The Theory of Tariffs

3

Unit Highlights:

® What is tariff?

® Analytical framework of a tariff.

® Partial and General Equilibrium Analysis.

® Effectes of tariff for a small country.

® Effectes of tariff for a large country.

® Effective rate of protection.

Lesson 1 : Tariffs and their effects: The case of a small country

Lesson Objectives

After studying this lesson, you will be able to understand:

® the nature of tariffs;

® the partial equilibrium effects of tariffs and

® the effects of tariff in a general equilibrium setting.

What is a Tariff?

A tariff is a tax on imports of goods and services from abroad. Usually a tariff will tend to raise the price of the goods or service on which it is imposed. Consumers will react as usual by consuming less than before. The volume of imports will tend to fall. A tariff is thus an instrument of trade restriction whatever its nature. Tariffs interfere with the free flow of trade, but may not block it altogether. This may of course happen in the extreme case where the tariff level is so high that demand for imports is reduced to zero. This level of tariff is called a prohibitive tariff as it virtually wipes out all imports, though formally there is no ban on imports. Like tariffs, quotas too restrict the volume of imports. Quotas impose ceilings on how much can be imported. Actual imports cannot legally exceed the specified amount. But tariffs don't impose any quantitative restriction on the volume of imports. This is regulated by the level of tariffs. If imports must be kept within specified limits, this can, in principle, be achieved by suitably adjusting the tariff level, provided the authority possesses is the requisite information to do so. Thus tariffs are distinguished from other import-restricting instruments by the fact that they work through the price mechanism rather than through physical control.

> A tariff is a tax on imports from abroad.

Depending on the basis of classification, there are several major types of tariffs. For example, tariffs may be specific, ad-valorem, or a combination of the two. This classification is obviously related to the levy criterion. If tariffs are specific, a fixed sum of money has to be paid for each unit of imports. This arrangement is preferable when the value of the imported items is difficult to determine or when the value criterion is subject to abuse through, for example, under-or over-valuation. Under the ad-valorem type, the import duty is a fixed percentage of the value of imports. This method may prove more convenient if values fluctuate widely depending on the size, make or brand. For example, the prices of television sets of different brands and sizes may vary over a very wide range. If there are only a few unit rates, they may be unfair, while a bewildering variety, though may be less so, can be quite cumbersome and misleading. A hybrid of ad-valorem and specific duties are sometimes used when the government wants tariffs to adjust automatically to price fluctuations and also to ensure that some minimum levy remains in force. Tariffs are sometimes classified on the basis of their objectives they are intended to achieve. Two major objectives are raising revenue for the governments and providing protection to domestic industries or workers against cheap imports. We have thus names like revenue tariffs and protective tariffs. It should, however, be carefully noted that the distinction between two is not very clear-cut because tariffs imposed with one purpose in mind may usually affect the attainment of the other, as can be easily imagined.

> The advalorem import duty is a fixed percentage of the value of imports.

Analytical Framework of Tariff Analysis

As mentioned earlier, tariffs tend to restrict the volume of trade. This will naturally lead to a reallocation of resources, production and consumption within as well as between trading countries. Within the tariff-imposing country, different groups like consumers, producers and workers will be differently affected. The tariff levying country may stand to gain or lose as a whole. All will depend on the economic environment in the context of which the tariff is applied.

Two critical aspects of this environment as we will see later, relate to the prevalence of perfect competition and the possession of market power by the tariff levying country. If by imposing a tariff on goods, a country can lower the price of the imported goods (i.e. can change the terms of trade in its favour), it is said to have market power in the trade of that commodity. In other wards, it can behave like a 'large' country with respect to the trade of the relevant commodity. On the other hand, if the tariff has no influence on the world price, the country has no market power, and it is said to be a small country with respect to the trade of that commodity. It is thus clear that 'smallness' and 'largeness' refer to possession (or otherwise) of market power in particular goods and have nothing to do with the physical size of the country. Moreover in this sense, a country can simultaneously be 'large' or 'small' with respect to the trade of different commodities.

In analyzing the effects of tariffs one can use a partial or a general equilibrium framework. The partial equilibrium approach is simpler than the general equilibrium one, but before its employment its appropriateness must be carefully considered, because it is based on the 'ceteris paribus' (i.e., other things constant) assumption. Therefore, this approach will be appropriate only if the change in the policy instrument is relatively small and so it is unlikely to affect the rest of the economy strongly.

Tariff by a Small Country : Partial Equilibrium Analysis

If a small country imposes a tariff, it, by definition, leaves the terms of trade unaffected. It, therefore, faces a perfectly elastic (horizontal) supply curve for imports. Moreover, since the terms of trade is unaffected, levying a tariff by a small country can have no effect on the welfare of its trading partners. The tariff imposing country alone will face consequences of the tariffs. However, different groups of people within the country may not be similarly and equally affected. Take the case of consumers. The very fact that some of the goods were imported before tariff shows that the consumers found it a better bargain than buying from the domestic market alone. Tariffs tend to raise prices inducing consumers to buy less than before. Tariffs should therefore make them worse off.

Effects on Consumers

We can confirm this intuition with the help of demand and supply analysis of Fig. 3.1 in a partial equilibrium framework. In Fig 3.1 D_d and S_d are respectively domestic demand and supply curves respectively for radios. P_w is the world price. In the absence of a tariff any number of radios can be imported freely at the fixed world price, P_w. The domestically produced radios will compete with imported ones which are available at a fixed price, P_w. Therefore, domestic price cannot exceed P_w. On the other hand, domestic producers will not clearly sell at a price lower than P_w. Therefore, the domestic price will settle at P_w. That is, radios will

Market power determines whether a country can gain from a tariff.

Different groups of people within the country may not be similarly and equally affected by tariff.

sell at P_w internationally as will as domestically, if there is free trade and the tariff imposing country is small.
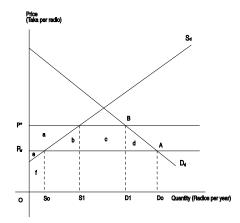

Fig 3.1 The Effect of Tariff on Consumers

At price P_w the total quantity demanded is Do and the quantity supplied by domestic producers is S_o. The extra demand, D_o-S_o, is met by imports from abroad.

Now, suppose that an ad-valorem tariff is imposed on the import of radios, raising the domestic price to P*. Since the country has no market power, the price goes up by the full extent of the tariff. The tariff thus drives a wedge between the price received by foreign suppliers and the price paid by domestic consumers. Faced with higher prices, consumers cut back demand from D_o to D_1. As a result the total consumer supplies is reduced by the area P* P_w AB which is the sum of areas a, b, c and d.

Note that in the post tariff situation, consumers pay more for both domestically produced and imported radios. Consumers cannot avoid the higher price by turning to domestic producers, because domestic production can be expanded only at higher and higher marginal costs. Therefore, the net loss to the consumers from the tariff remains the area (a+b+c+d).

Effect on Producers

From Fig. 3.1 we see that before tariff the quantity domestically supplied is S_o. As the price rises to P* because of the tariff, it pays to expand output to S_1. At this level of output, the merginal cost of production rises to P*. So, S_1 is the most profitable output level at the tariff ridden price P*.

The total revenue from selling S_o is P_w times S_O and can be represented by the area (e+f). The total variable cost of production of this level of output, is on other hand, given by the area 'f'. The difference between the two represents the net gain to producers (producers surplus) at S_O level of output and is given by the area 'e'.

When a tariff raises the domestic price to P*, the area 'a' is added to the existing producers surplus. The net gain in producers surplus is thus the area 'a'. In other words, the tariff raises the net gain of the domestic manufacturers of radios, but this gain is less than what the consumers lose. The reason for this is quite straightforward. The gain of the domestic producers is based only on the domestic

A tariff drives a wedge between the price received by foreign suppliers and the price paid by domestic consumers.

Consumers lose more than producers gain.

output, while the loss to consumers is caused by higher prices paid for both domestic and foreign sources of supply.

Government Revenue from Tariff

As mentioned before, if the tariff is so high that it wipes out all imports, it is called a prohibitive tariff. Prohibitive tariffs will generate no revenue for government. But as long as the tariff is not so high the government will collect some tariff revenue. In Fig 3.1 we see that as a result of the tariff, domestic production goes up from S_o to S_1 and total demand falls from D_O to D_1. Total import falls and stands at D_1-S_1. The total revenue collected on this level of import given by the area c. This is a gain for the nation which can take various forms such as extra spending on social projects. The important point however, is that the revenue accrues to somebody within the economy as a transfer.

Net Loss to the Nation from Tariff

We can now find the net loss to the nation as a whole by offsetting gains to producers and the government against the loss incurred by the consumers.

Consumers loss	:	Area (a+b+c+d)
Producers gain	:	Area 'a'
Government collects	:	Area 'c'
Net National Loss	:	Area (b+d)

Therefore, we can say that when a small country imposes a tariff it becomes worse off, though individual groups within the country (e.g. the producers) may gain at the cost of other groups (e.g. consumers). This conclusion however depends on two crucial assumptions. Firstly, the value of every taka lost or gained as a result of the tariff is just the same as every other taka lost or gained, irrespective of the identity of losers or gainers. Obviously this is a distributional value judgment. Secondly, the analysis assumes a first best world in which there is no divergence between private and social gains and losses.

National Loss Explained

We have seen that the country as a whole loses by the extent of the area (b+d) (Fig. 3.1). This loss arises from the fact that the tariff provents reaping the gains from international trade and specialization. The area 'd' called the consumption effect of tariff represents a deadweight loss (no one else in the economy gains it). For an extra radio, the consumer is willing to pay at the margin P* and in the absence of tariff the demand can be satisfied by paying Pw. Tariff prevents this from happening and hence the deadweight loss.

On the other hand, the area 'b' is known as the production effect of the tariff. This arises because some consumer demand is diverted from imports to more expensive domestic production. This is also a dead weight loss.

Effects of Tariff by a Small Country : General Equilibrium Framework

The conclusion that a small country is made worse off by imposition of a tariff on its imports can also be established in a general equilibrium setting using indifference curves and transformation curves, as illustrated in Fig. 3.2 where TT' is the country's transformation curve. The given relative world price of radios (imports) in terms of wheat is shown by the slope of line 1. Under free trade A and G are respectively the production and consumption points. The country is

importing GK radios in exchange for AK amount of wheat, attaining a level of utility (real income) gain by Y_O. Clearly this level is higher that what would have been possible by consuming only what it produced.

Now if a tariff is imposed on the importation of the radios, their domestic price will rise above the world price. Faced with a higher relative price of radios shown by the slope of the flatter line 2 (it takes fewer radios now to buy a given quantity of wheat), the domestic producers will shift resources away from wheat production to the production of radios (in order to maximize profits). The new production point is B on TT^1 where the ratio of marginal costs again becomes equal to the new price ratio.

In the new production equilibrium, the output of radios has gone up, while that of wheat has fallen. Notice that the reallocation of production from A to B caused by the tariff has made the country poorer. This can be seen from the fact that national output at B valued at world price is lower by FD in teams of radio. The division of resources to radio production causes inefficiency because the nation increases production costs for radios exceeding what these radios cost in the international market. This loss in national welfare is analogous to that represented by area 'b' in Fig. 3.1.
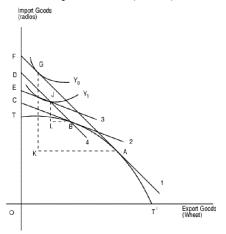
Import Goods (radios)

Fig. 3.2 : The Effect of Tariff in a General Equilibrium Setting

To the loss due to production inefficiency we must also add the loss due to consumption inefficiency (distorted consumption). Line 4 in Fig. 3.2 (which is parallel to line 1) shows the combinations of wheat and radios having the same value at world price as does the production point B. The home country's consumption point in the post-tariff situation must lie somewhere along this line, since trade must continue at the world price. Moreover, the point should be such that at this point an indiffence curve has slope equal to that of line 2 (i.e. the marginal rate of substitution in consumption equals the altered price ratio). In Fig. 3.2, the equilibrium consumption point is indicated by J (line 3 is parallel to line 2). The consumers have reduced consumption of redios from the free-trade level. This reduction is associated with a loss in welfare, because in equilibrium (at J) what the consumers are willing to pay for an extra unit of radio is higher than what they can pay if the demand is met by imports under free trade. The loss due to distorted consumption following the tariff corresponds to area 'd' in Fig. 3.1.

> A tariff on any goods, will push their domestic prices above the world levels.

> Welfare loss results from both production and consumption inefficiency.

The national loss arising from imposition of the tariff is the sum of consumption and production losses (areas 'b+d' in Fig. 3.1) which is reflected in Fig. 3.2 in the fact that the nation has been pushed to a lower indifference curve y_1 in the post-tariff situation.

Questions for Review

MCQ's (tick the correct answer)

1. Welfare loss from tariff may be due to
    A. consumption inefficiency only
    B. production
    C. both consumption and production inefficiency
    D. none of the above.

2. When a small country imposes a tariff, the domestic price is expected to rise
    A. by full amount of the tariff
    B. By less than the tariff
    C. by more than the tariff
    D. by 50% of the tariff.

3. The national loss from tariff is
    A. shared equally by all citizens
    B. falls heavily on the consumers of the relevant commodity
    C. is unlikely to be shared by the producer of the import competing goods
    D. is simply shifted on to the foreigner

4. The national loss from tariff arises because
    A. consumers alone suffer
    B. producers alone suffer
    C. consumers lose and producers gain
    D. consumers lose more than producers gain.

Exercise

Fill in the blank space with the right word/words that follow:

1. A tariff is tax on ------ of goods and services.
    a) Import
    b) Production
    c) Export
    d) Consumption

2. Under the advalorem type of tariff, the import duty is------ percentage of the value of imports.
    a) not fixed
    b) a fixed
    c) increasing
    d) decreasing

3. When a small country imposes a tariff it becomes------
    a) better off
    b) worse off
    c) neither better off nor worse off
    d) less exposed to inflation.

Short Questions

1. Distinguish between a specific and an ad-valorem tariff. When is one to be preferred to the other?

2. In what respects are partial equilibrium effects of a tariff different from its general equilibrium effects?

3. Comment on the methodological difference between partial and general equilibrium analysis of a tariff.

4. What is meant by a 'small' country in the context of trade and tariffs? Has it anything to do with the physical size of the country? Can a given country be small as well as large in separate contexts?

Essay type Questions

1. What is tariff? How are tariffs classified?

2. On the basis of a partial equilibrium analysis, show the effects of a tariff on

   (i) Consumers

   (ii) Producers

   (iii) Government revenue

3. Explain the effect of tariff on a small country welfare.

Answer: 1.C, 2.A, 3.B, 4.D

Lesson 2 : Tariff for a Large Country

Lesson Objectives

After studying this lesson, you will be able to

® analyze in both partial and general equilibrium settings how a large country gains from a tariff;

® analyze how a tariff may sometimes be harm to the imposing country and

® see the relation between tariff and welfare.

In lesson 1 we have shown that a small country stands to lose as a nation from imposition of a tariff on imports. By definition, a small country is a country which can't affect the international terms of trade in its favour and thus cannot influence the welfare of its trading partners. The tariff only hurts the small country itself. Hence the conclusion that for a small country free trade is the best policy. For a large country, this conclusion is not necessarily valid, since it can, by restricting trade, say by tariff on imports, turn the international terms of trade in its favour and thus can gain at the expense of the foreigners. A large country as a buyer has monopsony power, though no firm within the country has this power individually. For example, the US as large buyer of Toyota cars of Japan can to some extent influence the price at which Toyotas are sold in the US market by putting a tariff on car imports and thus gain nationally. This is illustrated in Fig. 3.3 in a partial equilibrium framework.

e country buyer has onopsony r, though rm within untry has his power ividually.

Import Tariff for the Large Country : Partial Equilibrium Analysis

In Fig. 3.3, D_H is the home country's demand curve for radios and S_F is the foreign supply curve. In the absence of tariff, the price for radios is P_w (=100). A small (ad valorem) tariff is now imposed on imported radios raising the price to P_2=(101). Notice that the price in the domestic market has gone up by less than the tariff. The price paid by domestic consumers (P_2) is higher than the price paid to foreign suppliers (P_1). The free-trade price is in between the two. The tariff, while raising the domestic price a little bit, has also lowered the foreign price to some extent. Why is this possible?

n a 'large' y imposes tariff, the e paid by stic buyer gher than at paid to gn sellers.

The foreign suppliers can sell a smaller quantity at a lower price (since the supply curve is positively sloped). Therefore, in an attempt to limit drop in exports, the foreign sellers lower radio prices. This is the source of gain from tariff to the tariff-levying country as a whole. The tariff lowers the volume of imports from Q_o to Q_1. The quantity Q_1 which previously cost P_w times Q_1 (=Tk. 1,98,00,000) now costs P_1 times Q_1 (=Tk. 1,96,02,000) implying savings equal to the area M (=Tk. 1,98,000). The amount of tariff revenue collected is (P_2-P_1) times Q_1 (=Tk. 3,96,000) represented by the area N+M of which the area M (=Tk. 1,98,000) is **practically collected from the foreign supplier.** In the small country case, there is no such scope of taxing the foreigners, since the tariff has no effect on the import price in the post-tariff situation.
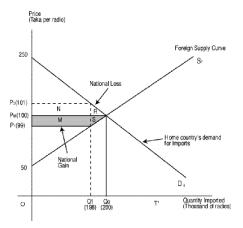
Fig. 3.3 : A Large Country's Gain from a Small Tariff

There is, of course, the usual deadweight loss from reduced consumption represented by the area R in Fig. 3.3. As price rises from P_w to P_2, the consumers cut back consumption by Q_0-Q_1 and thereby lose consumer surplus represented by the area (N+R) of which N is collected as tariff revenue by the government and is a transfer from consumers to the government. Let us suppose that the government returns the tariff revenue to the citizens in one form or another. Therefore the deadweight loss from diverting consumption to the more expensive source is given by the area R. This must be offset against the national gain of area M. If the area M is larger than the area R, the tariff-imposing country as a whole can be a net gainer.

Why doesn't the country try to enlarge its gain by imposing ever higher tariffs? A look at Fig. 3.3 should convince one that this will work only up to a point. There are limits to a country's market power. If the tariff rate is pushed to the prohibitive level, imports will fall to zero. Then there will be no foreigner around to exploit. In terms of Fig. 3.3 this will happen when the tariff per radio exceeds Tk. 200, driving the price received by the foreigners below Tk. 50. The home country will then face the loss of all gains from trade. In general, the lower the foreign supply elasticity, the higher can be the tariff rate and the larger the national gain. At the extreme, if foreigners' supply elasticity is infinite, the home country faces a fixed price of imports, and the home country cannot gain at the expense of the foreigners.

Tariff and World Welfare

Even when the tariff imposing 'large' country can gain from tariff, the world as a whole is worse off. What the nation gains is less than what the foreigner lose. We see from Fig. 3.3 that in cutting back production from Q_0 to Q_1, foreign producers suffer a loss of producers' surplus to the tune of area (M+S) of which M is a transfer to their home country. S thus represents a deadweight loss. So for the world as a whole the loss is represented by the area (R+S). The tariff may be good nationally, but it still causes net loss to world welfare.

Tariffs for a Large Country : General Equilibrium Analysis

The fact that a large country can influence the international price by restricting imports through tariff means that the domestic price of the imported goods rises by

less than the amount of the tariff. To the extent that the domestic price of the importable rises, it encourages the shifting of resources away from the domestic production of exportables to the production of importables. The terms of trade improves for the country because the reduced demand tends to lower the international price of importables while reduced production raises the price of the exportables. As we have seen in partial equilibrium analysis, the terms of trade effect of tariff is the source of gain to the tariff imposing 'large' country which may be partly or wholly offset by loss of consumer surplus caused by tariff-restricted consumption. The gain may exceed the loss and vice versa. So in the abstract what we can say is that in order to avoid the welfare loss from consumption dominating the gains from terms-of-trade improvement, the tariff rate must be carefully chosen. The possibility that a large country can gain or lose from tariff (despite market power) is illustrated below.

National Welfare Reducing Tariff

Fig. 3.4 illustrates the case where a tariff imposed by a large country can lead to a loss of national welfare. The free-trade production and consumption points are A and G respectively. A tariff on importation of radios causes their domestic price to rise. The new price ratio is shown by the slope of line 3 rather than by that of international price line 1. At the new (higher) domestic price the producers find it more profitable to expand the production of radios at the expense of wheat. Let us suppose that the new product mix shifts from A to A*.
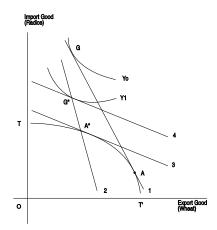

Fig. 3.4 : Tariff Reduces National Welfare

Apart from raising the domestic price, the tariff also lowers the international price, an implication of the possession of market power by the tariff-imposing country. This is reflected in Fig. 3.4 by the steeper price line 2 (foreigners get less wheat for a given number of radios). Since trade must be carried out at the new international price, the post-tariff consumption bundle has to be somewhere on line 2 passing through A*. Line 2 shows the country's consumption possibilities, because the value at the new international price of each bundle on this line must be equal to the value of the bundle A*. The buyers facing the domestic price ratio of line 3 (and of 4 which is parallel to line 3) will choose point G* at which the indifference curve Y_1 has the same slope as that of line 3 (or 4). In this particular case, the terms of trade gain is more than offset by the deadweight loss due to reduced consumption caused by tariff-induced higher domestic price. This is

reflected in the fact that the nation's welfare level drops from Y_0 (pre-tariff level) to Y_1 (post tariff level): the tariff rate is simply too high.

National Welfare Increasing Tariff

We have just seen that a tariff by a large country can be destructive of national welfare. The opposite case in which national welfare may increase is demonstrated with the help of Fig. 3.5. The free-trade production is at A on the domestic product transformation curve TT', the international price being shown by the slope of line 1. At this price, consumption is at G, allowing the country to reach the indifference curve Y_0.

A tariff on the importation of radios raises as usual the price faced by the domestic producers and consumers. The producers adjust to the new situation by reducing the production of wheat and increasing that of radios. The new production point is A* where the domestic price ratio represented by the slope of line 3 is equal to the slope of TT'. On the other hand, by virtue of the market power possessed by the country, it forces the international price to fall to the level indicated by the slope of line 2 (foreign suppliers now give more radios for any given amount of wheat). Line 2 also shows the consumption possibilities open to the country. Apart from representing the new (lower) international price, line 2 also indicates the purchasing power of output mix A*.
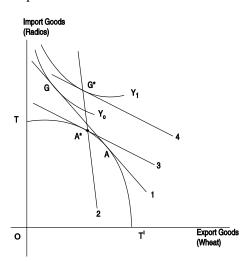

Fig. 3.5 : Welfare Increasing Tariff for a Large Country.

Consumers faced with the domestic price given by the slope of line 3, (or of line 4 which is parallel to line 3) choose the bundle G*. Therefore, the movement of the consumption point in the post-tariff situation to a higher indifference curse Y_1 shows that the country's welfare has gone up as a result of the tariff: the exercise of market power has paid off.

We have seen above that by restricting trade a country with market power can increase its level of national welfare above the free-trade level, provided it chooses the tariff rate so as not allow the welfare-reducing consumption effect to offset the welfare-increasing terms-of-trade effect of a tariff. This implies that from the national point view, free trade is not optional for a large country, though this is so for a small country. We must then ask why we are led to different policy prescriptions for the two sets of countries with respect to free trade.

When there is universal perfect competition, free trade ensures that all marginal conditions for pareto optional allocation of factors and for distribution of goods are satisfied. There is no other allocation of factor and of goods which can increase the welfare of one member of the society without simultaneously reducing that of another. Now if a small country trades freely, buyers and sellers face the same international price ratios. Therefore, in free trade equilibrium, the marginal rate of substitution in consumption (MRSC) and the marginal rate of transformation in production (MRTP) are equal. Moreover, both are equal to the average rate as well as the marginal rate of transformation through trade (ARTT). As a result, resource allocation is pareto optimal, and any tariff, by interfering with it, will lead to a loss of national welfare. Free trade is, therefore, optimal for a small county.

But when the country has market power, the marginal rate at which a unit of a good can be transformed into another through trade (MRTT) is not equal to the average rate of transformation through trade (ARTT). The latter is, in fact, the terms of trade. By buying less, the large country can push the MRTT below ARTT. In free trade, as we have just mentioned, MRCS=MRTP=ARTT. Since for a large country MRTT<ARTT, under free trade we have

$$MRCS=MRTP=ARTT>MRTT$$

which violates the condition for pareto optimality. The country is, in fact, producing too little of the import good. Free trade is thus not optimal for a large country. In this situation, any policy that brings MRTP closer to MRTT will increase welfare. A small tariff can do this. But if the tariff is very high, it may lead to the reversal of the relationship (i.e. MRTP<MRTT) and, if the gap is too large, national welfare may decrease. These observations suggest that there will be a tariff rate which will maximize national welfare, as we shall see.

Questions for Review

MCQ's (tick the correct answer)

1. A large country is one which has
   A. a large area
   B. a vast population
   C. a skilled labour force
   D. the ability to change the world price in its favour by imposing tariff.

2. That a country possesses market power should imply that it will exercise that power
   A. irrespective of circumstances
   B. only when it can change the international terms of exchange
   C. only when it can gain by changing the terms of trade
   D. under no circumstances.

3. A tariff by a large country can
   A. raise its welfare
   B. lower its welfare
   C. leave its welfare unaffected
   D. either raise or lower welfare depending on circumstances.

3. Free trade
   A. is optimal for a small country
   B. not optimal for a large country
   C. always optimal for a large country
   D. both (A) and (B).

Exercise

Tick (√) the right answer:

1. When a large country imposes a tariff it becomes
   a) better off usually
   b) worse off
   c) neither worse off nor better off
   d) strong.

2. When a large country imposes a tariff, the world as a whole is
   a) better off
   b) worse off
   c) neither worse off nor better off
   d) remain the same.

3. When MRSC and MRTP are equal, the resource allocation is
   a) maximum
   b) minimum
   c) pareto optimal
   d) equal.

Short Questions

1. "A country as a whole may possess market power in a particular commodity, though an individual firm in the industry may not have". Does it sound paradoxical? Explain.

2. Explain why the tariff imposed by a large country can lead to a situation in which the domestic buyers pay more than what is paid to foreign suppliers.

3. The power to raise tariff profitably by a large country is not unlimited. Explain why this might be true on occasions.

Essay type Question

1. Discuss the effects of tariff by a large country assign a general equilibrium framework.

2. Explain how world welfare is reduced by tariff imposed by a large country.

3. Explain how national welfare is enhanced when a large country exercises its market power.

Answer: 1.D, 2.C, 3.D, 4.D

Lesson 3 : Tariffs and World Welfare

Lesson Objectives

After studying this lesson, you will be able to

® understand how tariffs affect world welfare;
® understand how costs of protection are measured and
® understand the concept of effective protection and its significance.

Tariffs and World Welfare

We have explained earlier that a tariff tends to reduce welfare for the small country, While it may do the opposite for the large country. We have also hinted that even when a large country gains from 'tariff' the other countries lose more. Therefore, even in the absence of retaliation by countries on the imports from which a large country imposes tariff, the world as a whole is worse off by a tariff. Those who support free trade basically depend on this point that no matter whether the tariff imposing country is small or large, world welfare with tariff will be lower than the free trade level. We shall explain this argument more rigorously in a general equilibrium setting.

One consequence of tariff is to lower world output below the free trade level. This is explained with the help of Fig. 3.6. Here TT is the home country's transformation curve with respect to the origin O, while T^1T^1 is the same curve for the foreign country (rest of the world) with origin at O'. Home country's tariff on radios raises their price in the domestic market relative to the price of wheat. This is reflected in the divergence between the slopes of domestic and foreign transformation curves in the post-tariff production point. Note that in Fig. 3.6, the production points at home and abroad have been superimposed on each other at point Q. The slope of line 1 shows the domestic relative price and that of line 2 shows the foreign relative price. Line 1 is flatter than line 2 because of the home country's tariff on radios. Total world output with tariff is indicated by point O' relative to the axes through O.

> World welfare with tariff will be lower than the free trade level.

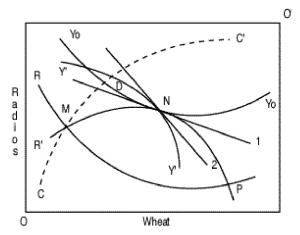Fig. 3.6 : Tariff Reduces World Production

Fig. 3.7 : Tariff Pulls Consumption Off the Contract Curve

Tariffs tend to reduce world output below the free trade level.

Now let us suppose that free trade is allowed by removing the tariff so that resources at home and abroad can shift in accordance with the respective comparative advantage- wheat at home and radios abroad. In Fig. 3.6, the possible free trade production points at home and abroad are indicated by points A and B respectively. Under free trade, the slopes of TT at A and that of T^1T^1 at B are equal. If we now super impose production point B on production point A, the total output will expand from O^1 to (say) C. This shows that tariffs tend to reduce world output below the free trade level. This is one reason why tariffs lower world welfare.

There is, however, another reason which relates to distortion in world consumption induced by tariff. In Fig. 3.7 CC' is the contract curve which is the locus of all points at which a home indifference curve (origin at O) is tangent to a foreign indifference curve. For any given total of world output shown by the dimensions of the box world consumption is efficient if it takes place on a point on the contract curve (CC') which will indeed be the case under free trade.

By imposing tariff the home country gains at the expense of the foreigners.

In Fig. 3.7, this point is M which represents intersection of home country's offer curve (PMR) and the foreign country's offer curve (PNR'). The world terms of trade is given by the slope of the straight line passing through M and P (not shown in Fig. 3.7). A tariff by the home country on radios will shift the home country's offer curve so as to intersect the foreign country's offer curve at N. The slope of line 1 shows the domestic price ratio, while that of line 2 gives the foreign price ratio. The two price lines must intersect to reflect the divergence between the domestic and the foreign price ratios. As a result of the tariff, consumption is thrown off the contract curve: consumption shifts from M to N. At N, the home country's welfare level is shown by the indifference curve Y_o which is tangent to price line 1 at this point. The home country has reached a higher welfare level than at M. The welfare of the foreign country (the rest of the world) is lower than before (Y'Y' represents a lower welfare).

We see, therefore, that by imposing a tariff the home country gains at the expense of the foreigners. We have yet to decide whether the world as a whole is worse off by tariff. Notice that consumption at N is inefficient from a world point of view, since N is off the contract curve CC'. A free trade from N would have allowed the

world to reach a point such as D on the contract curve. At this point all countries (the world as a whole) are better off than at N.

Tariff as Production Subsidy plus Consumption Tax

We have seen earlier that a tariff drives a wedge between the domestic price and world price. The producers and consumers of the tariff imposing country (assumed to be a small one) face the same (higher) domestic price for importables. The higher price induces home producers to shift resources away from exportables. Consumers, on their part, reshuffle their purchases in the light of the new price ratio. We have also seen that the tariff leads to welfare losses by distorting production as well as consumption.

Tariffs, however, are not the only kinds of policy-induced distortions that affect production and consumption decisions. In the absence of any per-existing distortions, production subsidies and consumption taxes too will have the same effect of distorting choices faced by producers and consumers. In fact, it can be shown that a given tariff is equivalent to a combination of an appropriately chosen production subsidy and a consumption tax in the sense that each will produce identical deviations from free-trade production and consumption levels. For example, let us suppose that the free trade price of a bicycle is $50. A 10% tariff will raise its price to $55 for both domestic producers and consumers. The same result can be obtained by imposing a 10% consumption tax and giving a 10% subsidy to producers. The consumption tax alone raises the price for consumers to $55, while producers receive $50 (the difference i.e. $5 goes to the government as revenue). A production subsidy of 10% then raises the price received by domestic producers to $55.

> Production subsidies and consumption taxes too will have the same effect of distorting choices faced by producers and consumers.

The same idea is illustrated graphically in Fig. 3.8. The free-trade price ratio is shown by the slope of line. Free trade production is at A on the domestic transformation curve TT^1 and consumption at B on line 1 passing through A. A tariff on imports raises the relative price of importables as shown by the slope of line 2. Production shifts from A to C. The slope of line 3 is the same as that of line 1 and since it passes through the new production point C, the home country can purchase any bundle on this line. But the domestic consumers face the price ratio shown by line 2. The consumption point chosen by consumers is shown by E on line 3 at which an indifference curve (Y_2) is tangent to line 4 (which is parallel to line 2 and hence shows the same price ratio as does line 2).
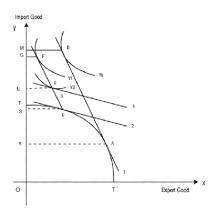

Fig. 3.8 : Tariff Equivalent of Production Subsidy plus Consumption Tax.

Given the consumption opportunity line 3 and the domestic price ratio, Y_2 is the highest level of welfare attainable in the post-tariff situation. Therefore, the tariff has caused domestic production of importables to increase from OR to OS and consumption of improtable to fall from OM to ON.

Now the same results can be obtained by a suitable combination of production subsidy and consumption tax. Let us first take the case of production expansion. It is clear that producers will not shift production from A to C as long as it faces the world price shown by line 1. What is needed is an increase in the domestic price of importables, because production at C involves a higher cost than at A. Therefore, a properly chosen subsidy which exactly offsets the higher cost at C should cause domestic producers to shift production from A to C, exactly as the tariff does.

Notice, however, that the production subsidy only enables the domestic producers to successfully face the higher cost given by the slope of line 2; but it leaves the consumers free to trade at the world price. Line 3 is parallel to line 1 and passes through C. While the subsidy takes production to the desired level (OS of importables), it fails to reach the consumption target. At point 'F' the importable consumption is higher than in the case of tariff (OG>ON). To obtain the same effect consumption must fall by GN from the post subsidy level OG. This can be attained by a suitable consumption tax on importables such that instead of facing the world price the consumers too face the same price ratio as faced by domestic producers (i.e. the price shown by the slope of line 2 and 4). In that case the consumption point will be E, and the tax will reduce the consumption of improtables by GN, as required.

We can, therefore, say that a given tariff corresponds to a combination of production subsidy and consumption tax which together will produce the same effect as a tariff is expected to do.

Measuring Costs of Protection

Since 1950s, serious attempts have been made to empirically estimate the national welfare losses from tariffs and other forms of trade barriers. Earlier estimates were based on Marshallian surpluses (basically measuring areas (b+d) as in Fig. 3.1). For such measures reasonably accurate information on a few key variables often proves sufficient. The variables include the extent of imports, the height of the tariff and the price elasticity of import demand for each product.

Using this method of loss estimation, Harry G. Johnson (1960) argued, on the basis of his estimates, that the deadweight loss from tariffs, though positive, was but a tiny share of the nation's gross national product. He noted that for any commodity:

$$\frac{\text{Net national loss from tariff}}{\text{GNP}}$$

$$= \frac{1}{2} \, (\% \text{ of tariff}) \times (\% \text{ change in import quantity}) \times \frac{\text{import value}}{\text{GNP}}$$

To appreciate why the fraction on the left is likely to be small, let us imagine some reasonable values for the variables on the right hand side : all tariff are 10% tariffs causing a 20% drop in all import quantities; total import of all goods is 10% of the GNP. Therefore,

$$\frac{\text{Net national loss from tariff}}{\text{GNP}} = \frac{1}{2}\left(\frac{1}{10}\right)\left(\frac{1}{5}\right)\left(\frac{1}{10}\right) = \frac{1}{1000} = 0.1\%$$

In other words, the national deadweight loss from tariff is unlikely to be large, at least for those large countries which are only partially dependent on foreign trade.

The later estimates since the mid-1970s are more complex than the earlier Marshallian surplus type estimates based as they are on what are called computable general Equilibrium (CGE) models. The estimates obtained from those computer-solved large models of the economy are thought to be more satisfactory because these models can easily take account of suitable income and price repercussions that are hidden away in geometrical representations like Fig. 3.1.

With either method (Marshallian or CGE) the gains from free trade range between -1 percent of GNP and + 10% of GNP. The largest gains have been found in cases where barriers were high and were to be removed completely, as in the studies of Brazil and Canada.

Making the Estimates More Accurate

If the national loss due to tariff or other forms of trade barrier is really 'small' the question may be raised whether the issue deserves serious political attention.

If must however, be noted that measuring areas 'b' and 'd' as in Fig. 3.1 are not very accurate because they are subject to several biases which tend to underestimate the net national loss.

First, it may be asked why the actual net loss must be compared with the gross national product of the country. After all, the GNP is a very large denominator and many numerators will look 'small' in relation to the GNP. In fact, even if the percentage is small (say, 1 percent), the national loss due to tariff could be between 10% and 20% of all imports.

Second, the loss is 'net' national loss. Consumers as a group lose more than what the tariffs cost the nation as whole. For example, in term of Fig. 3.1 the consumers lose areas a, b, c and d, while the national loss is restricted to areas b and d. Therefore, the net loss does not truly reflect the loss suffered by the consumers and this explains why tariffs sometimes cause so much controversy even where the national loss is insignificant.

Third, the administration of trade barriers ties up valuable national resources which could be productively used elsewhere. Therefore, to the area (b+d) must be added a part of the area 'c' as national loss, but this adjustment is not usually done in most studies.

Fourth, the estimates of the effect of tariffs on quantities imported are often biased downward for various reasons causing the net deadweight loss look smaller than what they really are.

We must note that there are other factors which under certain circumstances tend to offset the downward bias in loss estimation mentioned above. For example, a tariff may affect the exchange rate in such a way as to reduce the welfare cost. Similarly, adjustments for dislocation costs suffered by displaced workers (or other inputs) in the contracting industries can sometimes lower the deadweight loss as conventionally measured.

Factors counteracting downward bias in loss estimation are to be noted.

Economists are trying hard to refine the estimates by trying to take account of these problems. Sadly, it is easier to identify than to quantify the biases.

Effective Rate of Protection

A large volume of international trade takes place in commodities at various stages of production. The output of one industry is the input of another and vice versa. For example, to make bread we need flour, or to make cloth we need yarn. What a particular industry does is to add value to the (material) inputs it buys from other

industries. The value added represents the "income" of the factors that contribute to value addition.

The ability of a given industry to add value (i.e. to generate 'income' for the factors of production) is affected by the tariff on its output as well as the tariff on the material inputs it uses for value addition. Therefore, in measuring the extent of tariff protection enjoyed by the factors of production of a given industry, we must take account not only of tariff on its outputs, but also on its inputs (if any).

For this purpose, the economists have developed a measure called the effective rate of protection which is distinct from the nominal rate of tariff (i.e. tariff on output only). It is defined a the percentage increase in an industry's value added because of the operation of the country's entire tariff structure. Obviously it takes into account the input-output linkages of the industrial structure.
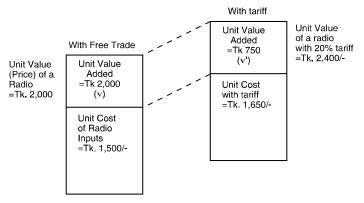
Let us illustrate how the effective rate of protection (ERP) is calculated. We assume that the price of a radio under free trade is Tk. 2000. To produce a radio, the producer has to spend Tk. 1500 for material inputs which are not subject to any tariff. Therefore in the free trade situation, the value added per radio is Tk. 500 (=Tk. 2000 - Tk. 1500). We call this v. Now suppose that a tariff of 20% and 10% are imposed respectively on the import of radios and inputs. The unit price of radios in the domestic market goes up to Tk. 2400, while the material cost of production of a radio rises to Tk. 1650. As a result of both types of tariff, the value added goes up to Tk. 750, which we denote by v'. The effective rate of protection is then

$$ERP = \frac{v'-v}{v} = \frac{Tk\ (750-500)}{Tk\ 500} = \frac{1}{2} \text{ or } 50\%$$

In other words, the value added per unit of output has gone up by 50%. The calculation of ERP in the above instance has been pictorially illustrated in Fig. 3.9.

Notice that the effective rate of protection (50%) is much higher than the nominal rate (20%). This kind of tariff 'escalation' will always take place if the nation's tariff structure is such that commodities at lower levels of fabrication or processing (like yarn and steel) are charged lower rates of tariff than those for goods at higher stages of fabrication or processing (automobile, clothing).

Fig. 3.9 - Calculation of Effective Rate of Protection : An Illustration

$$\text{Effective Rate of Protection} = ERP\ \frac{v'-v}{v} = \frac{Tk\ (750-500)}{Tk\ 500} = .5 \text{ or } 50\%$$

The effective rate of protection is the key indicator of how protection affects resource allocations. For example, if the tariff structure accords higher effective

The economists have developed a measure- the effective rate of protection as distinct from the nominal rate of tariff.

ERP shows how protection affects resource allocation by reflecting the effects of the whole tariff structure.

protection to the garments industry than the steel industry, resource will tend to flow from the steel industry to the garments industry. This will be true even when the nominal tariff is higher for the steel industry (but the effective tariff is lower). Measures of effective rate of protective have been frequently used in negotiations over tariff schedules among nations.

Reading List (Unit 3)

1. H.G Johnson, *Aspects of the Theory of Tariffs* (London : Allen & Union, 1974)

2. J.N. Bhagwati, *The Theory of Commercial Policy* (Cambridge : Mass, MIT Press, 1983)

3. W.M. Corden, *International Trade Theory and Policy* (Brookfield, Vt. : Edward Elgar, 1992)

4. D. Salvador, *International Economics* (5th ed.) Prentice - Hall Inc. 1995.

5. Bo Sodersten and G. Reed, International Economics (3rd Ed), (MacMillan, 1994)

Questions for Review

MCQ's (tick the correct answer)

1. Tariff can lower world welfare, because
   A. world allocation of output is made inefficient
   B. world consumption of output is distorted
   C. both apply
   D. none applies

2. A tariff
   A. drives a wedge between the domestic price and the world price
   B. does not cause domestic price to differ from the world price
   C. drives a wedge between costs of production of a good by different producer in a given country.
   D. does both A and C

3. The ability of a given industry to add value is
   A. affected by a tariff on that industry alone
   B. affected by all tariffs including those on its inputs
   C. unaffected by any tariff.
   D. both A & B.

Exercise

1. When a country imposes tariff, the world as a whole is worse off
   A) only if the country is small
   B) only if the country is large
   C) irrespective of whether it is large or small
   D) only if it is rich.

2. A tariff may effect the exchange rate in such a way as to:
   A) increase the welfare cost
   B) reduce the welfare cost
   C) stop the tariff
   D) reduce the tariff rate.

3. The Effective Rate of Production (ERP) is what how
   A) the tariff is calculated
   B) protection effects resource allocation
   C) a country imposes tariff
   D) tariff effects welfare.

Short Questions

1. World welfare is lower with tariff than otherwise. Does this conclusion depend on whether the tariff imposing country is large or small? If there are gains from tariff, will that mean that the gaining country gains at the expense of its trading partner?

2. Explain how a tariff tends to reduce world output below the free trade level. Is it the only reason why the world welfare is reduced by tariffs?

3. Show how production subsides and consumption taxes too can lead to the same distortion as world a tariff.

4. The retrieval deadweight loss from tariff is unlikely to be large. Is it more likely to be true for large countries where dependence on trade is small? Why is this so?

5. Distinguish between the nominal and effective rates of protection. Which measure is more appropriate to analyze the resource pull effects of a country's tariff structure?

Essay type Questions

1. Discuss the relationship between tariff and world welfare.
2. What is the cost of protection? How do you calculate it?
3. Define the Effective Rate of Protection (ERP). Explain ERP with suitable examples.

Answer (Exercise) : 1.C, 2.B, 3.B

Answer (MCQ) : 1.C, 2.A, 3.B