation of the Leontief paradox is also not accepted.

The Stolper-Samuelson Theorem states that when the relative price of a commodity rises, say due to tariff, it raises the return on the factor which is being extensively used in the production of that commodity. Therefore, the real return on the country's scarce factor production will rise with the imposition of tariff. Under these circumstances there are some proofs such as Samuelson's proof and Hicksian proof. Samuelson's proof or analysis of the factor price equalisation is based upon the some assumptions. J.R. Hicks attempted to provide a proof for the absolute factor price equalisation. He remained all the assumptions taken by Samuelson.

The problem of international trade under conditions of imperfect competition has received little attention up to the present. This is probably due to two main reasons. In the first place, the question seems to be one of little practical importance, since the most practical articles of international trade are raw materials or staple commodities, which are generally produced under condition of perfect competition.

2.1 Objectives

- To understand Leontief Paradox
- To explain Stolper-Samuelson Theorem: Factor Price Equalization Theorem
- To know the mechanism of International Trade And Imperfect Competition

2.2 Leontief Paradox

Heckscher-Ohlin theory assumes that relative factor prices reflect the relative supplies of factors. Thus, abundant factor will have a lower price and vice-versa. This implies that the supply outweighs the demand in the determination of factor prices. However, when the demand for factors prevails upon the supply, factor prices so determined would not confirm to the supplies of the factors. Suppose, a country has abundance of capital and scarcity of labour in physical terms, but there is relatively greater demand for capital. In such a situation, the price of capital would be relatively higher in comparison to that of labour.

Under these circumstances, contrary to the factor endowments, the country may export labour intensive commodities and import capital intensive commodities. "Perhaps it is

this which lies behind the empirical findings by Leontief that though America is a capital abundant and labour scarce country, in the structure of its imports, capital-intensive goods are relatively smaller whereas in the structure of its exports, labour intensive goods are relatively greater."

According to Leontief, Heckscher-Ohlin model is essentially static, applies to a point of time, given factor endowments and techniques of production. It may not hold well in the real world subject to continuous changes.

For a model to become a theory, a number of empirical tests are run on it. Heckscher-Ohlin model was tested empirically for the first time by Wassily Leontief in 1951 using the US data for the year 1947. Leontief hypothised that US being a capital abundant nation should export capital intensive goods and import labour intensive goods.

To measure and analyse it, Leontief developed a technique (tool) called the input-output table. He utilized the input-output table of the U.S. economy to calculate the amount of labour and capital in a 'representative bundle' of $ 1 million worth of US exports and imports substitutes for the year 1947. This table depicts the origin and destination of each commodity in the economy. Leontief was awarded Nobel Prize in 1973 for the development of this technique.

It should be noted here that Leontief estimated capital- labour for U.S import substitutes rather than imports. Import substitutes are the goods such as automobiles that are produced at U.S. (the home country), but are also imported from abroad because of incomplete specialisation in production. It was taken into account, because the foreign production data on U.S. imports was not available. However, an explanation on it was provided by Leontief himself. It stated that even though U.S. import substitutes would be more capital intensive rather than the actual imports; because capital was relatively cheaper in U.S. than abroad. So, they should be still less capital intensive than U.S. exports if Heckscher-Ohlin model holds true. The inclusion of import substitutes instead of foreign data on actual US imports eliminated the commodities such as coffee and banana, which are not at all produced in US.

On testing the hypothesis with the given data on U.S. exports and import substitutes, Leontief found out that U.S. import substitutes were about 30% more capital intensive than U.S. exports. This is to say that United Stated was exporting labour intensive commodities and importing capital intensive commodities in 1947. This was opposite of Heckscher-Onlin model postulated, and is popularly known as the Leontief Paradox, as it was contrary to the generally held view.

However, Mead's view on Leontief paradox was that Leontief did not refute the Heckscher-Ohlin model. Instead he reasoned out that it was an optical illusion since U.S. labour was about 3 times as productive as foreign labour in 1947. High labour productivity made U.S. a labour abundant country. As a result, U.S was essentially a labour intensive nation as compared to the availability of capital. Therefore, it was appropriate that U.S. exported labour intensive goods in relation to U.S. import substitutes. This explanation was not acceptable and Leontief himself withdrew it. Reason being that while U.S. labour was more productive than foreign labour (though the assumption of it being 3 times more productive was arbitrary), so it was U.S. capital. Thus, both U.S. labour and U.S. capital should be multiplied by the same multiple, leaving the relative abundance of capital in U.S. unaffected.

Another argument was postulated that U.S. tastes were biased strongly in favour of capital intensive commodities. As a result, the prices of such commodities rose relatively. Therefore U.S. would export relatively labour intensive commodities. However, this explanation was also rejected based on the study by Houthakker in 1957 on household consumption patterns in many countries. It was found that the income elasticity of demand for food, clothing, housing and other classes of goods was remarkably similar across the nations. Thus, this explanation of the Leontief paradox is also not accepted.

Check Your Progress

1. What do you mean by Leontief Paradox?
2. Explain Heckscher-Ohlin theory of international trade.

2.3 Stolper-Samuelson Theorem: Factor Price Equalization Theorem

Wolfgang Stolper and Paul Samuelson proved that trade does split a country into clear gainers and clear losers under certain assumptions: such as, a country produces two goods (for example, wheat and cloth) with two factors of production (for example, land and labour); neither good is an input into the production of the other; competition prevails; factor supplies are given; both factors are fully employed; one good (wheat) is land-intensive and the other (cloth) is labour–intensive with or without trade; both factors are mobile between sectors (but not between countries); and opening trade raises the relative price of wheat.

The Stolper-Samuelson theorem: under the assumptions just stated, moving from no trade to free trade unambiguously raises the returns to the factor used intensively in the rising-price industry (land) and lowers the returns to the factor used intensively in the falling-price industry (labour), regardless of which goods the sellers of the two factors prefer to consume.

When tariff is imposed, the domestic producers increase the production of imported goods due to rise in their prices and decrease that of exported goods. This change in the production pattern will affect the relative prices of the factors of production. The redistributive effect is explained here with the help of Stolper-Samuelson Theorem.

The Stolper-Samuelson Theorem states that when the relative price of a commodity rises, say due to tariff, it raises the return on the factor which is being extensively used in the production of that commodity. Therefore, the real return on the country's scarce factor production will rise with the imposition of tariff.

In our example, country 'B' being a capital abundant nation imposes an import tariff on commodity 'X' which is a labour-intensive commodity and Y is a capital-intensive commodity. Thus, P_X/Py rises for both domestic consumers and producers. So, the real wage of labour (i.e., the scarce resource of country 'B') will rise. This is explained now.

After imposition of import tariff on commodity 'X', the country starts producing more of commodity 'X', and less of commodity 'Y'. Thus, the country moves from point 'D' to point 'F' in Fig. 2.1. This movement to point 'F' is the result of increase in capital–labour

ratio in the production of both the commodities which further results in increase in the price of the country's scarce factor, labour.

To illustrate it, consider the following Fig.2.1, which makes use of the Edgeworth box diagram for country 'B'. The curve O_XO_Y is the usual contract curve and isoquants are assumed to be linearly homogenous in this country.

In this figure, point 'C' depicts the autarky situation and point 'D' is the free trade production point on the contract curve. Point 'F' is the new production point when country 'B' imposes 100 percent ad valorem tariff on importable commodity 'X'. Observe from the figure that point 'F' is further away from the origin 'O_x and closer to the origin 'O_Y' than point 'D' implying post-trade capital-labour ratio. The slope of the line from the origin 'O_x to point 'F' measures the capital–labour ratio in the production of commodity 'X'. Again, the slope of the line from the origin 'Oy to point 'D' measures the capital–labour ratio in the production of commodity 'Y'.

This shows that with the rise in the price (P_X/P_Y) as a result of import tariff on commodity 'X', country 'B' reduces more of commodity 'X' and less of commodity 'Y'.

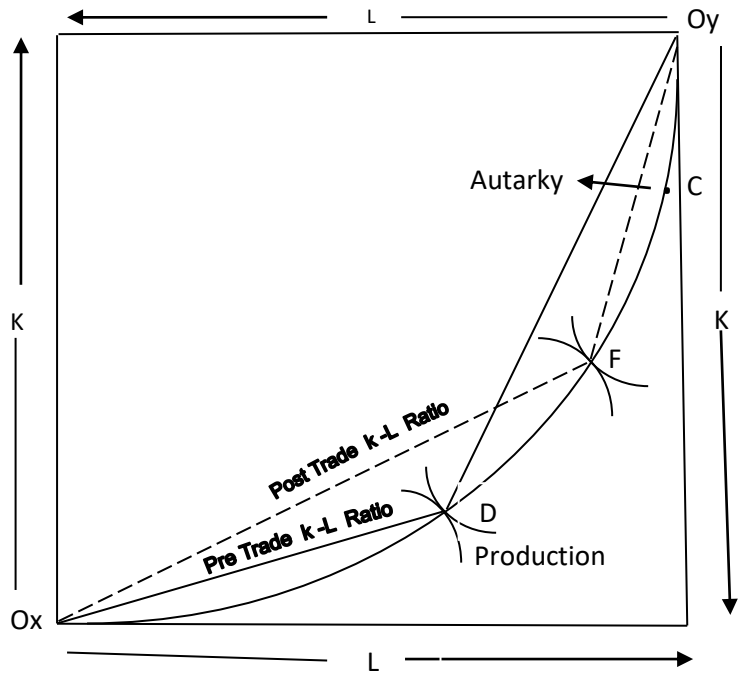

Fig 2.1: Stolper-Samuelson Theorem: Edgeworth Box Diagram

The slope of the line from the origin 'O_x to point 'D' measures the capital–labour ratio in the production of commodity 'X' implying pre trade capital-labour ratio. Further, the slope of the line from the origin O_Y to point 'D' measures the capital–labour ratio in the production of commodity 'Y' under free trade. After imposition of import tariff, the country 'B' produces at point 'F'.

The capital–labour ratio in the production of commodity 'X' and commodity 'Y' are measured by the slope of the dotted lines from the origins O_x and O_Y respectively to point 'F'. As it can be seen in the diagram, dotted lines from the origin are steeper than the solid lines O_XD and O_YD. This indicates use of higher capital-labour ratio in the production of both the commodities after imposition of import tariff than under the free trade.

When the tariff is imposed by country 'B' on commodity 'X', i.e., the labour-intensive commodity, each unit of labour is combined with more units of capital in the production of both the commodities. As a result, the productivity of labour increases. Consequently, not only the money wage but also the real wage rises in country 'B'. With labour fully employed before and after imposition of the tariff, the total earnings of labour and its share in national income will be greater. Thus, incomes get redistributed in favour of labour. It may thus, be concluded that tariff favours a factor which is used intensively after tariff implosion. In this Fig., since national income is reduced by the tariff, i.e., from point 'E' to point 'H' and the share of total income going to 'L' is higher, the rate of interest and total earnings of 'K' fall in country 'B'. Therefore, while a small nation as a whole is harmed by the tariff, its scarce factor benefits at the expense of its abundant factor.

2.3.1 Criticism

The validity of the Heckscher–Ohlin model has been questioned since the classical Leontief paradox. Indeed, Feenstra (2004) called the Heckscher–Ohlin model "hopelessly inadequate as an explanation for historical and modern trade patterns". As for the Stolper–Samuelson theorem itself, Davis and Mishra (2006) recently stated, "It is time to declare Stolper–Samuelson theorem dead". They argue that the Stolper–Samuelson theorem is "dead" because following trade liberalization in some developing countries (particularly in Latin America), wage inequality rose, and, under the assumption that these countries are labour-abundant, the Stolper–Samuelson theorem predicts that wage inequality should have

fallen. Aside from the declining trend in wage inequality in Latin America that has followed trade liberalization in the longer run; an alternative view would be to recognize that technically the Stolper–Samuelson theorem predicts a relationship between output prices and relative wages.

2.3.2 Factor Price Equalisation Theory

The factor price equalisation theory is an important corollary of the Heckscher- Ohlin theory of trade. If there is a free international movement of factors, the prices of the factors of production undisputedly get equalised. However, the classical theorists as well as Heckscher and Ohlin had assumed an international immobility of factors. This led to the crucial question of how the international trade would affect the prices of the factors of production.

Heckscher, on the one hand, suggested that international trade in commodities would act as a substitute for the international mobility of factors leading to a complete equalisation of the costs or factor prices. Ohlin, on the other hand, recognised that the international trade might result in only an incomplete or partial equalisation of prices of factors. The writers like Samuleson (1948) and Lerner (1953) discussed the possibility of a complete equalisation of factor prices.

The factor price equalisation theory picks up the argument that the labour-abundant country specialises in the export of the labour-intensive commodity because, labour is a relatively cheaper factor compared with capital. On the other hand, the capital-abundant country specialises in the export of capital-intensive commodity on account of capital being a relatively cheaper factor there. The pressure of international demand renders the abundant factor scarce and its price starts rising.

At the same time, the import of the commodities that require more input of scarce factor relieves the domestic pressure of demand for that factor, resulting in a fall in its price. The process of change in prices of factors will ultimately bring about equality in the prices of factors. It is in this sense that free international trade in commodities acts as a substitute for the international mobility of factors. Under these circumstances there are some proofs such as Samuelson’s proof and Hicksian proof. Now we shall discuss one by one.

2.3.3 Samuelson's Proof

Samuelson's proof or analysis of the factor price equalisation is based upon the following assumptions.

(i) There are two countries, say A and B.

(ii) These countries produce two commodities, say X and Y.

(iii) The production of these commodities requires only two factors of production—labour and capital.

(iv) There is free competition both in the product and labour markets.

(v) There is an absence of tariff and transport costs.

(vi) The production function related to each commodity is identical and homogeneous of degree one. It implies the production is governed by constant returns of scale.

(vii) The factor-intensities are different for the two commodities. For instance, the commodity X is labour-intensive, while commodity Y is capital- intensive. It means there is an absence of reversal of factor intensity.

(viii) Capital and labour are qualitatively identical in the two countries.

(ix) The availability of factors is quantitatively different in the two countries. The country A is supposed to be labour-abundant whereas country B is capital-abundant.

(x) There is absence of complete specialisation. It means both the countries continue to produce both the commodities even after trade takes place between them.

(xi) The factor supplies are fixed in the two countries.

(xii) In each country, there is full employment of both the factors.

(xiii) There is no mobility of factors between the countries.

(xiv) The marginal-physical product of each factor is diminishing.

(xv) The tastes are identical in the two countries.

Before trade, there is low capital-labour ratio in country A and a high capital-labour ratio in country B. As trade commences, the labour-abundant country A exports the labour-intensive commodity X and country B exports the capital-intensive commodity Y. The export of labour-intensive commodity X by A creates relative scarcity of labour and consequent rise in wage rate. It also leads to a rise in capital- labour ratio.

On the opposite, the export of capital- intensive commodity by country B will result in its scarcity there. It will cause a rise in the price of capital (rate of interest) and a consequent fall in the capital-labour ratio. These relative changes in K-L ratio will continue until the K-L ratios in both the countries become exactly equal. Along with it, the prices of the two factors also undergo changes (rise in wage rate in country A and rise in interest rate of country B) in such a manner that there is ultimate equalisation of prices of two factors in both the countries.

2.3.4 Hicksian Proof

J.R. Hicks attempted to provide a proof for the absolute factor price equalisation. He remained all the assumptions taken by Samuelson. It is assumed that price of labour is low in the labour-abundant country, while it is higher in country B which is capital-abundant. On the contrary, the price of capital is high in country A but it is low in country B.

After trade, country A exports labour-intensive commodity X and B exports capital-intensive commodity Y. l_x and l_y are the labour co-efficients for X and Y commodities and k_x and k_y are the capital co-efficient, w_a and w_b are the wage rates in the two countries, r_a and r_b are the rates of interest in these two countries. It is assumed that the unit cost of producing X and Y commodities becomes equal in the two countries after the determination of trade equilibrium.

Unit Cost of Commodity X:

$l_x.w_a + k_xr_a = l_x.w_b + k_xr_b$

Dividing both sides by k_x

$(l_x/k_x)\ w_a + r_a = (l_x/k_x)\ w_b + r_b$

$r_a - r_b = (l_x/k_x)\ w_b - (l_x/k_x)\ w_a$

$r_a - r_b = (l_x/k_x)\ [w_b - w_a]$ ….(i)

Unit Cost of Commodity Y:

$l_y.w_a + k_yr_a = l_y.w_b + k_yr_b$

Dividing both sides by k_y

$(I_y/k_y)\ w_a + r_a = (l_y/k_y)\ w_b + r_b$

$r_a - r_b = w_b\ (l_y/k_y) - (l_y/k_y)\ w_a$

$r_a - r_b = (ly/ky)(w_b - w_a)$ …(ii)

From (i) and (ii)

$(I_x/k_x)(w_b - w_a) = (l_y/k_y)(w_b - w_a)$

If trade results in equalisation of factor-intensity in the two products X and Y and $r_a = r_b$, there will also be $w_a = w_b$. It shows that after-trade equilibrium results in the equalisation of factor prices.

The relative factor price equalisation can be explained on the assumption that the value of marginal product (MP) of each factor within each country is equal before trade under the conditions of prefect competition in product and factor markets and constant return to scale.

In Country A:

MPLax .Pax =MPLay . Pay

Or, $\frac{Pax}{Pay} = \frac{MPLay}{MPLax}$

Again, MPKax .Pax =MPKay . Pay

Or, $\frac{Pax}{Pay} = \frac{MPKay}{MPKax}$

In Country B:

MPKbx .Pbx =MPkby . Pby

Or, $\frac{Pbx}{Pby} = \frac{MPKby}{MPKbx}$

Again, MPLbx .Pbx =MPLby . Pby

Or, $\frac{Pbx}{Pby} = \frac{MPLby}{MPLbx}$

After trade takes place, there is equalisation of MPL and MPK in both the countries.

$MPL_{ax} = MPL_{bx}$, $MPL_{ay} = MPL_{by}$

$MPK_{ax} = MPK_{bx}$, $MPK_{ay} = MPK_{by}$

Hence $(P_{ax}/ P_{ay}) = (P_{bx} / P_{by})$ respect of both the commodities in the two countries.

The trade will lead to a rise in K-L ratio in country A and a fall in K-L ratio in country B. The increase in demand for labour relative to capital in A causes a rise in both the ratio of P_L to P_K and the ratio of P_X to P_Y. On the other hand, export of capital-intensive commodity Y by country B causes an increase in the demand for capital relative to labour. It brings about a fall in the ratio of P_L to P_K and also a fall in the ratio of P_X to P_Y.

The increase in capital-intensity in country A occurs because of a rise in the price of labour relative to capital. On the opposite, the decrease in the capital-intensity in country B takes place because the price of capital rises relative to labour. Such changes in prices of the two factors bring about an equality in the factor price ratios in the two countries.

2.3.5 Criticisms of Factor Price Equalisation Theory

The factor price equalisation theory developed by Samuelson has been found to be deficient by several economists including Meade and Ellsworth. They raised serious doubts about the validity of this theory on account of highly restrictive and unrealistic assumptions. They believe that there can only be partial equalisation of factor prices. There are serious obstacles to a complete equalisation of factor prices in the trading countries.

Such obstacles are discussed below:

(i) Tariff and Non-Tariff Barriers:

The theory rests upon the assumption that there are no tariff and non-tariff barriers to trade. In actual reality, such barriers do exist. It was on account of them that Ohlin ruled out the possibility of complete equalisation of factor prices.

(ii) Transport Costs:

The factor price equalisation theory takes another unrealistic assumption that transport costs are absent. In fact, the import and export of commodities do involve transport costs, which not only have restrictive effect on the product mobility but may also affect the comparative advantages of the trading countries. The existences of transport costs are likely to prevent the equalisation of factor prices.

(iii) Complete Specialisation:

This theory assumes that the trading countries are engaged in the production of both the commodities. In other words, there is only partial or incomplete specialisation. When the trading countries are of unequal size, there is possibility that there is complete specialisation in at least the smaller country. In the event of complete specialisation, there is little possibility of complete factor price equalisation.

(iv) Identical Production Function:

Samuelson's factor price equalisation theory assumes that production functions are identical in the two trading countries. Even if the two countries have the same resources, yet their productive capacities are different because of natural, technical and sociological differences between them. The diversities in their production functions may create hindrance in the equalisation of factor prices.

(v) Absence of Perfect Competition:

This theory rests upon the assumption that there are the conditions of prefect competition in the product and factor markets. In actual reality, the prefect competition does not exist. In the real market situations like oligopoly or monopolistic competition, there are rigidities in the product and factor markets that prevent the possibility of equalisation of factor prices.

(vi) Increasing Returns to Scale:

The factor price equalisation theorem assumes that there is a first-degree homogeneous production function, which implies that the production is governed by the constant returns to scale. If the economies of scale are present, according to Meade, the theory will become invalid for two reasons. Firstly, it will result in the emergence of monopolies and consequent breakdown of the apparatus based on the assumption of perfect competition. Secondly, the increasing returns to scale will lead to complete specialisation, which again rules out the possibility of equalisation of factor prices.

(vii) Changes in Factor Supplies:

The theorem takes the assumption that the factor supplies remain fixed in the trading countries. In actual reality, however, there are changes in factor supplies and these changes will create difficulties in the equalisation of factor prices.

(viii) Dynamic Conditions: The factor price equalisation theory assumes static conditions such as fixed factor endowments, techniques and same taste pattern in the trading countries. In the actual dynamic conditions, the continuous changes take place in all the relevant factors and variables and many often it is found that the differences in factor prices get widened rather than being eliminated.

Such a trend has been confirmed by economists like Kindelberger, Myrdal and Sodresten. In the words of Kindelberger, "…trade between developed and less developed countries widens the gap in living standards (the factor prices such as wages) rather than narrows, and it is evident after centuries of trade that there are still poor as well as rich countries.

(ix) Multi-Country, Multi-Commodity and Multi-Factor Trade:

The theorem can deal efficiently only in respect of trade involving two countries, two commodities and two factors. The theory is likely to become indeterminate in the multi-country, multi-commodity and multi-factor trade situation. If the number of productive factors exceeds the number of commodities, the theory breaks down completely.

(x) Factor-Intensity Reversal:

This theory assumes that there is an absence of factor intensity reversal. It means the labour-surplus country will export only labour-intensive commodity and the capital-surplus country will export the capital- intensive commodity. If there is reversal of factor intensity, the factor price equalisation theorem will fail to hold. If the labour-surplus country A specialises in the labour-intensive commodity X, the absolute and relative wage rates will rise in this country.

If country B specialises in commodity Y but produces it thorough labour-intensive method, the demand for labour will increase even in this country resulting in a rise in the absolute and relative wage rate. As the wage rates rise in the two countries, whether the difference in absolute and relative wage rates will rise, fall or remain unchanged, will depend on the rates at which wages increase in the two countries. Thus the factor- intensity reversal can result in the invalidation of the factor price equalisation theory.

The above arguments suggest that factor price equalisation cannot take place in actual dynamic realities. It, however, does not mean that the theorem is completely invalid. It only means that the assumptions of this theorem, being unrealistic, lead to an unrealistic conclusion.

There is little doubt that the movement of products from one country to another can at least reduce the factor price differentials. In the absence of trade, such differences are likely to be considerably large. In the words of Robert Heller, "…the effect of international trade may be considered as a 'leaning against the wind' in that factor price differentials would be even larger in the absence of trade."

Check your Progress

1. Define Stolper-Samuelson Theorem in context of international trade.
2. What do you mean by Factor Price Equalization Theorem?
3. Define Samuelson's Proof in context ofFactor Price Equalization Theorem.
4. Define Hicksian Proof in context ofFactor Price Equalization Theorem.
5. What are the Criticisms to Factor Price EqualisationTheory.

2.4 International Trade and Imperfect Competition

The stratagem to simplify the analysis is to start from an integrated world economy, which will be subsequently divided into two countries. So at the beginning we have a closed economic system (the world), which produces two commodities: a differentiated commodity, say good A and a homogeneous commodity, say food good B. In industry A, there are increasing returns to scale and monopolistic completion, while in industry B there are constant returns to scale and perfect competition. Both industries use homogeneous capital and labour as factors of production; both factors are freely mobile between industries and fully employed. Given the prevailing set of factor prices and goods prices, there will be a certain factor allocation between the two sectors.

The problem of international trade under conditions of monopolistic or imperfect competition, as these terms are used by Prof. Chamberlin and by Mrs. Robinson has received little attention up to the present. This is probably due to two main reasons. In the first place, the question seems to be one of little practical importance, since the most practical articles of international trade are raw materials or staple commodities, which are generally produced

under condition of perfect competition. The second and perhaps even more logical reason is that it seems to be almost impossible to arrive at any definite conclusions regarding the question whether international trade will take place, and if it does, to what extent and with what result, when the commodities are produced under imperfect competition. Mr. Beach concludes that the higher cost of production and the smaller output under imperfect completion will cause the volume of trade also to be smaller than it would be under perfect competition: "……if monopolistic competition prevailed throughout the economic system, the volume of international trade would generally be less than it would be under pure competition. The higher costs of production and the reduction in output would tend to restrict foreign trade as well as domestic trade……..", he does not, however, answer the question.

Imperfect competition has come to the fore in the theoretical analysis of international trade. This development was driven by a number of factors. The theory that has been developed over this period succeeds in providing a fuller explanation of recent developments in trade flows, and also supports a rich set of policy analyses, linking trade and industrial policy, and illuminating economic integration. It is noteworthy that the theory can be integrated with the more traditional factor endowment and general equilibrium concerns of trade theory; in some circumstances it can be placed 'on top of' traditional theory, providing a theory of both inter- and intra-industry trade. It also opens the way to constructing a theory of 'new economic geography', incorporating the location decisions of mobile factors of production.

Here, we focus on market power derived from product differentiation. Our primary concern is the pattern of trade, and we develop a complete synthesis of factor endowment and market access determined trade flows. We also look at factor mobility, and the possibility that this may lead to the agglomeration of economic activity.

Oligopolistic Interaction

If firms from different countries compete on international markets that are less than perfectly competitive, then what form does their competitive interaction take? What trade flows does it create? And what are the welfare effects of trade and of trade policy'! To answer these questions we devote here to the study of markets in which there is strategic interaction between firms.

As is often remarked, whereas there is only one theory of perfect competition, the problem with imperfect competition is that there are many theories. These theories are unfilled in their use of modern game theory -- we shall be analysing Nash equilibria -- but differ principally in their specification of the strategic variable chosen by firms. In the following two sub-sections we shall look first at the case where firms' strategic variables are price, output or sales quantities. In Nash equilibrium no firm has an incentive to change the value of its strategic variable given the values selected by other firms. However, the equilibrium can be quite different according as to whether prices or quantities are chosen.

The difference between price competition (Bertrand) and quantity competition (Cournot) is well known from industrial organisation. In the international trade context further distinction becomes important. Firms may chooses quantities (or prices) in each market separately, which will refer to as the case of segmented markets. Or they may select a single world-wide quantity (or price), which we shall refer to as integrated market. We shall focus on the segmented market case, merely commenting on the difference made by integrated markets.

Price Competition

The simplest framework we can consider is a single industry containing one firm in each country, l and 2. These firms have constant marginal costs, denoted c1 and c2 respectively, for producing a homogeneous product. We shall assume that markets are segmented, so it will look at just one country's market (there is no interaction between the two markets, so the other market can be described analogously. We shall look at the country l market and suppose that there is a trade cost, *t* per unit that the firm in country 2 must incur if it is to supply country l, making its effective marginal cost. Each firm chooses its price, what does the equilibrium look like, and does it involve trade? Since both firms produce the same homogeneous product, all sales will go to whichever firm has the lowest price. If D is the market demand function, we therefore have demands faced by each firm.

What is optimal trade policy in this model? To answer this question supposes that *t* is not a real trade cost, but a tariff, creating revenue which is transferred to the country 1 government.

If c2 <cl then welfare is maximised by setting *t* = cl - c2. This value of t has two properties. First, at this value of t, c2 + t >c1; this means that the domestic (country 1) firm (by assumption the lower cost supplier) takes the entire market. Second, the domestic firm is induced to set price equal to its marginal cost.

If *c2* > cl then the optimal policy is *t* = c2 – *c1.* The foreign (country 2) firm will then take the entire market at this price, just less than the minimum price at which the domestic firm is willing to supply. This policy generates tariff revenue, so the unit cost of imports to economy l as a whole is the consumer price minus tariff revenue, which is the world minimum production cost. The policy, therefore, amounts to the lowest cost producer supply the market (through imports), but using the tariff to extract any profits that the importer might make.

Bertrand competition with homogeneous products is notorious for giving very sharp and extreme results, and this is what we see in this case. Although quite illuminating, the model fails to predict intra-industry trade, and effects are probably too extreme to give an adequate representation of many industries. We now turn to a case where the sharp price under-cutting of Bertrand competition does not take place.

We have reached the conclusion that country 1, the relatively capital abundant country, exports the relatively capital-intensive good A, and imports the relatively labour-intensive good B. These results are perfectly in line with the conventional Heckscher- Ohlin theorem. But there is more to it than that: while international trade in good B will be of the conventional inter-industry type, trade in good A will be of the intra-industry type. We have in fact just seen that the exports of A are net exports: this means that country 1 will simultaneously export and import goods belonging to industry A, the exports being however greater than the imports. To show this, we must recall that– as a consequence of economies of scale in the production of each variety of commodities A -no country can produce all the range of varieties of this commodity, but only pat. Therefore, even if both countries produce manufactures, each will produce different varieties. Thus, to satisfy domestic demand, country 1 will import from country 2 the varieties that it does not produce, and export to country 2 the varieties that it produces, to meet county 2’s domestic demand. There is,

consequently, intra-industry trade (that, as we have seen above, in the aggregate gives rise to net exports of A from coutny1), which will coexist with inter-industry trade.

Trade Policy

It is on the study of the effects of a tariff (or other protective measures) on the number of varieties produced and on the unit cost of production that the free trade versus protectionism debate has concentrated its attention. Protectionist measures could indeed allow domestic firms to increase the scale of production and so bring about a price decrease due to internal economies. This can be seen as a new argument in favour of the protection of the infant industry, a problem already examined in the context of the orthodox theory. The effect on the number of varieties produced is not so clear. In addition, the use of protectionist measures can give rise to retaliation, in which case the result is probably a reduction in social welfare even when the effect of protectionism would have been positive in the absence of retaliation.

Check your Progress

1. Explain International Trade and Imperfect Competition.
2. Define Oligopolistic Interaction and Price Competition under International Trade.

2.5 Summary

Heckscher-Ohlin theory assumes that relative factor prices reflect the relative supplies of factors. Thus, abundant factor will have a lower price and vice-versa. This implies that the supply outweighs the demand in the determination of factor prices. However, when the demand for factors prevails upon the supply, factor prices so determined would not confirm to the supplies of the factors. Suppose, a country has abundance of capital and scarcity of labour in physical terms, but there is relatively greater demand for capital. In such a situation, the price of capital would be relatively higher in comparison to that of labour.

Wolfgang Stolper and Paul Samuelson proved that trade does split a country into clear gainers and clear losers under certain assumptions: such as, a country produces two goods (for example, wheat and cloth) with two factors of production (for example, land and labour);

neither good is an input into the production of the other; competition prevails; factor supplies are given; both factors are fully employed; one good (wheat) is land-intensive and the other (cloth) is labour–intensive with or without trade; both factors are mobile between sectors (but not between countries); and opening trade raises the relative price of wheat.

The factor price equalisation theory is an important corollary of the Heckscher- Ohlin theory of trade. If there is a free international movement of factors, the prices of the factors of production undisputedly get equalised. However, the classical theorists as well as Heckscher and Ohlin had assumed an international immobility of factors. This led to the crucial question of how the international trade would affect the prices of the factors of production. Under these circumstances there are some proofs such as Samuelson's proof and Hicksian proof. Now we shall discuss one by one.

The problem of international trade under conditions of imperfect competition, as these terms are used by Prof. Chamberlin and by Mrs. Robinson has received little attention up to the present. This is probably due to two main reasons. In the first place, the question seems to be one of little practical importance, since the most practical articles of international trade are raw materials or staple commodities, which are generally produced under condition of perfect competition.

2.6 Key Words

Heckscher-Ohlin theory:

Heckscher-Ohlin theory assumes that relative factor prices reflect the relative supplies of factors. Abundant factor will have a lower price and vice-versa. This implies that the supply outweighs the demand in the determination of factor prices.

The Stolper-Samuelson theorem:

This theorem states that moving from no trade to free trade unambiguously raises the returns to the factor used intensively in the rising-price industry (land) and lowers the returns to the factor used intensively in the falling-price industry (labour), regardless of which goods the sellers of the two factors prefer to consume.

Factor Price Equalisation Theory:

The factor price equalisation theory sates that the labour-abundant country specialises in the export of the labour-intensive commodity because, labour is a relatively cheaper factor compared with capital. On the other hand, the capital-abundant country specialises in the export of capital-intensive commodity on account of capital being a relatively cheaper factor there.

International Trade and Imperfect Competition:

The problem of international trade under conditions of imperfect competition, as these terms are used by Prof. Chamberlin and by Mrs. Robinson has received little attention up to the present. This is probably due to two main reasons. In the first place, the question seems to be one of little practical importance, since the most practical articles of international trade are raw materials or staple commodities, which are generally produced under condition of perfect competition. The second and perhaps even more logical reason is that it seems to be almost impossible to arrive at any definite conclusions regarding the question whether international trade will take place, and if it does, to what extent and with what result, when the commodities are produced under imperfect competition.

2.7 Questions

1. Explain International Trade and Imperfect Competition.
2. Define Oligopolistic Interaction and Price Competition under International Trade.
3. Define Stolper-Samuelson Theorem in context of international trade.
4. What do you mean by Factor Price Equalization Theorem?
5. Define Samuelson's Proof in context of Factor Price Equalization Theorem.
6. Define Hicksian Proof in context of Factor Price Equalization Theorem.
7. What are the Criticisms to Factor Price EqualisationTheory.
8. What do you mean by Leontief Paradox?
9. Explain Heckscher-Ohlin theory of international trade.

2.8 Questions and Answers

2.8.1 Short-Answer Questions

1. What do you mean by Leontief Paradox?

According to Leontief, Heckscher-Ohlin model is essentially static, applies to a point of time, given factor endowments and techniques of production. It may not hold well in the real world subject to continuous changes.

For a model to become a theory, a number of empirical tests are run on it. Heckscher-Ohlin model was tested empirically for the first time by Wassily Leontief in 1951 using US data for the year 1947. Leontief hypothised that US being a capital abundant nation should export capital intensive goods and import labour intensive goods.

To measure and analyse it, Leontief developed a technique (tool) called the input-output table. He utilized the input-output table of the U.S. economy to calculate the amount of labour and capital in a 'representative bundle' of $ 1 million worth of US exports and imports substitutes for the year 1947. This table depicts the origin and destination of each commodity in the economy. Leontief was awarded Nobel Prize in 1973 for the development of this technique.

It should be noted here that Leontief estimated capital- labour for U.S import substitutes rather than imports. Import substitutes are the goods such as automobiles that are produced at U.S. (the home country), but are also imported from abroad because of incomplete specialisation in production. It was taken into account, because the foreign production data on U.S. imports was not available. However, an explanation on it was provided by Leontief himself. It stated that even though U.S. import substitutes would be more capital intensive rather than the actual imports; because capital was relatively cheaper in U.S. than abroad. So, they should be still less capital intensive than U.S. exports if Heckscher-Ohlin model holds true. The inclusion of import substitutes instead of foreign data on actual US imports eliminated the commodities such as coffee and banana, which are not at all produced in US.

2. What is Stolper-Samuelson Theorem?

Wolfgang Stolper and Paul Samuelson proved that trade does split a country into clear gainers and clear losers under certain assumptions: such as, a country produces two goods (for example, wheat and cloth) with two factors of production (for example, land and labour); neither good is an input into the production of the other; competition prevails; factor supplies are given; both factors are fully employed; one good (wheat) is land-intensive and the other (cloth) is labour–intensive with or without trade; both factors are mobile between sectors (but not between countries); and opening trade raises the relative price of wheat.

The Stolper-Samuelson theorem: under the assumptions just stated, moving from no trade to free trade unambiguously raises the returns to the factor used intensively in the rising-price industry (land) and lowers the returns to the factor used intensively in the falling-price industry (labour), regardless of which goods the sellers of the two factors prefer to consume.

When tariff is imposed, the domestic producers increase the production of imported goods due to rise in their prices and decrease that of exported goods. This change in the production pattern will affect the relative prices of the factors of production. The redistributive effect is explained here with the help of Stolper-Samuelson Theorem.

The Stolper-Samuelson Theorem states that when the relative price of a commodity rises, say due to tariff, it raises the return on the factor which is being extensively used in the production of that commodity. Therefore, the real return on the country's scarce factor production will rise with the imposition of tariff.

3. What is Factor Price Equalisation Theory?

The factor price equalisation theory states that the labour-abundant country specialises in the export of the labour-intensive commodity because, labour is a relatively cheaper factor compared with capital. On the other hand, the capital-abundant country specialises in the export of capital-intensive commodity on account of capital being a relatively cheaper factor there. The pressure of international demand renders the abundant factor scarce and its price starts rising.

At the same time, the import of the commodities that require more input of scarce factor relieves the domestic pressure of demand for that factor, resulting in a fall in its price. The process of change in prices of factors will ultimately bring about equality in the prices of factors. It is in this sense that free international trade in commodities acts as a substitute for the international mobility of factors. Under these circumstances there are some proofs such as Samuelson's proof and Hicksian proof. Now we shall discuss one by one.

4. Describe the Samuelson's Proof in view of factor price equalization.

Samuelson's proof or analysis of the factor price equalisation is based upon the following assumptions

(i) There are two countries, say A and B.

(ii) These countries produce two commodities, say X and Y.

(iii) The production of these commodities requires only two factors of production—labour and capital.

(iv) There is free competition both in the product and labour markets.

(v) There is an absence of tariff and transport costs.

(vi) The production function related to each commodity is identical and homogeneous of degree one. It implies the production is governed by constant returns of scale.

(vii) The factor-intensities are different for the two commodities. For instance, the commodity X is labour-intensive, while commodity Y is capital- intensive. It means there is an absence of reversal of factor intensity.

(viii) Capital and labour are qualitatively identical in the two countries.

(ix) The availability of factors is quantitatively different in the two countries. The country A is supposed to be labour-abundant whereas country B is capital-abundant.

(x) There is absence of complete specialisation. It means both the countries continue to produce both the commodities even after trade takes place between them.

(xi) The factor supplies are fixed in the two countries.

(xii) In each country, there is full employment of both the factors.

(xiii) There is no mobility of factors between the countries.

(xiv) The marginal-physical product of each factor is diminishing.

(xv) The tastes are identical in the two countries.

Before trade, there is low capital-labour ratio in country A and a high capital-labour ratio in country B. As trade commences, the labour-abundant country A exports the labour-intensive commodity X and country B exports the capital-intensive commodity Y. The export of labour-intensive commodity X by A creates relative scarcity of labour and consequent rise in wage rate. It also leads to a rise in capital- labour ratio.

On the opposite, the export of capital- intensive commodity by country B will result in its scarcity there. It will cause a rise in the price of capital (rate of interest) and a consequent fall in the capital-labour ratio. These relative changes in K-L ratio will continue until the K-L ratios in both the countries become exactly equal. Along with it, the prices of the two factors also undergo changes (rise in wage rate in country A and rise in interest rate of country B) in such a manner that there is ultimate equalisation of prices of two factors in both the countries.

5. Describe the Hicksian Proof in view of factor price equalization.

J.R. Hicks attempted to provide a proof for the absolute factor price equalisation. He remained all the assumptions taken by Samuelson. It is assumed that price of labour is low in the labour-abundant country, while it is higher in country B which is capital-abundant. On the contrary, the price of capital is high in country A but it is low in country B.

After trade, country A exports labour-intensive commodity X and B exports capital-intensive commodity Y. l_x and l_y are the labour co-efficients for X and Y commodities and k_x and k_y are the capital co-efficient, w_a and w_b are the wage rates in the two countries, r_a and r_b are the rates of interest in these two countries. It is assumed that the unit cost of producing X and Y commodities becomes equal in the two countries after the determination of trade equilibrium.

Unit Cost of Commodity X:

$l_x.w_a + k_xr_a = l_x.w_b + k_xr_b$

Dividing both sides by k_x

$(l_x/k_x)\ w_a + r_a = (l_x/k_x)\ w_b + r_b$

$r_a - r_b = (l_x/k_x)\ w_b - (l_x/k_x)\ w_a$

$r_a - r_b = (l_x/k_x)\,[w_b - w_a]$ ….(i)

Unit Cost of Commodity Y:

$l_y.w_a + k_y r_a = l_y.w_b + k_y r_b$

Dividing both sides by k_y

$(I_y/k_y)\, w_a + r_a = (l_y/k_y)\, w_b + r_b$

$r_a - r_b = w_b\,(l_y/k_y) - (l_y/k_y)\, w_a$

$r_a - r_b = (ly/ky)(w_b - w_a)$ …(ii)

From (i) and (ii)

$(I_x/k_x)\,(w_b - w_a) = (l_y/k_y)\,(w_b - w_a)$

If trade results in equalisation of factor-intensity in the two products X and Y and $r_a = r_b$, there will also be $w_a = w_b$. It shows that after-trade equilibrium results in the equalisation of factor prices.

The relative factor price equalisation can be explained on the assumption that the value of marginal product (MP) of each factor within each country is equal before trade under the conditions of prefect competition in product and factor markets and constant return to scale.

In Country A:

MPLax .Pax =MPLay . Pay

Or, $\frac{Pax}{Pay} = \frac{MPLay}{MPLax}$

Again, MPKax .Pax =MPKay . Pay

Or, $\frac{Pax}{Pay} = \frac{MPKay}{MPKax}$

In Country B:

MPKbx .Pbx =MPkby . Pby

Or, $\frac{Pbx}{Pby} = \frac{MPKby}{MPKbx}$

Again, MPLbx .Pbx =MPLby . Pby

Or, $\frac{Pbx}{Pby} = \frac{MPLby}{MPLbx}$

After trade takes place, there is equalisation of MPL and MPK in both the countries.

$MPL_{ax} = MPL_{bx}$, $MPL_{ay} = MPL_{by}$

$MPK_{ax} = MPK_{bx}$, $MPK_{ay} = MPK_{by}$

Hence $(P_{ax}/ P_{ay}) = (P_{bx} / P_{by})$ respect of both the commodities in the two countries.

The trade will lead to a rise in K-L ratio in country A and a fall in K-L ratio in country B. The increase in demand for labour relative to capital in A causes a rise in both the ratio of P_L to P_K and the ratio of P_X to P_Y. On the other hand, export of capital-intensive commodity Y by country B causes an increase in the demand for capital relative to labour. It brings about a fall in the ratio of P_L to P_K and also a fall in the ratio of P_X to P_Y.

The increase in capital-intensity in country A occurs because of a rise in the price of labour relative to capital. On the opposite, the decrease in the capital-intensity in country B takes place because the price of capital rises relative to labour. Such changes in prices of the two factors bring about an equality in the factor price ratios in the two countries.

6. Describe the Criticisms to Factor Price Equalisation Theory.

(i) Tariff and Non-Tariff Barriers: The theory rests upon the assumption that there are no tariff and non-tariff barriers to trade. In actual reality, such barriers do exist. It was on account of them that Ohlin ruled out the possibility of complete equalisation of factor prices.

(ii) Transport Costs: The factor price equalisation theory takes another unrealistic assumption that transport costs are absent. In fact, the import and export of commodities do involve transport costs, which not only have restrictive effect on the product mobility but

may also affect the comparative advantages of the trading countries. The existences of transport costs are likely to prevent the equalisation of factor prices.

(iii) Complete Specialisation: This theory assumes that the trading countries are engaged in the production of both the commodities. In other words, there is only partial or incomplete specialisation. When the trading countries are of unequal size, there is possibility that there is complete specialisation in at least the smaller country. In the event of complete specialisation, there is little possibility of complete factor price equalisation.

(iv) Identical Production Function: Samuelson's factor price equalisation theory assumes that production functions are identical in the two trading countries. Even if the two countries have the same resources, yet their productive capacities are different because of natural, technical and sociological differences between them. The diversities in their production functions may create hindrance in the equalisation of factor prices.

(v) Absence of Perfect Competition: This theory rests upon the assumption that there are the conditions of prefect competition in the product and factor markets. In actual reality, the prefect competition does not exist. In the real market situations like oligopoly or monopolistic competition, there are rigidities in the product and factor markets that prevent the possibility of equalisation of factor prices.

(vi) Increasing Returns to Scale: The factor price equalisation theorem assumes that there is a first-degree homogeneous production function, which implies that the production is governed by the constant returns to scale. If the economies of scale are present, according to Meade, the theory will become invalid for two reasons. Firstly, it will result in the emergence of monopolies and consequent breakdown of the apparatus based on the assumption of perfect competition. Secondly, the increasing returns to scale will lead to complete specialisation, which again rules out the possibility of equalisation of factor prices.

(vii) Changes in Factor Supplies: The theorem takes the assumption that the factor supplies remain fixed in the trading countries. In actual reality, however, there are changes in factor supplies and these changes will create difficulties in the equalisation of factor prices.

(viii) Dynamic Conditions: The factor price equalisation theory assumes static conditions such as fixed factor endowments, techniques and same taste pattern in the trading countries. In the actual dynamic conditions, the continuous changes take place in all the relevant factors and variables and many often it is found that the differences in factor prices get widened rather than being eliminated.

Such a trend has been confirmed by economists like Kindelberger, Myrdal and Sodresten. In the words of Kindelberger, "…trade between developed and less developed

countries widens the gap in living standards (the factor prices such as wages) rather than narrows, and it is evident after centuries of trade that there are still poor as well as rich countries.

(ix) Multi-Country, Multi-Commodity and Multi-Factor Trade: The theorem can deal efficiently only in respect of trade involving two countries, two commodities and two factors. The theory is likely to become indeterminate in the multi-country, multi-commodity and multi-factor trade situation. If the number of productive factors exceeds the number of commodities, the theory breaks down completely.

(x) Factor-Intensity Reversal: This theory assumes that there is an absence of factor intensity reversal. It means the labour-surplus country will export only labour-intensive commodity and the capital-surplus country will export the capital- intensive commodity. If there is reversal of factor intensity, the factor price equalisation theorem will fail to hold. If the labour-surplus country A specialises in the labour-intensive commodity X, the absolute and relative wage rates will rise in this country.

If country B specialises in commodity Y but produces it thorough labour-intensive method, the demand for labour will increase even in this country resulting in a rise in the absolute and relative wage rate. As the wage rates rise in the two countries, whether the difference in absolute and relative wage rates will rise, fall or remain unchanged, will depend on the rates at which wages increase in the two countries. Thus the factor- intensity reversal can result in the invalidation of the factor price equalisation theory.

The above arguments suggest that factor price equalisation cannot take place in actual dynamic realities. It, however, does not mean that the theorem is completely invalid. It only means that the assumptions of this theorem, being unrealistic, lead to an unrealistic conclusion.

There is little doubt that the movement of products from one country to another can at least reduce the factor price differentials. In the absence of trade, such differences are likely to be considerably large. In the words of Robert Heller, "…the effect of international trade may be considered as a 'leaning against the wind' in that factor price differentials would be even larger in the absence of trade."

2.8.2 Long-Answers Questions

1. **Describe elaborately Leontief Paradox.**

Heckscher-Ohlin theory assumes that relative factor prices reflect the relative supplies of factors. Thus, abundant factor will have a lower price and vice-versa. This implies that the supply outweighs the demand in the determination of factor prices. However, when the demand for factors prevails upon the supply, factor prices so determined would not confirm to the supplies of the factors. Suppose, a country has abundance of capital and scarcity of labour in physical terms, but there is relatively greater demand for capital. In such a situation, the price of capital would be relatively higher in comparison to that of labour.

Under these circumstances, contrary to the factor endowments, the country may export labour intensive commodities and import capital intensive commodities. "Perhaps it is this which lies behind the empirical findings by Leontief that though America is a capital abundant and labour scarce country, in the structure of its imports, capital-intensive goods are relatively smaller whereas in the structure of its exports, labour intensive goods are relatively greater."

According to Leontief, Heckscher-Ohlin model is essentially static, applies to a point of time, given factor endowments and techniques of production. It may not hold well in the real world subject to continuous changes.

For a model to become a theory, a number of empirical tests are run on it. Heckscher-Ohlin model was tested empirically for the first time by Wassily Leontief in 1951 using US data for the year 1947. Leontief hypothised that US being a capital abundant nation should export capital intensive goods and import labout intensive goods.

To measure and analyse it, Leontief developed a technique (tool) called the input-output table. He utilized the input-output table of the U.S. economy to calculate the amount of labour and capital in a 'representative bundle' of $ 1 million worth of US exports and imports substitutes for the year 1947. This table depicts the origin and destination of each commodity in the economy. Leontief was awarded Nobel Prize in 1973 for the development of this technique.

It should be noted here that Leontief estimated capital- labour for U.S import substitutes rather than imports. Import substitutes are the goods such as automobiles that are produced at U.S. (the home country), but are also imported from abroad because of incomplete specialisation in production. It was taken into account, because the foreign production data on U.S. imports was not available. However, an explanation on it was provided by Leontief himself. It stated that even though U.S. import substitutes would be more capital intensive rather than the actual imports; because capital was relatively cheaper in U.S. than abroad. So, they should be still less capital intensive than U.S. exports if Heckscher-Ohlin model holds true. The inclusion of import substitutes instead of foreign data on actual US imports, eliminated the commodities such as coffee and banana, which are not at all produced in US.

On testing the hypothesis with the given data on U.S. exports and import substitutes, Leontief found out that U.S. import substitutes were about 30% more capital intensive than U.S. exports. This is to say that United Stated was exporting labour intensive commodities and importing capital intensive commodities in 1947. This was opposite of Heckscher-Onlin model postulated, and is popularly known as the Leontief Paradox, as it was contrary to the generally held view.

However, Mead's view on Leontief paradox was that Leontief did not refute the Heckscher-Ohlin model. Instead he reasoned out that it was an optical illusion since U.S. labour was about 3 times as productive as foreign labour in 1947. High labour productivity made U.S. a labour abundant country. As a result, U.S was essentially a labour intensive nation as compared to the availability of capital. Therefore, it was appropriate that U.S. exported labour intensive goods in relation to U.S. import substitutes. This explanation was not acceptable and Leontief himself withdrew it. Reason being that while U.S. labour was more productive than foreign labour (though the assumption of it being 3 times more productive was arbitrary), so it was U.S. capital. Thus, both U.S. labour and U.S. capital should be multiplied by the same multiple, leaving the relative abundance of capital in U.S. unaffected.

Another argument was postulated that U.S. tastes were biased strongly in favour of capital intensive commodities. As a result, the prices of such commodities rose relatively.

Therefore U.S. would export relatively labour intensive commodities. However, this explanation was also rejected based on the study by Houthakker in 1957 on household consumption patterns in many countries. It was found that the income elasticity of demand for food, clothing, housing and other classes of goods was remarkably similar across the nations. Thus, this explanation of the Leontief paradox is also not accepted.

2. **Explain Stolper-Samuelson Theorem.**

The Stolper-Samuelson theorem: Moving from no trade to free trade unambiguously raises the returns to the factor used intensively in the rising-price industry (land) and lowers the returns to the factor used intensively in the falling-price industry (labour), regardless of which goods the sellers of the two factors prefer to consume.

When tariff is imposed, the domestic producers increase the production of imported goods due to rise in their prices and decrease that of exported goods. This change in the production pattern will affect the relative prices of the factors of production. The redistributive effect is explained here with the help of Stolper-Samuelson Theorem.

The Stolper-Samuelson Theorem states that when the relative price of a commodity rises, say due to tariff, it raises the return on the factor which is being extensively used in the production of that commodity. Therefore, the real return on the country's scarce factor production will rise with the imposition of tariff.

In our example, country 'B' being a capital abundant nation imposes an import tariff on commodity 'X' which is a labour-intensive commodity and Y is a capital-intensive commodity. Thus, P_X/Py rises for both domestic consumers and producers. So, the real wage of labour (i.e., the scarce resource of country 'B') will rise. This is explained now.

After imposition of import tariff on commodity 'X', the country starts producing more of commodity 'X' , and less of commodity 'Y'. Thus, the country moves from point 'D' to point 'F' in Fig. 2.1. This movement to point 'F' is the result of increase in capital–labour ratio in the production of both the commodities which further results in increase in the price of the country's scarce factor, labour.

To illustrate it, consider the following Fig.2.1, which makes use of the Edgeworth box diagram for country 'B'. The curve O_XO_Y is the usual contract curve and isoquants are assumed to be linearly homogenous in this country.

In this figure, point 'C' depicts the autarky situation and point 'D' is the free trade production point on the contract curve. Point 'F' is the new production point when country 'B' imposes 100 percent ad valorem tariff on importable commodity 'X'. Observe from the figure that point 'F' is further away from the origin 'O_x and closer to the origin 'O_Y' than point 'D' implying post-trade capital-labour ratio. The slope of the line from the origin 'O_x to point 'F' measures the capital–labour ratio in the production of commodity 'X'. Again, the slope of the line from the origin 'Oy to point 'D' measures the capital–labour ratio in the production of commodity 'Y'.

This shows that with the rise in the price (P_X/P_Y) as a result of import tariff on commodity 'X', country 'B' reduces more of commodity 'X' and less of commodity 'Y'.

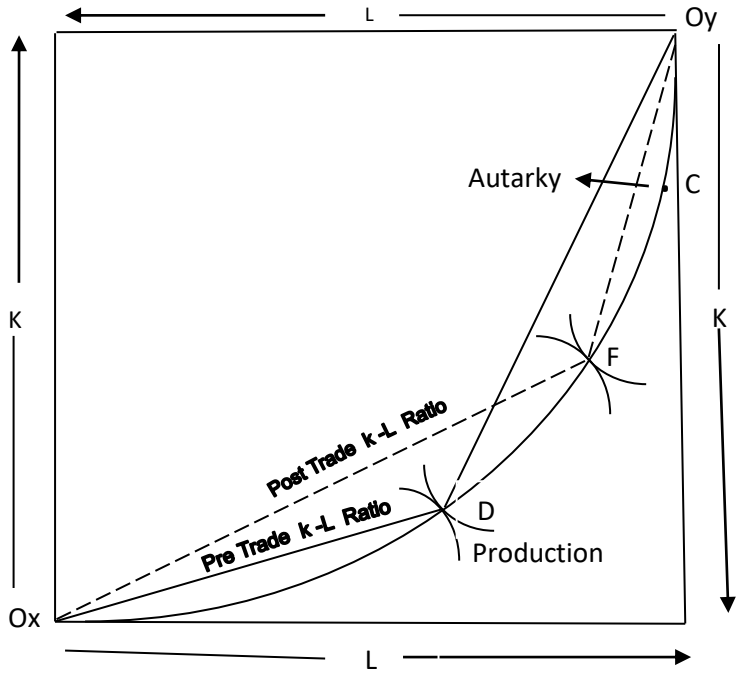

Fig 2.1: Stolper-Samuelson Theorem: Edgeworth Box Diagram

The slope of the line from the origin 'O_x to point 'D' measures the capital–labour ratio in the production of commodity 'X' implying pre trade capital-labour ratio. Further, the slope of the line from the origin O_Y to point 'D' measures the capital–labour ratio in the production of commodity 'Y' under free trade. After imposition of import tariff, the country 'B' produces at point 'F'.

The capital–labour ratio in the production of commodity ‘X’ and commodity ‘Y’ are measured by the slope of the dotted lines from the origins O_x and O_Y respectively to point ‘F’. As it can be seen in the diagram, dotted lines from the origin are steeper than the solid lines O_XD and O_YD. This indicates use of higher capital-labour ratio in the production of both the commodities after imposition of import tariff than under the free trade.

When the tariff is imposed by country ‘B’ on commodity ‘X’, i.e., the labour-intensive commodity, each unit of labour is combined with more units of capital in the production of both the commodities. As a result, the productivity of labour increases. Consequently, not only the money wage but also the real wage rises in country ‘B’. With labour fully employed before and after imposition of the tariff, the total earnings of labour and its share in national income will be greater. Thus, incomes get redistributed in favour of labour. It may thus, be concluded that tariff favours a factor which is used intensively after tariff implosion. In this Fig., since national income is reduced by the tariff, i.e., from point ‘E’ to point ‘H’ and the share of total income going to ‘L’ is higher, the rate of interest and total earnings of ‘K’ fall in country ‘B’. Therefore, while a small nation as a whole is harmed by the tariff, its scarce factor benefits at the expense of its abundant factor.

3. **Discuss the relationship between International Trade And Imperfect Competition.**

The stratagem to simplify the analysis is to start from an integrated world economy, which will be subsequently divided into two countries. So at the beginning we have a closed economic system (the world), which produces two commodities: a differentiated commodity, say good A and a homogeneous commodity, say food good B. In industry A, there are increasing returns to scale and monopolistic completion, while in industry B there are constant returns to scale and perfect competition. Both industries use homogeneous capital and labour as factors of production; both factors are freely mobile between industries and fully employed. Given the prevailing set of factor prices and goods prices, there will be a certain factor allocation between the two sectors.

The problem of international trade under conditions of monopolistic or imperfect competition, as these terms are used by Prof. Chamberlin and by Mrs. Robinson has received little attention up to the present. This is probably due to two main reasons. In the first place, the question seems to be one of little practical importance, since the most practical articles of

international trade are raw materials or staple commodities, which are generally produced under condition of perfect competition. The second and perhaps even more logical reason is that it seems to be almost impossible to arrive at any definite conclusions regarding the question whether international trade will take place, and if it does, to what extent and with what result, when the commodities are produced under imperfect competition. Mr. Beach concludes that the higher cost of production and the smaller output under imperfect completion will cause the volume of trade also to be smaller than it would be under perfect competition: "……if monopolistic competition prevailed throughout the economic system, the volume of international trade would generally be less than it would be under pure competition. The higher costs of production and the reduction in output would tend to restrict foreign trade as well as domestic trade……..", he does not, however, answer the question.

Imperfect competition has come to the fore in the theoretical analysis of international trade. This development was driven by a number of factors. The theory that has been developed over this period succeeds in providing a fuller explanation of recent developments in trade flows, and also supports a rich set of policy analyses, linking trade and industrial policy, and illuminating economic integration. It is noteworthy that the theory can be integrated with the more traditional factor endowment and general equilibrium concerns of trade theory; in some circumstances it can be placed 'on top of' traditional theory, providing a theory of both inter- and intra-industry trade. It also opens the way to constructing a theory of 'new economic geography', incorporating the location decisions of mobile factors of production.

Here, we focus on market power derived from product differentiation. Our primary concern is the pattern of trade, and we develop a complete synthesis of factor endowment and market access determined trade flows. We also look at factor mobility, and the possibility that this may lead to the agglomeration of economic activity.

Oligopolistic Interaction

If firms from different countries compete on international markets that are less than perfectly competitive, then what form does their competitive interaction take? What trade flows does it create? And what are the welfare effects of trade and of trade policy'! To answer these questions we devote here to the study of markets in which there is strategic interaction between firms.

As is often remarked, whereas there is only one theory of perfect competition, the problem with imperfect competition is that there are many theories. These theories are unfilled in their use of modern game theory -- we shall be analysing Nash equilibria -- but differ principally in their specification of the strategic variable chosen by firms. In the following two sub-sections we shall look first at the case where firms' strategic variables are price, output or sales quantities. In Nash equilibrium no firm has an incentive to change the value of its strategic variable given the values selected by other firms. However, the equilibrium can be quite different according as to whether prices or quantities are chosen.

The difference between price competition (Bertrand) and quantity competition (Cournot) is well known from industrial organisation. In the international trade context further distinction becomes important. Firms may chooses quantities (or prices) in each market separately, which will refer to as the case of segmented markets. Or they may select a single world-wide quantity (or price), which we shall refer to as integrated market. We shall focus on the segmented market case, merely commenting on the difference made by integrated markets.

Price Competition

The simplest framework we can consider is a single industry containing one firm in each country, l and 2. These firms have constant marginal costs, denoted c1 and c2 respectively, for producing a homogeneous product. We shall assume that markets are segmented, so it will look at just one country's market (there is no interaction between the two markets, so the other market can be described analogously. We shall look at the country l market and suppose that there is a trade cost, *t* per unit that the firm in country 2 must incur if it is to supply country l, making its effective marginal cost. Each firm chooses its price, what does the equilibrium look like, and does it involve trade? Since both firms produce the same homogeneous product, all sales will go to whichever firm has the lowest price. If D is the market demand function, we therefore have demands faced by each firm.

What is optimal trade policy in this model? To answer this question supposes that *t* is not a real trade cost, but a tariff, creating revenue which is transferred to the country 1 government.

If c2 < cl then welfare is maximised by setting *t* = cl - c2. This value of t has two properties. First, at this value of t, c2 + t >c1 ; this means that the domestic (country 1) firm (by assumption the lower cost supplier) takes the entire market. Second, the domestic firm is induced to set price equal to its marginal cost.

If *c2* > cl then the optimal policy is *t* = c2 – *c1*. The foreign (country 2) firm will then take the entire market at this price, just less than the minimum price at which the domestic firm is willing to supply. This policy generates tariff revenue, so the unit cost of imports to economy l as a whole is the consumer price minus tariff revenue, which is the world minimum production cost. The policy, therefore, amounts to the lowest cost producer supply the market (through imports), but using the tariff to extract any profits that the importer might make.

Bertrand competition with homogeneous products is notorious for giving very sharp and extreme results, and this is what we see in this case. Although quite illuminating, the model fails to predict intra-industry trade, and effects are probably too extreme to give an adequate representation of many industries. We now turn to a case where the sharp price under-cutting of Bertrand competition does not take place.

We have reached the conclusion that country 1, the relatively capital abundant country, exports the relatively capital-intensive good A, and exports the relatively labour-intensive good B. These results are perfectly in line with the conventional Heckscher- Ohlin theorem. But there is more to it than that: while international trade in good B will be of the conventional inter-industry type, trade in good A will be of the intra-industry type. We have in fact just seen that the exports of A are net exports: this means that country 1 will simultaneously export and import goods belonging to industry A, the exports being however greater than the imports. To show this, we must recall that– as a consequence of economies of scale in the production of each variety of commodities A -no country can produce all the range of varieties of this commodity, but only pat. Therefore, even if both countries produce manufactures, each will produce different varieties. Thus, to satisfy domestic demand, country 1 will import from country 2 the varieties that it does not produce, and export to country 2 the varieties that it produces, to meet county 2's domestic demand. There is, consequently, intra-industry trade (that, as we have seen above, in the aggregate gives rise to net exports of A from coutny1), which will coexist with inter-industry trade.

2.9. Suggested Readings

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UNIT- III
TERMS OF TRADE

Structure

3.0 Introduction
3.1 Objectives
3.2 Meaning of Terms of Trade
  3.2.1 Measurement of Terms of Trade and Illustration of the Terms of Trade
  3.2.2 Offer curves, its elasticity and Terms of Trade
3.3 Lets Sum Up
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  3.6.2 Long-Answer Questions
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3. 0 Introduction

With the exception of a handful of countries in North America, Western Europe, and Japan, most countries of the world are classified as less developed or developing countries. Moreover, some countries in the world adopt open economy while few countries adopt closed economy and others adopt both the types of economy. However, the term 'trade' originated with human civilization but trade started with barter system being replaced by Mercantilism in the 16^{th} and the 17^{th} centuries. The 18^{th} century saw the shift towards liberalism. It was in this period that Adam Smith, the father of Economics wrote the famous book *The Wealth of Country* in 1776 where in he defined the importance of specialization in production and brought trade under the said scope. David Ricardo developed the Comparative advantage principle, which stands true even today. But, the term (barter) terms of trade was first coined by the US American economist Frank William Taussig in his 1927 book *International Trade*.

3.1 Objectives

By the time you complete the study of this unit, you should be able to do the followings:

- To explain the meaning of Terms of Trade
- To understand different measures of Terms of Trade and illustrate their measurement
- To analyse the meaning of a change in a country's terms of trade
- To explain Offer curves, its elasticity and Terms of Trade
- To take stock of what have been accomplished and examine the usefulness of trade models.

3.2 Meaning of the Terms of Trade

The terms of trade are defined as *the ratio between export price of a commodity and import price of a commodity*. If the export price of a commodity increases more than the import price of a commodity, a country has a positive terms of trade, as for the same amount of exports, it can purchase more imports.

However, trade today, is not fixed in one commodity only and multi-commodities play an active part in the process of trade. Under such circumstances, average exports and average imports price index are taken into consideration for calculation of terms of trade. Trade, in goods and services, is defined as the transactions in goods and services between residents and non-residents. It is measured in million US dollar, as percentage of Gross Domestic Product for net trade, and also in annual growth for exports and imports.
Therefore, we calculate the terms of trade as an index number using the following formula:

Terms of trade, $(ToT) = \frac{P_x}{P_m} X100$ where P_x is the average Export Price index and P_m is the average Import Price Index of a country.

If a country can buy more imports with a given quantity of exports, its terms of trade are better-off or improved. For example, during the commodity price boom, many resource-exporting developing countries experienced increases in their terms of trade. In other words, for the same physical quantity of exports (copper, rubber, oil etc.) as before, they could buy

more consumer and capital goods from abroad. If import prices rise faster than export prices, the terms of trade are worse-off or deteriorated. A greater volume of exports has to be sold to finance a given amount of imported goods and services. Typically, this leads to a fall in the standard of living because imports of foods and technologies are more costly. The terms of trade fluctuate in line with changes in export and import prices. The exchange rate and the rate of inflation can both influence the direction of any change in terms of trade. A key variable for many developing countries is the world price received for exports of primary commodity e.g. the world export price for coffee, raw sugar cane, iron ore and soybeans.

3.2.1 Measurement of Terms of Trade and Illustration of the Terms of Trade

There are various types of terms of trade. These are Gross barter terms of trade, Net barter terms of trade, Income terms of trade, Single factorial terms of trade, Double factorial terms of trade, Real Cost terms of Trade and Utility terms of trade. These measures are classified under three broad categories by G. M. Meier as follows:

A. The terms of trade that measures to the ratio of exchange between commodities:
   (i) Gross Barter terms of trade (G)
   (ii) Net Barter terms of trade (N)
   (iii) Income terms of trade (I)

B. The terms of trade that measures to the interchange between productive resources:
   (i) Single factorial terms of trade (S)
   (ii) Double factorial terms of trade (D), and

C. The terms of trade that measures to the gains from trade in terms of utility analysis:
   (i) Real cost terms of trade (R)
   (ii) Utility terms of trade (U)

W.F. Taussig developed both Gross barter terms of trade and Net barter terms of trade and G.S. Dorrance improved Net barter terms of trade by formulating the concept of Income terms of trade. Jacob Viner made another modification of Net barter terms of trade and corrected it for changes in factor productivity in the production of export goods which is called as Single factorial terms of trade and later he modified it to Double factorial terms of trade for being able to measure the productive resources from import sector. Later on, the gains from trade in terms of utility by Real cost and Utility terms of trade.

1. **Gross barter terms of trade**:

The Gross barter terms of trade (G) is the ratio of the quantity of goods exported of a country to the quantity of goods imported multiplied by 100 to express the terms of trade in percentages.
That is:

$$G = \frac{Q_m}{Q_x} x100.....(1)$$

Where, G stands for Gross barter terms of trade

Q_m stands for an index of the volume or quantity of imports and Q_x for an index of the volume or quantity of exports. To measure it in percentages, it is multiplied by 100.

So long as the numerator value (i.e., Q_m) is more than the denominator value (i.e., Q_x), Gross barter terms of trade will remain positive, it becomes negative when the former is less than the later and it becomes constant when both the value is equal. The first instance is a case of favorable or better-off situation of a country, the second instance is a case of un-favorable or worse-off situation and the last one is a case of neither favorable or better-off or worst-off situation of a country.

The Gross barter terms of trade is useful in barter economy where exchange of goods for goods take place but it becomes obsolete in the mercantilist and liberal period.

2. **Net barter terms of trade**:

The commodity or net barter terms of trade (N) is the ratio of the price index of the country's exports (P_x), to the price index of its imports (P_m), multiplied by 100 to express the terms of trade in percentages.
That is:

$$N = \frac{P_x}{P_m} x100.....(2)$$

For example, if we take 1990 as the base year (N-100), and we find that by the end of 2018, the country's P_x fell by 5% (to 95), while its P_m rose by 10% (to 110), then this country's commodity terms of trade declined to

$$N = \frac{95}{110} x100 = 86.36$$

This means that between 1990 and 2018, the country's export prices fell by 14% in relation to its import prices.

3. Income terms of trade:

A country's income terms of trade (I) are given by:

$$I = \frac{P_x}{P_m} xQ_x .....(3)$$

Where, Q_x is an index of the volume of exports of a country. Thus, I measures the country's export-based capacity to import. In our example, if Q_x rose from 100 in 1990 to 120 in 2018, then the country's income terms of trade rose to

$$I = \frac{95}{110} X120 = 0.8636x120 = 103.63$$

This means that from 1990 to 2018 the country's capacity to import (based on its export earnings) increased by 3.63% (even though $\frac{P_x}{P_m}$ declined). The change in the income terms of trade is very important for developing countries, since they rely to a large extent on imported capital goods for their development.

4. Single factorial terms of trade:

A country's single factorial terms of trade (S) are given by:

$$S = \frac{P_x}{P_m} xZ_x .....(4)$$

Where, Z_x is a productivity index in the country's export sector. Thus, S measures the amount of imports the country gets per unit of domestic factors of production included in its exports.

For example, if productivity in the country's export sector rose from 100 in 1990 to 130 in 201**8 then the country's single factorial terms of trade increased to:**

$$S = \frac{95}{110} x130 = 0.8636x130 = 112.27$$

This means that in 2018 the country received 12.27% more imports per unit of domestic factors embodied in its exports than it did in 1990. Even though the country shares part of its productivity increase in its export sector with other country's, the country was better-off in 2018 than it was in 1990 (by more than indicated by the increase in/and even though N declined).

5. **Double factorial terms of trade**:

The concept of the single factorial terms of trade can be extended to measure the country's double factorial terms of trade (D), given by

$$D = \frac{P_x}{P_m} x \frac{Z_x}{Z_m} x100.....(5)$$

Where, Z_m is an import productivity index. Thus, D measures how many units of domestic factors embodied in the country's exports are exchanged per unit of foreign factors included in its imports.

For example, if Z_m **rises from 100 to 105 between 1990 and** 201**8 then D rises to:**

$$D = \frac{95}{110} x \frac{130}{105} x100 = 0.8636x1.23813x100 = 106.92$$

6. **Real cost terms of trade**:

The real cost terms of trade (R) measures the gain from trade in utility terms.

$$R = SxK_x.....(6)$$

Where, K_x is an index of amount of disutility incurred per unit in productive factors in export sector.

7. **Utility terms of trade**:

$$U = RxK_m$$

K_m is an index of relative utility of imports as compared with those productive factors which are at present engaged to the production of export sector.

Illustration of the Terms of Trade:

If country 1 exports commodity X and imports commodity Y, its terms of trade are given by P_x/P_y. If it exported and imported many commodities, P_x would be the index of its export prices, and P_y would be the index of its import prices.

If country 2 exports commodity Y and imports commodity X, its terms of trade are given by P_y/P_x. This is the inverse, or reciprocal, of country 1's terms of trade and also equals 1 or 100 (in percentages) in this case.

If through time the terms of trade of country 1 rose, say, from 100 to 120, this would mean that country 1's export prices rose by 20% in relation to its import prices. This would also mean that country 2 is terms of trade have deteriorated from 100 to (100/120)100 = 83. We can always set a country's terms of trade equal to 100 in the base period, so that changes in its terms of trade over time can be measured in percentages.

Even if country 1's terms of trade improve over time, we cannot conclude that country 1 is necessarily better-off because of this, or that country 2 is necessarily worse-off because of the deterioration in its terms of trade. Changes in a country's terms of trade are the result of many forces at work both in that country and in the rest of the world, and we cannot determine their new effect on a country's welfare by simply looking at the change in the country's terms of trade.

Check your Progress 1

1. Mark True (T) or False (F):
   (i) Terms of trade is the ratio between Import price of a commodity and Export price of a commodity.
   (ii) A country can sell more exports with a given quantity of imports if its terms of trade are better-off or improved.
   (iii) G, N and I measure to the ratio of exchange between commodities in international trade.
   (iv) S and D measure to the interchange between productive resources in international trade.

(v) In the developing countries, all the measures of terms of trade are practiced for gains from trade.

2. Explain the important measures of terms of trade in about five sentences.

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3.2.2 Offer curves, its elasticity and Terms of Trade

J. S. Mill propounded the theory of reciprocal demand or the law of international values to explain the actual determination of equilibrium terms of trade. This theory allows examining the unfinished task of David Ricardo's theory of comparative cost where it states that comparative cost difference between the countries sets the outer limits between where international trade can take place, but did not explain where and between the limits, international trade will actually take place.

In this theory, Mill provides answer to these questions. According to him, the equilibrium terms of trade are determined by the equation of reciprocal demand. Reciprocal demand means the relative strength and elasticity of demand of the two countries for each other's commodity in terms of their own product. In other words, the actual ratio at which goods are traded will depend upon the strength and elasticity of each country's demand for the other country's commodity or upon reciprocal demand. Simply, a stable ratio of exchange will be determined at a level where the value of imports and exports of each country is in equilibrium. In other words, the ratio will be stable when the value of each country's export is adequate to pay for its imports.

$$e = \frac{\%\Delta Q_m}{\frac{\%\Delta P_x}{\%\Delta P_m}}$$

Where, ΔQ_m is change in quantity of imports, ΔP_x is the change in price of exports and ΔP_m is the change in price of imports. The symbol % indicates percentage.

If $e > 1$, then the terms of trade will be favorable for the concerned country and its share of gains from trade will be larger; if $e < 1$, the terms of trade for the concerned country and the share of gains from trade will be relatively less or unfavorable and if $e = 1$, the gains from trade will be equally distributed between the two countries.

Alfred Marshall developed a geometrical technique which is known as offer curve through this we can show the determination of equilibrium terms of trade graphically. The offer curve is a typical demand curve as it shows the demand (imports) for one commodity in terms of the supply (exports) of another commodity.

In Fig 3.1, we take up two Countries, two commodities and one factor case where, India (I) and Britain (B) are the countries. Wheat is produced by India and Cloth by Britain. OI is India's offer curve indicating India's demand for cloth in terms of wheat. In other words, OI offer curve represents the quantity of wheat which India is willing to offer in exchange of British cloth. As the quantity of cloth increases, India will be offering lesser amount of wheat in exchange for cloth. For example, in exchange for KW cloth India is offering OW wheat. Similarly, OB is the Britain's offer curve of cloth for wheat which represents Britain's demand for wheat. For example, Britain is willing to offer DW cloth in exchange for OW wheat. T is the equilibrium point where TP cloth is exchange for OP wheat. The reciprocal demands are equal at the equilibrium point T. The line OT shows the general equilibrium terms of trade.

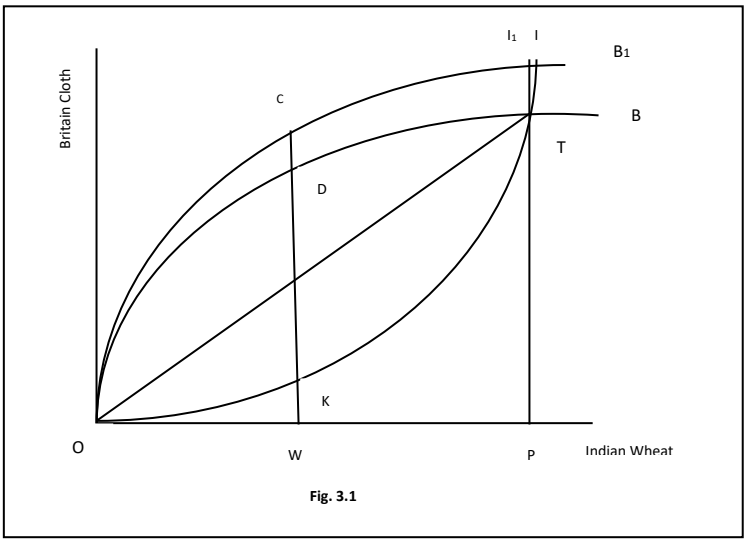

Fig. 3.1

If any change in demand and supply due to cost reduction in production of increase in tastes and preferences the offer curves will change. For example, due to sudden cost reduction in the production of cloth in Britain, the offer curve shifts from OB offer curve to OB_1 offer curve thereby no change in demand for cloth in India, then the terms of trade is in favour of India as OP wheat will be available for I_2P cloth since $TP < I_2P$ or vice versa.

The theory of reciprocal demand has been criticized of its unrealistic assumptions such as perfect completion and full employment. This theory focuses on the elasticity of demand, thus negating the impact of elasticity of supply.

In fact, terms of trade and economic development of a country have two-way relationship; first terms of trade affects the nature and extent of a country's economic development and second, the course of economic development also affects the terms of trade. An improvement in terms of trade promotes a country's development while deterioration in terms of trade adversely affects the economic development. However, some of the most important factors that influence terms of trade are as follows:

(i) Changes in factor endowments: Nature has provided different factor to different countries in the world. Some countries are large and others are small in terms of land, labour, capital and organizational capabilities. Any changes in factor endowments influence the terms of trade in the world.

(ii) Changes in technology: Technology is the main driving force for augmentation of output. Any change in technology has great impact on the production of an output.

(iii) Changes in tastes and preferences: Tastes and preferences of consumers have also an effect in the demand of a commodity and thus it influences the terms of trade of a nation.

(iv) Economic growth: The growth effect of trade may differ according to the level of economic development. Greater openness to trade has positive impacts on economic growth for advanced economies. For developing countries, however, higher trade openness has negative impacts on economic growth.

(v) Reciprocal demand: Reciprocal demand refers to the intensity of demand for a commodity of one country in the other country. Higher the intensity of demand in the other country allows the country to export more and can improve the terms of trade and vice versa.

(vi) Tariff: Tariffs, Quotas or preferential trade influence the terms of trade. These measures, if not retaliated by other trading countries, improve a country's terms of trade by increasing more exports and restricting imports.

(vii) Balance of payments: If a country experiences deterioration in the balance of payment then it may impact upon the terms of trade because the country's value of imports increases faster than the value of exports. In other words, deterioration in balance of payment means a country is importing more than exporting. This

would mean cheaper exports and more expensive imports. Hence, balance of payment controls the terms of trade of a nation.

(viii) International capital flows: International capital flows are the financial side of international trade. When a country imports a goods and services, the buyer or importer gives the seller or exporter a monetary payment, just as done in domestic transactions. If total exports are equal to total imports, these monetary transactions would balance at net zero. In other words, people in the country would receive as much financial inflows as they paid out in financial outflows. Hence, it influences the terms of trade of the country.

(ix) Import substitution: It is a trade and economic policy which advocates replacing foreign goods with domestic goods. This policy is adopted to correct the terms of trade of a country.

(x) Degree of competition: There are four types of competition in a free market system: monopoly, perfect competition, monopolistic completion, and oligopoly. In a monopoly, there is only one seller in the market. The monopolist is able to control prices of his goods. Most monopolies fall into one of two categories: natural and legal. Natural monopoly includes public utilities such as electricity and gas suppliers. They inhibit competition in the society. Legal monopoly on the other hand, arises when a company receives a patent giving it exclusive use of an invented product or process for a limited time, generally twenty years. If a country enjoys legal monopoly power in case of its exports and there are many alternative sources of supply of its imports, then it will have favourable terms of trade.

(xi) Rate of exchange: Changes in the rate of exchange of a country's currency affect its terms of trade. If a country's currency appreciates, its terms of trade will be improved because of the rise in the value of currency which led to increase in export prices and decrease in import prices. On the other hand, if a country's currency depreciates, its terms of trade will be deteriorated because of the fall in the value of currency which led to decrease in export prices and increase in import prices. Therefore, rate of exchange also influences the terms of trade of the country.

Check Your Progress 2

1. Mark True (T) or False (F):

(i) The theory of reciprocal demand or the law of international values explains the actual determination of equilibrium terms of trade.

(ii) J. S. Mill propounded the concept of offer curve.

(iii) Offer curve represents a country's demand for a commodity.

(iv) If $e > 1$, then the terms of trade will be unfavorable for the concerned country and its share of gains from trade will be smaller.

(v) An improvement in terms of trade promotes a country's development while deterioration in terms of trade adversely affects the economic development.

2. Explain the factors that influence terms of trade in about five sentences.

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3.3 Lets Sum Up

Of the seven terms of trade defined, N, I and S are the most important measures of terms of trade. G, D, R and U do not have much significance for developing countries and are not usually used for measurement of terms of trade in the world. However, it is significant to mention that these measures are only in theory. Generally, the most significant terms of trade for developing countries are I and S. Since N is the easiest to measure, it is widely used. Indeed, N is often referred to simply as "the terms of trade".

I and S can rise even when N declines. This is generally regarded as favorable to a developing country. Of course, the most favorable situation is when N, I and S all increase. On the other hand, the worst possible situation from the point of view of a developing country occurs when all three terms of trade deteriorate at the same time.

The concept of Income terms of trade attempted is a correction in the Commodity terms of trade for changes in the volume of exports. Jacob Viner made another modification over the Net barter or Commodity terms of trade. He corrected the Net barter terms of trade for changes in factor productivity in the production of export goods. The concept of terms of trade developed by him is called as the 'Single Factorial Terms of Trade'. It is determined by

multiplying the commodity terms of trade with the productivity index in the domestic export sector. The Single factorial terms of trade imply a ratio of the export price index and import price index adjusted for changes in the productivity of factors used in the production of export goods.

3.4 Key Terms

Terms of trade: The terms of trade are defined as the ratio between export price of a commodity and import price of a commodity.

Commodity or net barter terms of trade: The commodity or net barter terms of trade is the ratio of the price index of the country's exports to the price index of its imports multiplied by 100 to express the terms of trade in percentages.

General equilibrium: The intersection between the demand and supply curve shows the general equilibrium.

Offer curves: The offer curve is a typical demand curve as it shows the quantity that will be import (offered) for each quantity of other commodity that it imports.

Open economy: An open economy is an economy in which there are economic activities between the domestic country and outside world.

Close economy: A closed economy is a self-sufficient, which means no imports come into the country and no exports leave the country. It provides domestic consumers with everything they need from within the country's borders and no international trade and finance can take place.

Exports: The act of selling goods and service to a foreign country is called exports.

Imports: The act of buying goods and service from a foreign country is called imports.

Better-off: Better-off means being in comfortable economic circumstances.

Worse-off: Worse-off means being in uncomfortable economic circumstances.

3.5 Answers to Check Your Progress

1. Check Your Progress 1

   (i) T

   (ii) F

   (iii) T

   (iv) T

   (v) F

2. Explain the important measures of terms of trade in about five sentences.

There are seven important measures of terms of trade. Gross barter terms of trade (G), Net barter terms of trade (N), Income terms of trade (I), Single factorial terms of trade (S), Double factorial terms of trade (D), Real cost terms of trade (R) and Utility terms of trade (U). Out of these measures of terms of trade, N, I and S are the most important measures of terms of trade. The commodity or net barter terms of trade (N) is the ratio of the price index of the country's exports (P_x), to the price index of its imports (P_m), multiplied by 100 to express the terms of trade in percentages. Income terms of trade is the multiplication of N and Q_x, where, Q_x is an index of the volume of exports of a country. Similarly, **Single factorial terms of trade is the product of N and Z_x, w**here, Z_x is a productivity index in the country's export sector. Thus, S measures the amount of imports the country gets per unit of domestic factors of production included in its exports.

Check Your Progress 2

1. Mark True (T) or False (F):

   (i) T

   (ii) F

   (iii) T

   (iv) F

   (v) T

2. Explain the factors that influence terms of trade in about five sentences.

Some of the most important factors that influence terms of trade are changes in factor endowments, changes in technology, changes in tastes and preferences, economic growth, reciprocal demand, tariffs etc. Any changes in factor endowments influence the terms of trade

in the world. Similarly, any change in technology has great impact on the production of an output. Tastes and preferences of consumers have also an effect in the demand of a commodity and thus it influences the terms of trade of a nation. Moreover, the growth effect of trade may differ according to the level of economic development. Greater openness to trade has positive impacts on economic growth for advanced economies.

3.6 Questions and Answers

3.6.1 Short-Answer Questions

1. What is meant by terms of trade?
2. What is a Gross barter term of trade?
3. Define Net barter terms of trade?
4. Classify Income terms of trade.
5. Define Single factorial terms of trade.
6. What do you know about Reciprocal demand?
7. Define Offer curve.
8. What are the measures of terms of trade that evaluate the ratio of exchange between commodities?
9. What are the measures of terms of that appraise the interchange between productive resources?
10. What are the measures of terms of that analyze the gains from trade in terms of utility analysis

3.6.2 Long-Answers Questions

1. What are terms of trade? What are the factors influencing terms of trade?
2. What are gains from trade? Examine gains from trade through suitable examples and diagrams.
3. Examine Mill's theory of Reciprocal demand.
4. Explain the determination of equilibrium terms of trade with the help of Marshal's offer curves.
5. Discuss the relation between terms of trade and economic development.

3.7 Suggested Readings

Meade, J. E (1952): A Geometry of International Trade, George Allen and Unwin, London.

Meier, G. M (1964): Leading Issues in Development Economics, Oxford University Press, New York.

Salvatore, D (2007): International Economics, Wiley India (P) Ltd, New Delhi.

Viner, J (1937): Studies in the Theory of International Trade, Harper and Brothers, New York.

UNIT-IV

TARIFF

Structure

4.0Introduction
4.1 Objectives
4.2 Arguments in favour of tariff
4.3 Arguments against tariff
4.4 Impact of tariff (partial equilibrium analysis)
4.5 Impact of tariff(General Equilibrium Analysis)
4.6 Concepts of Game Theory
4.7 Types of Games and Strategy
4.7.1GameswithDominantStrategyEquilibrium
4.8 Free Trade and Protection
4.9 Tariff and Trade Policies
4.10 Strategic Game Theoritic approach to Tariff: Brenda Spencer Model
4.11 Questions
4.12 Key Words
4.13 Suggested Readings

4.0 Introduction

In this unit learners are expected to acquaint themselves with tariff, the argument fore and against it, along with, the impact of tariff ; both under partial and general equilibrium framework. The learner are also introduced with the concept of game theory and its applicability pertaining to tariff.

4.1 Objectives

In this unit the following will be discussed;

- Arguments of tariff,
- Impact of tariff: Partial and general equilibrium analysis

- Game theoretic approach to tariff
- Tariff and income distribution.

4.2 Arguments in favour of tariff

A. Infant industry argument:

According to this argument, infant industries during the initial stages of their development are not strong enough to compete with the long established foreign industries. Such an industry needs to be fully protected by the government from foreign competition. By imposing a tariff on imports, the government raises the domestic price and helps the home producers to cover their high costs and thus grow under protection.

B. Promotion of employment argument:

It is believed that imposition of tariff leads to expansion of employment and income. Imposition of tariff restricts certain imports so that some money is saved in the domestic economy which will be spent upon the purchase of the products of protected home industries. As the protected industries expand, employment therein increases and income of the economy increases.

C. balance of payments argument:

Achievement of favourable balance of payments is another argument put forward in favour of protection. The basic idea is that, country which faces deficit in balance of payment should impose tariffs to have an excess of export over imports. This will enable the country to earn more foreign exchange.

D. Revenue argument:

According to this argument, tariffs are a good source of revenue to the government. The imposition of tariff duties not only provides protection to the domestic industries, but also brings revenue to the state.

4.3 Arguments against tariff:

A. Uneconomic use of resources:

Protected industries are generally those in which a country has less comparative advantage. Thus, protection leads to the development of economically less efficient

industries and shifting of natural resources of the country from more productive occupations to less productive occupations.

B. Loss to consumer:

The ultimate burden of the imposition of tariff falls on the consumers. Tariff results in the restriction on cheap imports and raising of domestic prices. The consumer suffer from these effects.

C. Production inefficiency:

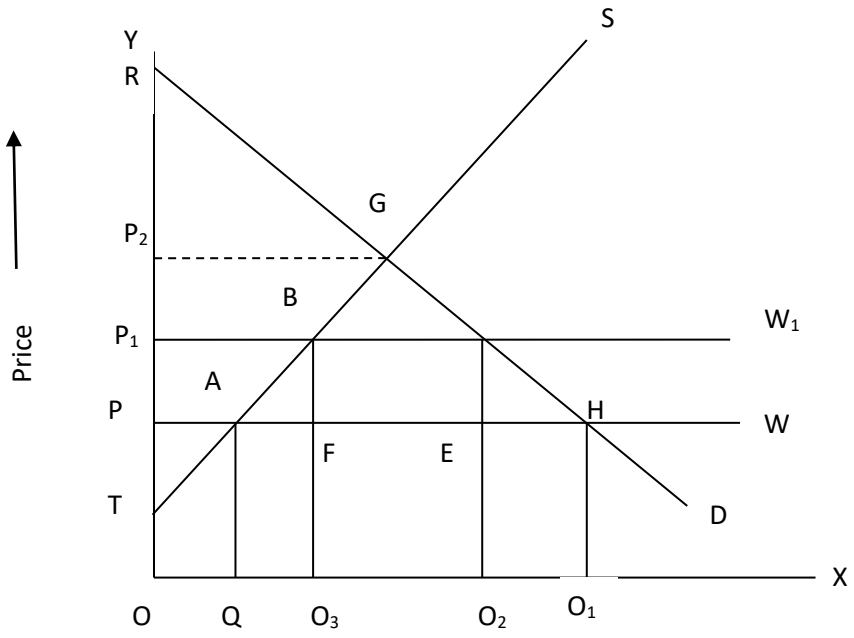
The imposition of tariff leads to increase in domestic price compare to international price. As such the domestic producers who otherwise are inefficient or cannot produce at world price are subsidise due to hiked domestic price. This leads to breeding of inefficient domestic producers and inefficient resource utilisation and allocation thereof.

4.4 Impact of tariff (partial equilibrium analysis)

When a small country impose tariff on import of the product that compete with the product of the small domestic industry, the tariff can neither effect the international prices nor can it affect the rest of the economy (as the industry is small). In such conditions, the partial equilibrium analysis that concern the market for a particular product becomes the most appropriate.

Assumption:

1. The demand and supply curves of the given commodity are concerned with home country that imposes import tariff.
2. The given demand and supply curve remain constant.
3. There is no change in consumer's taste, prices of other commodities and money income of the consumers.
4. No tariff is imposed by the home country on the import of materials that are required in producing the given commodity.
5. There is an absence of transportation cost.
6. Imported product and home produced product are perfect substitutes.



Demand and Supply

Figure 2.1

1. Protective/productive effect:

In the above diagram, D and S are the domestic demand and supply curve of the given commodity respectively. PW is the world supply curve of the commodity. At OP price, domestic supply is OQ and demand is OQ_I. the gap QQ_I between demand and supply is met through import of commodity from abroad.

Now, given the above situation, if PP_I per unit of tariff is impossed on import, the price rises to OP_I and world supply curve shift to $P_I W_I$. at this higher price, the demand is reduced from OQ_I to OQ_2 whereas the domestic supply expands from OQ to OQ_3.

Thus, the domestic production of import substitutes rises by the extent of QQ_3. This is the protective or production or import substitute effect. The increased domestic production reduced the demand for foreign product from QQ_1 to Q_2Q_3.

2. Consumption effect:

At the free trade price OP , the total consumption was OQ_1. After the imposition of tariff, when price rises to OP_1, the consumption is reduced from OQ_1 to OQ_2. Out of it, OQ_3 is the consumption of home-produced good and Q_2Q_3 is the consumption of foreign produced good. Thus, there is a reduction in consumption by OQ_1-OQ_2=Q_1Q_2.There is net loss in consumer satisfaction amounting to the area $PHCP_I$.

Combined protective and consumption effect as thetrade effect. Subsequent to the imposition of tariff the volume of international trade gets reduced from QQ_1 to Q_2Q_3.

3. Revenue effect:

Tariff being revenue to the government. The revenue receipts due to tariff is equal to PP_1 x Q_3Q_2=BF x FE=BCEF. This is the revenue effect.

4. **Redistribution effect**:

The imposition of tariff on one hand, causes a reduction in consumer's satisfaction and on the other hand, provide a larger producer's surplus or economic rent to domestic producers and revenue to the government.

Thus, tariff leads to redistribution effect in the tariff imposing country.

Loss in consumer's surplus=RHP-RCP_1=$PHCP_1$

Gain in producer's surplus=TBP_1-TAP=$PABP_1$

Gain in revenue to the Government=BCEF.

5. Balance of payment effect:

Imposition of tariff reduce import and increase export. Thus, it reduce the deficit in balance of payment.

4.5 Impact of tariff (General Equilibrium Analysis)

In a gneral equilibrium analysis when tariffs are imposed by a country on its import, import substitution would take place in the tariff imposing country. This must then lead to a contraction in output of other production sectors in theeconomy, because the resources will be drawn into the importing replacement sector away from other sectors of the economy. This means, a reallocation of the country's resources in favour of import-replacement production.

Assumption:

1. Trade take place between two countries, say A and B.
2. One-home country.
3. It produces two goods(wheat and steel)
4. Wheat is exportable and steel is importable.

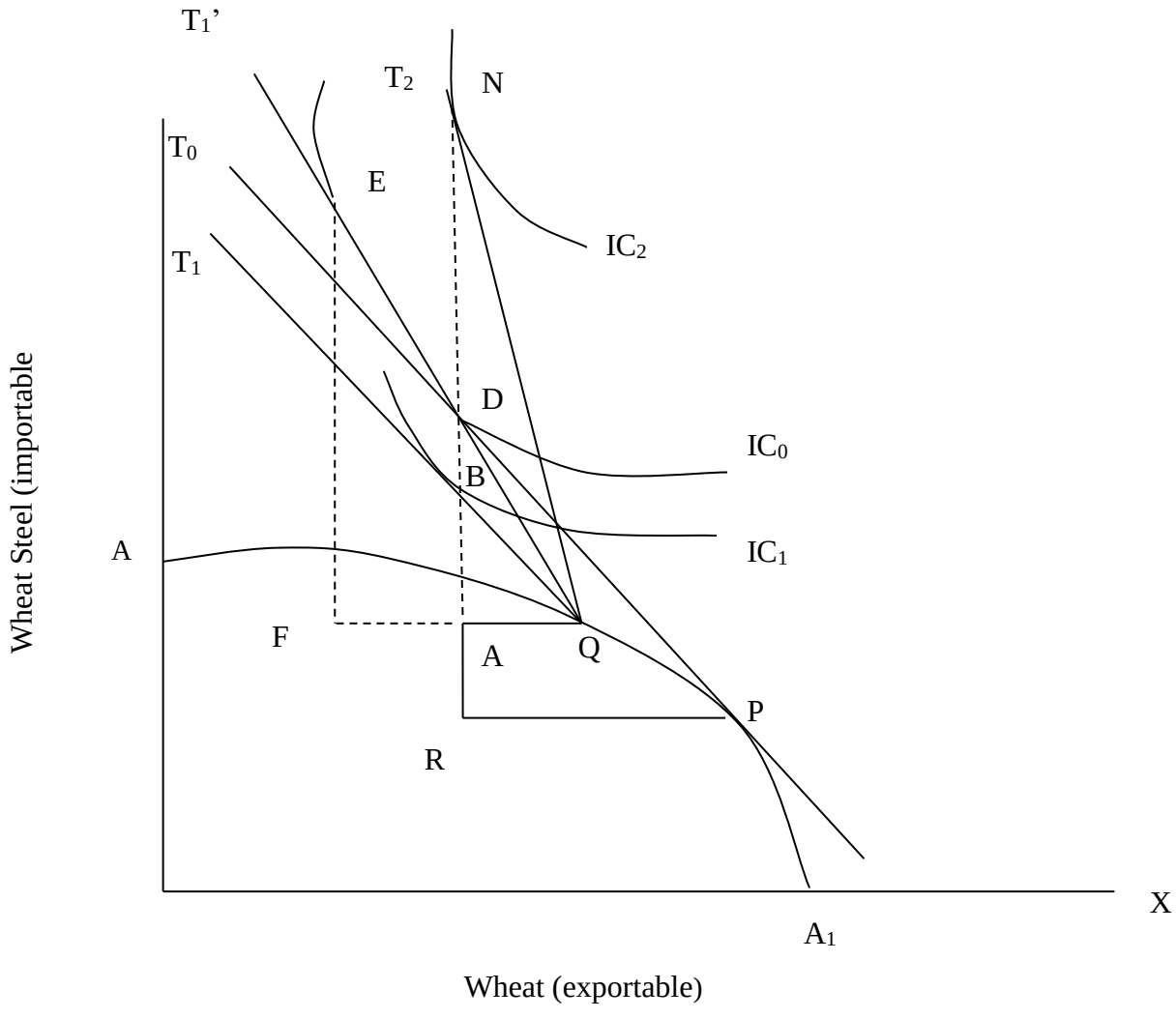


Figure 2.2

In the above diagram, under free-trade equilibrium, country produces at point P and consume at point D, exporting RP amount of wheat in exchange for RD amount of steel. T_0T_0 is the international exchange ratio line. At this pre-tariff free-trade-equilibrium, the economic welfare of the country is indicated by point D on IC_0.

Let us now introduce tariffs on the import of steel. As a result of the tariff imposition, the level of import will fall and domestic production of the importable goods will rise at unchanged terms of trade. This will have the effect of shifting the production equilibrium point from P to Q. note that line T_1Q is parallel to T_0T_0 indicating no change in terms of trade. After the imposition of tariff, the country import AB amount of steel and export AQ amount of wheat and consume at point B. tariff imposition has made the country worse off because post-tariff consumption point B is lower than free trade consumption point D. this worsening of economic welfare is due to misallocation of resources due to tariff. Therefore, production at Q is not a pareto optimal point. From this discussion, it is clear that, tariff have led to misallocation of resources and deteriorated the country's economic welfare. This assumes that, tariff will not bring about any change in terms of trade.

Now, if we assume that tariff will turn the terms of trade in favour of tariff imposing country, i.e., price of steel will decline relative to price of wheat. The terms of trade line will be steeper than before and this is shown by QT'_1 linewhich is steeper than T_0T_0 line. This means that, the countrycould produce at Q and consume at E exporting QF amountof wheat and importing FE amount of steel. Point E is on the same indifference curve as point D. Therefore, the imposition of tariff have not resulted in any of economic welfare, compared to free trade equilibrium situation.

Tariff could also lead to an increase in economic welfare as compared to free trade. At terms of trade line QT_2, country would consume at point N on IC_2 while still producing at Q. and it will be exporting AQ amounting of wheat and importing AN amount of steel. The post tariff consumption point N represent a superior welfare position compared to free trade consumption point D on terms of trade line T_0T_0.

Thus, if tariff improves the TOT, tariff will raise level of economic welfare. If tariff produces no changes in terms of trade, the result is loss of economic welfare.

If the tariff importing country is a small country that, its reduced volume of import have no effect on the world demand for the imported products, then the internartional terms of trade would remain unchanged. Such a country would then suffer loss.

But if the tariff imposing country is a largerone, that its reduced import from the rest of the world would cause a substantial fall in demand for the imported product, the terms of trade would improve infavour of the tariff-imposing country. Such a large country will then enjoy lowerimport prices relative to export price and thereby enjoy favourable terms of trade.

4.6 Concepts of Game Theory

Technically, a *strategy* here is a plan for dealing with all possible actions of other players. As opposed to less sophisticated conceptions of human behavior, game theory is decidedly social. In human conflict situations there is rarely one context-independent best strategy. What works well depends on the actions of others. And since these actions depend on perceptions, game theory takes into account that agents expect each other to have certain interests, and to do their best to attain them.

In order not to confuse issues, there is an important distinction to be made between payoff (measured in points, dollars or the like) and the personal joy gained through a game. The game theoretical concepts described in the following make sense in relation to game-internal payoff only.

Four characteristics of games are of particular interest: 1) The number of players, 2) the sum type, 3) whether the game is repeated and 4) the existence and type of equilibrium.

Number of Players – Game theory works with either ***two-person games*** or games with more than two players, termed ***n-player games***. An important difference between the two types, apart from the complexity of the mathematics involved, is the fact that coalitions may form between players of n-person games affecting the game dynamics. Since we are concerned with opposing interests, a player in this perspective needs not be a single person but can be a nation, a football team or a pair of Bridge partners.

The most famous among the key two-person games is "The Prisoner's Dilemma" -- "the game that launched a thousand studies". The game, explained below, is often considered a fundamental model for the study of conflict and its simplicity and potential scope has earned it a place in textbooks within a truly wide range of fields. Briefly, the Prisoner's Dilemma is a situation in which two people are faced with a temptation to act in their personal interest disregarding the interest of the other person. However, if they both choose this (individually rational) course of action they will both be worse off than if they had cooperated.

In Prisoner's Dilemma two people A and B, who are suspected of committing a crime together, are being questioned separately. They can choose to confess (strategy *C*) or deny (strategy *D*). The payoffs are as follows:

-If they both confess, they will each receive a moderate sentence.

-If they stand firm and both deny, there is insufficient evidence for a full conviction, so they will each receive a light sentence.

If one denies while the other confesses, the one who denies will receive a heavy sentence and the other will be set free for providing evidence against the other. The dilemma is whether an individual prisoner should confess or deny. As before, if we consider Prisoner A: if B chooses strategy *C*, then A has a higher payoff with strategy *C*. If B chooses strategy *D*, then A has a higher payoff with strategy *C*. Thus, strategy *C* is a dominant strategy for A, and, by symmetry, also a dominant strategy for B. This leads to a dominant strategy equilibrium at (*C, C*). Again, we find that the players choose an inferior strategy because they are not co-operating and do not trust each other.

Sum Type – A key to understanding game dynamics is considering the payoff sum. The crucial question is whether the sum is ***fixed*** or ***variable***. In the first case one player's loss is another's gain. A stand - alone game of chess where the loser pays the winner 10 dollars would qualify. In such a case there is no reason for negotiation since there is no sense in cooperating: Both players' self-interest dictates that they try to reduce the opponent's payoff. Such games are termed ***zero-sum***, as the total sum of the players' gains and losses equals zero. Let's imagine, however, that our chess-players enter a tournament with the additional special rule that each opponent pawn killed earns the killing player 1 dollar, paid by the

tournament sponsor. In this case the sum is not fixed; the game is ***non-zero sum*** (or variable sum), as the total sum of gains and losses experienced by the players is not necessarily zero. This calls for rather different strategies among the players and would inspire cooperation to a certain egree-for instance, by agreeing to perform a mutual sacrifice of all pawns before battling it out with the remaining pieces. The Prisoner's Dilemma is a non-zero sum game as the size of the combined pay-off depends on aggregate player choices.

Single-shot Games versus Repeated Games-The strategic dynamics may be quite different between games which are only played once (single-shot games) and games that are repeated. In single-shot games, players seek short-term gains while players of repeated games will be able to make short-term sacrifices in favor of perceived long-term opportunities. For instance, a single-shot Prisoner's Dilemma ends in mutual defection but a repeated version may not. The players in the repeated version operate under what Robert Axelrod (1984) has called "the shadow of the future": their actions in any given round will have consequences in later rounds. Thus, on every (if not universally) successful strategy is Tit-for-Tat, the prescription that one should start by cooperating and then do whatever the other player did in the previous round (Axelrod,1984). By punishing defectors while not angering vengeful opponents, such as other versions of itself, Tit-for-Tat can manage to generate the trust necessary for collectively successful play (the cooperate-cooperate instance shown above). Often, the implication of interacting repeatedly with the same people will be that reputation becomes highly important.

Equilibrium – In a standard one-round version of the Prisoner's Dilemma, rational players will not cooperate. Thus, they get a payoff that could have been larger (if they had trusted each other) but are stuck in a situation where neither player by changing his strategy can do any better. The Prisoner's Dilemma, then, has equilibrium (although a so-called deficient one since overall the players could do better); the game calls for particular strategies and players will not deviate from their set course. Equilibrium, then, may be thought of as a game state to which the game is likely to gravitate and once reached the players will generally not change their strategies. A game may have any number of equilibrium including none and these may be either of the pure strategy type where players play one particular strategy or of the mixed strategy type where players randomly pick a strategy each round. An example of the latter is rock-paper-scissors where rational players need to

play one of the three available strategies with the probability of 1/3.

4.7 Types of Games and Strategy

4.7.1Games with Dominant Strategy Equilibrium

The *cartel* is an example. There are two firms in the market, and they can choose to operate independently (strategy *I*) or form a cartel (strategy *C*). The payoffs are as follows:

- If they form a cartel, they agree to limit production, hence increasing price, so they both gain 8.
- If they both operate independently, they both gain 4.
- If they agree to form a cartel, thus increasing the price, but one firm betrays the other by producing more than agreed, then that firm gains a lot while the other loses a lot.

How should the two firms operate to maximize their gains? Consider Firm1: if Firm 2 chooses strategy *C*, then Firm 1 has a higher payoff with strategy *I*, if Firm 2 chooses strategy *I*, then Firm 1 has a higher pay off with strategy *I*.

Thus, strategy *I* is a dominant strategy for Firm 1, because it gives the higher payoff regardless of the other player's strategy. The same reasoning applies for Firm 2: if Firm 1 chooses strategy *C*, then Firm 2 has a higher payoff with strategy *I*, if Firm 1 chooses strategy *I*, then Firm 2 has a higher payoff with strategy *I*.

So strategy *I* is a dominant strategy for Firm 2 as well. This leads to a dominant strategy equilibrium at (4,4). If a certain strategy pays a player the highest payoff, regardless of the other player's strategies, then that strategy is known as a dominant strategy. If both players have dominant strategies, the point which they both choose is known as the dominant strategy equilibrium. We see from our example that the (C,C) strategy is Pareto Superior to(I,I). However, unless the players co-operate in choosing their strategies, they will choose the inferior (I,I). The dominant strategy equilibrium does not always provide the best result. If the players choose (C,C), either player can gain by moving to I unilaterally.

In other words, if they agree to form a cartel, either player can gain by reneging on the agreement. This is why cartels are considered unstable and easy to collapse. Both players try to maximize their own profit by defecting. However, as a result, both of them experience reduction of profit. Therefore, it is known as a "tragedy of commons". How do firms keep a cartel strong? Invoke severe punishments for firms that renege on the agreement. If the game is played repeatedly, a player that reneges is not likely to be trusted, so will not be able to form a cartel with others again.

4.8 Free Trade and Protection

Consider the game between the United States and Japan, each of who can choose free trade (strategy *F*) or protection (strategy *P*). The payoffs are as follows:

- If they both choose free trade, both countries gain by trade.
- If they both choose protection, there is no gain for either country.
- If only one country chooses protection, they will gain by protecting their Domestic market while still trading in the other country's market.

As before, to consider strategies, consider the United States: if Japan chooses strategy *F*, then U.S. has a higher payoff with strategy *P*. If Japan chooses strategy *P*, then U.S. has a higher payoff with strategy *P*. Thus, strategy *P* is a dominant strategy for the U.S., and, by symmetry, also a dominant strategy for Japan. This leads to dominant strategy equilibrium at (*P*,*P*). The tragedy here is that, in the absence of any other information, both countries will choose the inferior but still dominant (*P*,*P*) when they could both gain by moving to(*F*,*F*).

How can they reach (*F*,*F*)? Integration (co-operation) is one way and Negotiation (with penalties for reneging) is another way.

4.9 Tariff and Trade Policies

Strategic trade policies aim to promote exports or discourage imports in particular sectors, to increase a nation's welfare. While some policy makers advocate the policy, many economists have raised questions on the justification and validity of the policy. Among many strategic trade policies, this section analyses "industrial subsidy" using game theory.

An example is *Air bus and Boeing*. In this example, Boeing (American) and Airbus (European) are competing in a world market. They can choose to produce (*P*) or not (*N)*.

- If they both produce, competition will drive down the price and they will both lose.
- If neither produces, neither gains.
- If one produces and the other doesn't, the producing company takes the entire market share and the other company gets nothing.

This is similar to the previous example. Again, we find two Nash equilibrium (*P,N*) and (N,P). If we assume that Boeing is already in the market (in other words, has chosen strategy *P* already) and Airbus is considering entering it, how is the game played out? By the same process of backward induction as before, we find that Boeing chooses strategy *P* and Airbus chooses strategy *N*. In other words, it is not in Airbus's interests to enter the market.

Government Subsidy is another example. Suppose that the European government regards the aircraft industry as very important. To encourage Airbus to enter the market, the European government might subsidize production by, say, 25. This changes some payoffs, and changes the game's structure:

-If Boeing chooses strategy *P*, Airbus will choose strategy *P*.

-If Boeing chooses strategy *N*, Airbus will still choose strategy *P*.

Now Airbus has a dominant strategy *P*. Then, theoretically, Boeing calculates its payoff again and finds that strategy *N* is its best strategy. Although this looks attractive for Airbus, there are other factors to consider: if Airbus is subsidized by the European government, the U.S. government can retaliate by subsidizing Boeing. Then Boeing will keep producing (strategy *P*), which will incur losses to both producers. Both producers are then subsidized by their governments, and all the burden from the subsidy is borne by taxpayers. If Boeing is stable in the U.S. domestic market, it might be able to absorb the

competition from Airbus. In other words, its strategy *P* payoff might be greater than anticipated by Airbus. If Boeing's payoff from strategy *P* is positive, it will keep producing. To finance the subsidy, the European government must use consumers' money. How can we justify the transfer of money from consumers to subsidize Airbus?

Another example is the *monopolist and new entrant in the world market*. In this example, there is a monopolist in the market facing a potential new entrant. The monopolist can choose to fight (*F*) or acquiesce (*A*). The new entrant can choose to enter (*E*)or not (*N*).

The payoffs are as follows:

- If the new entrant doesn't enter the market, the monopolist will retain its position.
- If the new entrant enters and the monopolist fights, they will both lose market share.
- If the new entrant enters and the monopolist acquiesces, they both gain, but the monopolist's share is reduced.

We find that there is no dominant strategy for either player, but there are two Nash equilibrium (*F,N*) and (*A,E*). In this game, it is the new entrant who makes the first move-to enter or not. If it chooses strategy *E,* the monopolist has two choices strategies *F* and *A*, and will choose A for a payoff of 2. On the other hand, if the new entrant chooses strategy *N*, the monopolist again has two choices, both of which have the same payoff. Now, if the new entrant compares its payoffs for each of the monopolist's choices, it finds that its best payoff is 2, by entering the market and the monopolist acquiescing. If the government of the potential entrant considers the sector is important, the government can provide an incentive by subsidizing the entrant and guaranteeing positive profits when it enters the market.

Conclusion

Can government intervention raise national welfare by shifting oligopoly rents from foreign to domestic firms? In principle, government policies such as export subsidies can serve the strategic purpose of altering the subsequent incentives of firms, acting as a deterrent to foreign competitors. This seems to offer possible rationales for trade policies. The topic became especially 'hot' as the countries experienced so called competitiveness problems.

4.10 Strategic Game Theoritic approach to Tariff: Brenda Spencer Model

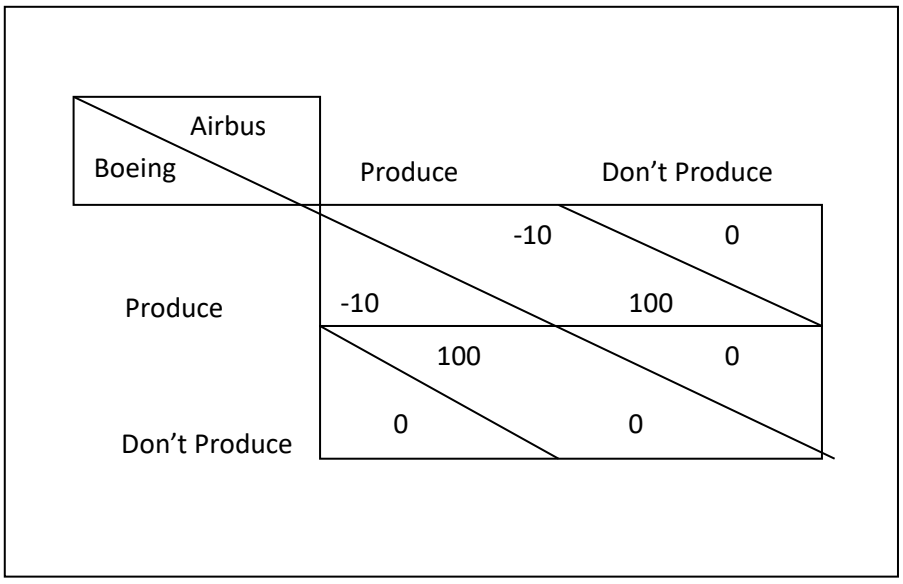
Game theoretic approach to tariff is used to examine strategic trade and industrial policies.

The trade war is considered to be a game between the two countries with following assumptions:

1. Countries trade only with each other.
2. Countries produce and consume only two goods.
3. The only way to restrict trade is an import tariff.
4. Countries are identical, except for differences in endowments.
5. Countries aim to maximize their increasing utility functions.
6. Perfect information exists.

Given these assumptions, we examine the effects of optimal tariffs and retaliation more formally by using a simple game theory set-up.

Suppose both Boeing and Airbus are deciding to produce new aircraft and because of huge cost of developing aircraft, a single producer have to have the entire world market to earn a profit .



Two firm competition and strategic trade policy

Figure 2.3

The case where both firm produce the aircraft and each loses $ 10 million is shown in the first raw and left column(top left hand corner).

If only Boeing produces the aircraft, Boieng makes a profit of $ 100 while Airbus make a 0 profit(the first raw and second column or top right hand corner). On the other hand, if only airbus produces the aircraft, airbus make a profit of $ 100, while Boieng makes a zero profit(bottom left hand corner. Finally, if neither firm produces the aircraft, each makes a zero profit (bottom right hand corner of the table).

Suppose Boieng enter the market first and earn a profit of $100 million, Airbus is out of market because it couldn't earn a profit. This is the case shown in first raw and second column(top right hand corner).

If Airbus enter the market, both firm incurr loss (first raw first column). Suppose European Government gives subsidy to Airbus of $ 15 million, then the Airbus will produce the aircraft though Boeing is already producing the aircraft, as $15 million subsidy to airbus will turn a loss of $10 into a profit of $ 5 million. Without subsidy, Boeing will then go from making a profit of $ 100 million (without Airbus in the market) to incurring a loss of $ 10 million afterwards. Because of it's unsubsidised loss, Boeing will then stop producing the aircraft and leave the entire market to Airbus which will then make a profit of $ 100 million without any further subsidy (the case of second raw first column).

The US Government can retaliate with a subsidy of its own to keep Boeing producing the aircraft. Moreover, the US Government is much less opposed to grant subsidy to firm than on European Government.

While the real world is much more complex than this, we can see how the nation would overcome a market disadvantage and acquire a strategic comparative advantage in higher field by using an industrial and strategic trade policy.

4.11 Questions

1. Discuss the implication of tariff under both partial and general equilibrium.
2. What are the various forms of Game?

3. Discuss the strategic game theory in relation to tariff: Brenda Spencer Model.

4.12 Key Words

Tariff	:	A levy on import and export
Strategy	**:**	A move by a player of the game
Pay Off	**:**	Yield from a move or strategy in a game
TOT	**:**	Terms of Trade

4.13 Suggested Readings

Soderston, Bo, *International Economics*, The Macmillan Press Ltd., London, 1991
Salvator, D, *International Economics*, Prentice Hall, Upper Saddle River, N.J. NewYork, 1997.

UNIT-V

TRADE AND ECONOMIC GROWTH

Structure

5.0 Introduction

5.1 Objectives

5.2 Growth in factor endowments and international trade

5.3 Rybzynski Theorem

5.4 Stolper-Samuelson Theorem

5.5 Bhagwati's view on immiserizing growth

5.6 Technical changes and international trade

5.6.1 Neutral technical progress and trade

5.6.2 Effect of labour using or capital saving technical progress on TOT:

5.6.3 Effect of capital-using or labour-saving technical progress

5.7 Questions

5.8 Key Words

5.9 Suggested Readings

5.0 Introduction

In this unit students will learn about the relaxation in the assumption of factor constancy and its subsequent outcomes. Students will particularly know about Ryvczynski Theorem as well as the Stolper-Samuelson theorem. Students will also learn about immiserising growth and finally technical changes.

5.1. Objectives

The learning objectives are:

- Growth in factor endowments and international trade, Rybczynski theorem
- Bhagwati's views on immiserising growth
- Technical change and international trade: Neutral, capital saving and labour saving technical progress and their impact on terms of trade.

5.2 Growth in factor endowments and international trade

The factor endowment theory holds that, countries are likely to be abundant in different types of resources. In economic reasoning, the simplest case for this distribution is the idea that countries will have different ratio of capital and labour. Factor endowments theory is used to determine comparative advantage. One of the famous theory of factor endowment in international trade is Heckscher-Ohlin theory. It states that, when two countries are involved in trade, each country will export commodity, intensive in relation abundant and cheap factor. On the other hand, the countries will import commodity, intensive in relatively scare and expensive factor.

Factor abundancy can be define in volume concept and factor price concept. According to Heckscher-Ohlin theory, a country is abundant when a price of factor is less. When the physical availability of factor is more, it cannot be said necessarily that the country is abundant in factor. Heckscher and Ohlin has taken price of factor as a determinant of factor abundant.

Another important theorem of factor endowment is Rybzynski's theorem. Ohlin's factor equalization theorem is based on the assumption of constant factor supply. T.M. Rybczynski tried to examine this theorem by removing the underlying assumption.

Rybzynski's theorem seeks to examine the effect of change in factor supplies in one of the two trading countries in their trade relationships.

Rybzynski's theorem states that, in a two factor two-commodity economy, a rise in the supply of one factor keeping the supply of the other factor constant, leads to an increase in the output of the commodity that uses the increased factor intensively and also leads to a decline in the output of the other commodity.

5.3 Rybzynski Theorem

Rybezynski demonstrated in a paper published in 1955, the effect of change in one factor, keeping the other constant on output of the two commodities entering into international trade. This has come to be known as the Rybezynski theorem, the Rybeznski

theorem states that, in a two factors, two-commodity economy, a rise in the supply of one factor keeping the supply of the other factor constant, leads to an increase in the output of the commodity that uses the increased factor intensively and also leads to a decline in the output of the other commodity.

For example, if the supply of labour increases, the output of the labour-intensive commodity increases and the output of the capital-intensive commodity declines. On the contrary, if the supply of capital increases, the output of capital-intensive commodities increased and the output of the labour-intensive commodities declines.

Assumptions:

1. It is 2x2x2 model, i.e., there are two commodities two countries and two factor of production (labour and capital).
2. Production functions of both the commodities are different.
3. The factor intensity of each commodity is different.
4. Perfect competition in commodity and factor market.
5. Only the supply of one factor is changed while keeping that of the other as constant.

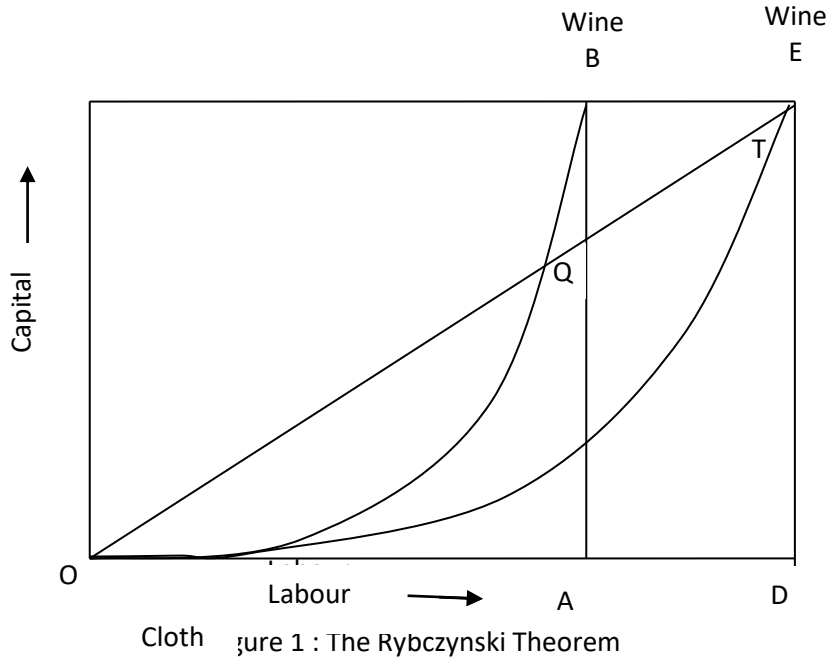


Figure 1 : The Rybczynski Theorem

Now, let us assume the supply of labour increases. This is shown by extending the size of the box by AD. So new box representing factor-endowments in this country is ODEC. Now, the point of origin for wine is E instead of B.

In the beginning, the country reaches an equilibrium point Q on the contract curve OQB. Which means factor-intensity in producing cloth is OQ, and that of wine is BQ. With the increase in labour upto AD further, labour supply being constant, the country tends to set new equilibrum point T on the new contract curve OTE.

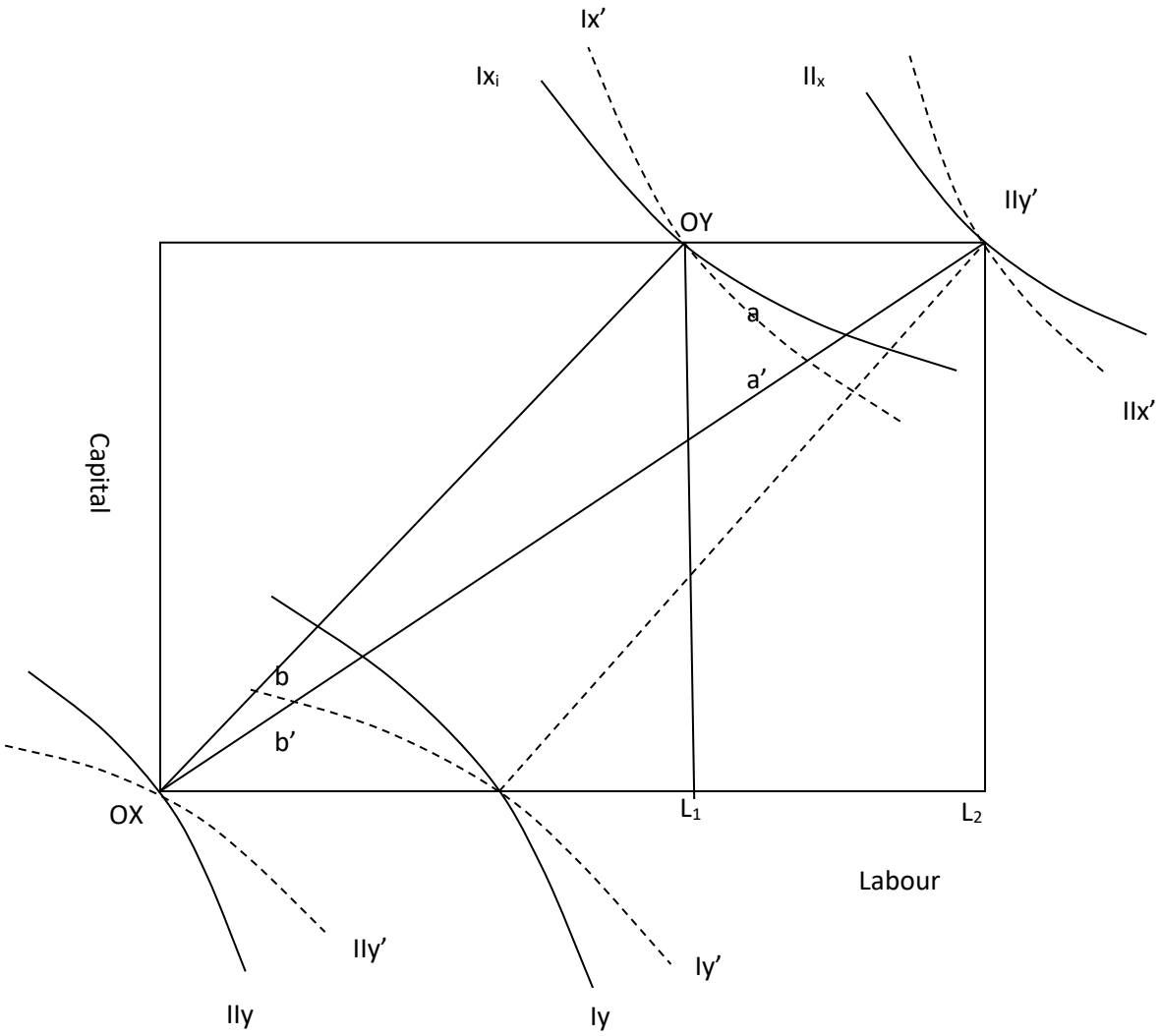


Fig. 1.1 Stolper and Somnelson box

5.4 Stolper-Samuelson Theroam

In the above diagram fig 1.1, stolper and samuelson box diagram is employed to show the effect of an increase in one factor labour(L), which is more intensively used in commodity x. In the diagram, due to increase in labour from L_1 to L_2 the origin for capital-intensive commodity Y moves from OY to OY^I. If the two commodites are equally intensive in the use of capital and labour an increase in labour will have unbiased expansion effect on the maximum possible output of both commodities. This situation is depicted by the same set

of isoquants for both industries, for, example, Ix and IIx for commodity x and Iy and IIy for commodity y. In this case, the distance between a and OY^I is equal to the distance between b and OX, indicating equi-expansion of the maximum possible output of x and y. on the other hand, if x is relatively more labour-intensive whereas Y is relatively more capital-intensive, the isoquant for the x are depicted by doted curves Ix and IIx, which are steeper than original curves, because of labour-intensive nature of production. Similarly, isoquant of Y and Iy^I and IIy^I which are more capital-intensive than the previous curves.

Under this condition, the distance betweeb a and oy is greater than the distance betweeb b^I and ox. Thus, the maximum possible output of x using the increased factor more intensively rise more than that of y using the same factor less intensive.

5.5 Bhagwati's view on immiserizing growth

The theory of immiserizing growth is related to the deterioration in the terms of trade of the country experiencing growth. According to Jagdish N Bhawati, under certain circumtances economic expansion and trade may harm the welfare of the developing countries. Immerising growth refers to the case where economic growth which may be due to the technical progress or factor accumulation leads to a deterioration in the terms of trade, which imposses a loss of real income outweighting the primary gain in real income due to growth itself. In other words, the concept of immerising growth is a situation in which a sustantial increase in the export of a commodity can depress its price in the international market to such an extent that, it harms the country's welfare because negative terms of trade outweights the positive effect of increased output.

Condition necessary for immiserizing growth to occur:

1. The country's growth must be biased towards the export sector.
2. The foreign demands for the country's export must be price inelastic, so that expansion in export supply leads to large drop in prices of export commodities.
3. The country must be heavily engaged in trade for the welfare so that the drop in the terms of trade is great enough to offset the gain from being able to supply more.

Assumptions:

1. There are two countries A and B.
2. There are two commodity, say X and Y.

3. X is an exportable and Y is importable.
4. Full-employment of resources.
5. Mobility of resources between different countries.

Given the above assumption, the case of immiserising growth is illustrated in below diagram fig 1.2. the figure represents a situation of underdeveloped country exporting primary products and importing industrial goods.

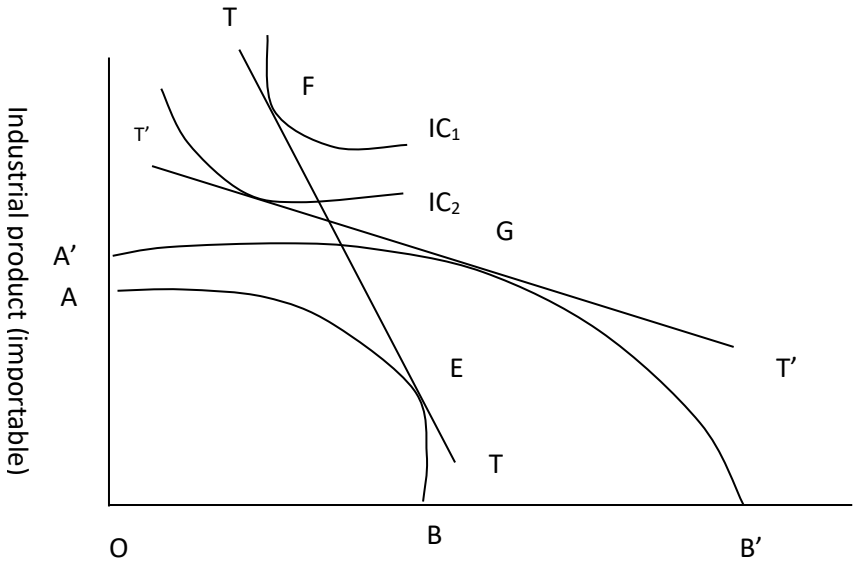


Figure 1.2

In the above diagram, fig 1.2, initially with the AB production possibility curve and TT terms of trade, the country is producing at point E and consuming at point F on the international terms of trade line TT. The level of welfare corresponding to this situation is indicated by the position of indifference curve IC_1. Now, when the contry's production capabilities increases strongly biased towards primary products, PPC shift from AB to A'B' and TOT line TT shift to T^IT^I. now, country is producing at point G and consuming at point H on IC_2.

Thus, due to increase in output or growth, the level of welfare decrease because earlier the country was consuming at point F on infifference curve IC_1 and now with the increased output, it is consuming at point H on IC_2. Thus, growth has deteriorated the level of welfare. This is known as immiserzing growth. The fall in the welfare level actually happens because foreign demands for the export is relatively inelastic due to which the increase in supply of primary product depresses price. In the international market, as a result, TOT deteriorated which ultimatly lead to fall in level of welfare.

5.6 Technical changes and international trade

Technical progress or changes consists of discovering new methods of production, developing new products and introducing new technique of marketing, management and organisation.

5.6.1 Neutral technical progress and trade

According to Hicks, technocal progress is neutral when the marginal product of labour and marginal product of capital increases in such a manner that the capital-labour ratio(k/L) remains the same.

Assumption

1. Economy experiences economic expansion due to technical progress.
2. It produce two commodities, say, X an d Y.
3. Production function for both commodities are homogeneous of degree one.
4. Factor supplies are unchanged.
5. There is perfect competition.

If the technical progress is of a neutral character and it takes place in export industry of the country, it will leads to a deterioration of terms of trade of the country. On the other hand, if the neutral technical progress occur in the import-competing industry of the country, it will result in the improvement in the TOT of this country.

The impact of neutral technical progress in the export industry producing capital-intensive commodity Y upon the capital-labour ratio, factor and commodity prices, output and TOT is explained in below diagram fig 1.3.

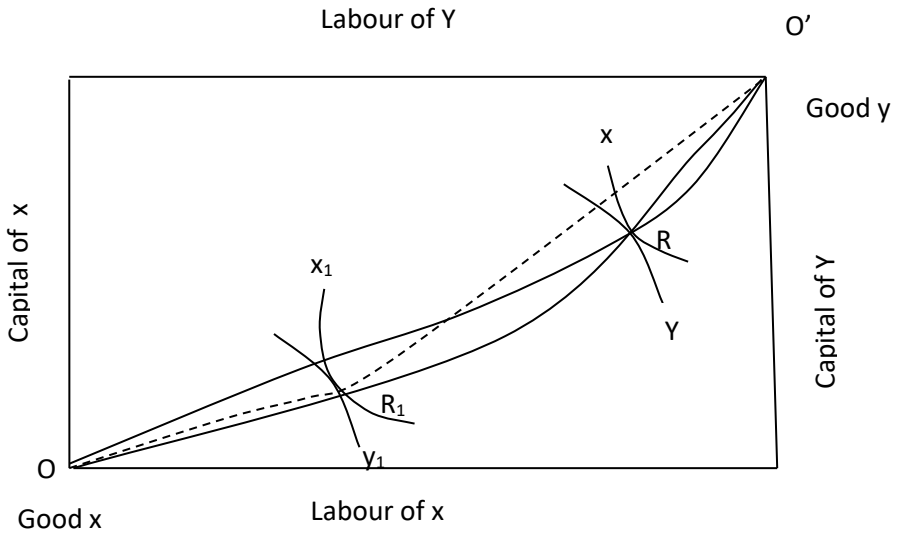


Figure 1.3

In the above box diagram, fig 1.3, O is the origin for good x and O^I is the origin for good Y. OO^I is their contract curve. Initially, the equilibrium is at point R, where the isoquants X and Y concerning the two commodities are tangent to each other. The K/L ratio in X at R is measured by the slope of line OR. The K/L ratio in Y at R is measured by the slope O^IR.

Now due to neutral technical progress in the capital-intensive industry Y, its isoquant shift to Y_I and is tangent to the new isoquant X_I of X at point R. As a result, output of Y increses from O^I R to $O^IR_1$and that of X decreases from OR to OR_I . With the increase in the supply of the exportable commodity Y, relative to the decrease in the output of the importable commodity X, the price of Y will fall and that of X will rise. As the price of export good Y fall relative to that of import-competing good X_I , there will be deterioration in the term of trade for this country. On contrary, if technical progress takes place in the import-competing industry, there will be an improvement in the TOT of the country.

5.6.2 Effect of labour using or capital saving technical progress on TOT:

Techinical progres is capital saving (or labour using) when it increase the marginal productivity of labour more than the maginal productivity of capital. The effect of capital saving technical progress in the export industry producing capital intensive commodity Y upon the output and TOT is explained with the help of below diagram.

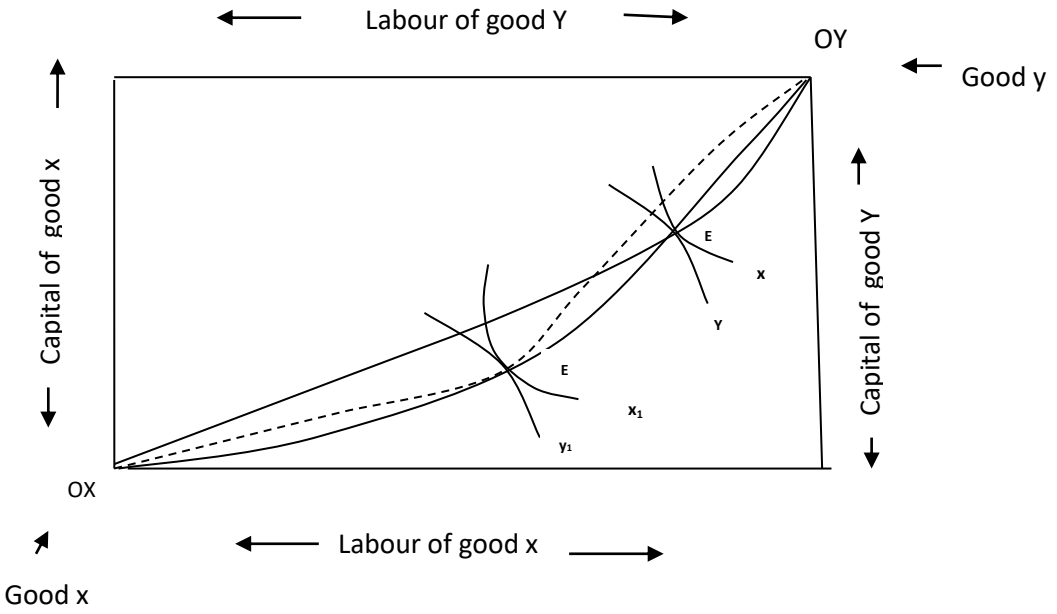


Figure 1.4

In the above diagram. OX is the origin of good X and OY is the origin of good Y. OXOY is their contract curve. Initially, the equilibrium is at point E where isoquant X and Y concerning two commodities are tangent to each other. The k/L ratio in X at point E is measured by the slope of line OXE and the k/L ratio in Y at E is measured by the slope of line OYE. At point E, OXE is the output of X and OYE is the output of Y.

Now, due to technical progress take place in capital-intensive industry Y, its isoquant shift to Y_I and is tangent to the new isoquant X_I of X at point E_I . As the technical progress is capital-saving, more labour will be transferred to the Y industry. As a result, the price of the importable commodity X will rise because its output has already fallen from OXE to OXE_I . On the other hand, the output of exportable commodity Y has increased from OYE to OYE1 thereby leading to fall in its price. Thus, the terms of trade have become unfavourable for the country.

5.6.3 Effect of capital-using or labour-saving technical progress

Technical progress is capital using or labour saving when it increses the productivity of capital more than the productivity of labour. The effect of country are explained in the following diagram.

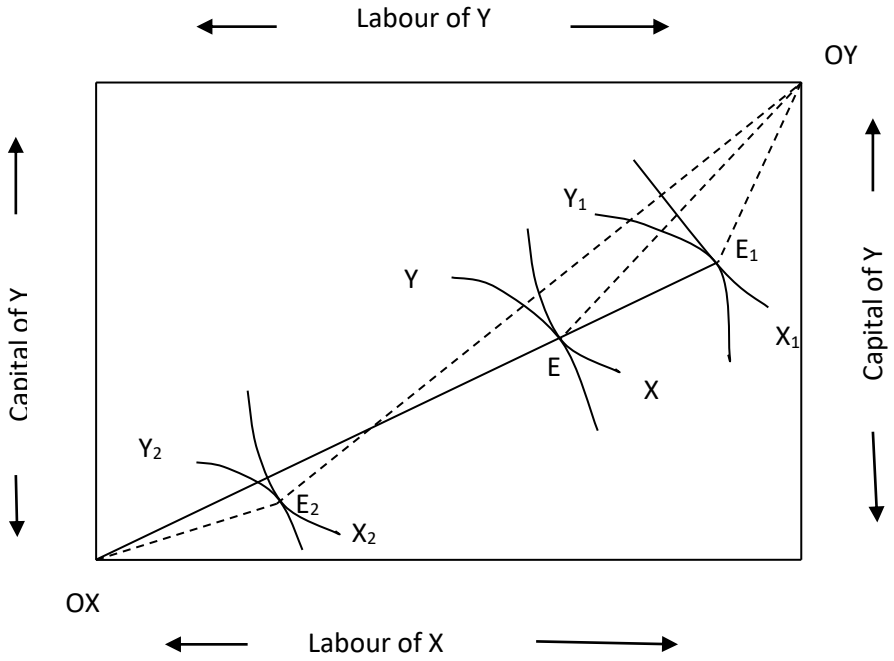


Figure 1.5

In the pre-technical progress situation, the equilibrium is at point E, where the isoquant X and Y are tangential. Here OXE is the output of X and OYE is the output of Y. if the capital-using technical progress is labour saving in Y industry and factor prices remains the same, than E1 will be new equilibrium where the isoquant X_I and Y_I are tangent. Thus, the output of X is higher and that of Y lower at E than at E1 i.e., $OXE_I > OXE$ and $OYE_I < OYE$.

In this situation the prices of the importable commodity X will fall because its output has increased. Thus, the terms of trade will improve for the country.

If the technical progress is capital-using in industry Y_I the new equilibrium point will be at point E_2 where the isoquants X_2 and Y_2 are tangential. As is evident from the figure, the output of Y is higher at E_2 than at E and that of X is lower i.e., $OYE_2 > OYE$ and $OXE_2 < OXE$. In this case, the price of exportable commodity X will rise because its output has fallen. As a result, the terms of trade will be unfavourable for the country.

5.7 Questions

1. Discuss Rybzynski Theorem.
2. Illustrate and explain Stolper-Samuelson theorem.
3. Discuss the implications of technological change on international trade

5.8 Key Words

Technical Progress	:	Change in Technology of factor –factor combination
Immiserizing Growth	**:**	When opening up of the economy leads to reduction in welfare
Endowment	:	Possession of factors of production

5.9 Suggested Readings

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