

[Lecture 8] Analysis of Tariffs

We now turn our attention to the role of government in the area of international trade. Actions taken by a government to influence the volume and composition of trade flows into or out of country are known as **commercial policy**. A government has a variety of options in conducting the commercial policy, which includes **tariffs, quotas, subsidies, and non-tariff barriers (NTBs)**.

We want to have an in-depth discussion of various forms of commercial policy. This topic is largely devoted to a theoretical analysis of tariffs. And then, we turn to other forms of trade policy followed by the commercial policy practices in the United States and other countries as well as various national and international initiatives to set rules on the conduct of commercial policy. And finally, we will describe the formation of various regional trading blocs, such as EU and NAFTA, and analyze some of the effects these agreements have on member as well as nonmember countries.

1) Tariffs: An Introduction

Tariff is a tax imposed on mainly imports and exports (e.g., Coffee in Brazil).

Tariffs have several effects on the economy where they are imposed;

- (a) **Revenue Effect**: the amount of revenue accruing to a government from a tariff
- (b) **Protective Effect**: the amount by which domestic producers are able to expand their output because a tariff is in place.

Developed countries rarely if ever rely on tariffs as a major source of government revenue. Consequently, it is difficult to point to an example of a pure revenue tariff collected by the United States or other major industrialized countries. On the other hand, the governments in developing economies depend heavily on trade taxes as a source of revenue. There, examples of pure revenue tariffs abound. Tariffs in developed countries primarily exist because of their protective effect.

To understand the tariff mechanism, let's see the handout regarding the "Harmonized Tariff Schedule of the United States."

Note that for every product there are three possible tariffs. The first column, known as *Column 1 General Rates of Duty*, is the duty category most commonly utilized by customs officials. Tariffs from this category are applied to goods from countries to whom the United States has granted **most favored nation status (MFN)**. If U.S. (or any other country) grants another country MFN status, it agrees to charge tariffs against that country's goods that are no higher than those imposed against the goods of any other country (the U.S. government now uses the term **permanent normal trade relations (PNTA)** to denote most favored nation status).

Tariffs may be **ad valorem**, which means that the tax is collected as a percentage of the value of the product (e.g., 17% on imported peaches, while 0.9% on palm hearts. Why different?)

Tariffs may be **specific**. That is, the tariff may be a fixed amount of money per unit of goods traded – regardless of the value of an individual unit.

And tariffs may be **compound**. Such tariffs have both specific and ad valorem components. Processed cherry products are protected by a compound tariff of 6.9¢ per kilogram (specific) plus 4.5% of the product price (ad valorem).

Countries that have not been granted MFN status are charged tariffs based on **Column 2 Rates of Duty**. As the numbers in the table indicate, these rates are substantially higher (sometimes 200 or 300 percent higher) than MFN rates (e.g., strawberry product is 35%, almost three times the MFN rate).

The third set of rates, known as *Column 1 Special Rates of Duty*, are tariffs, even lower than MFN rates, that are applied to certain products from many developing countries or to products from countries with whom the United States has negotiated special trade agreements.

The example of the first is the *Generalized System of Preferences (GSP)*, which was instituted by U.S. in the early 1970s. Other industrialized countries like Canada, EU, and Japan, have their own GSP programs, many instituted about the same time or before the date of the U.S. plan. The idea behind the GSP is that by charging lower tariffs on goods from developing countries, importers in the preference-granting countries such as U.S. will have an incentive to expand their purchases from the preference-receiving countries. In turn, expanded exports should improve the standards of living for these countries and raise the demand for imports from industrialized countries like U.S. (But, GSP has been modified on September 7, 2004. Visit <http://www.usitc.gov/taffairs.htm>)

Another of the U.S. trade assistance programs is the *Caribbean Basin Initiative (CBI)*, which was begun in the 1980s. The program applies low tariffs on certain goods coming from most nations of the Caribbean Basin.

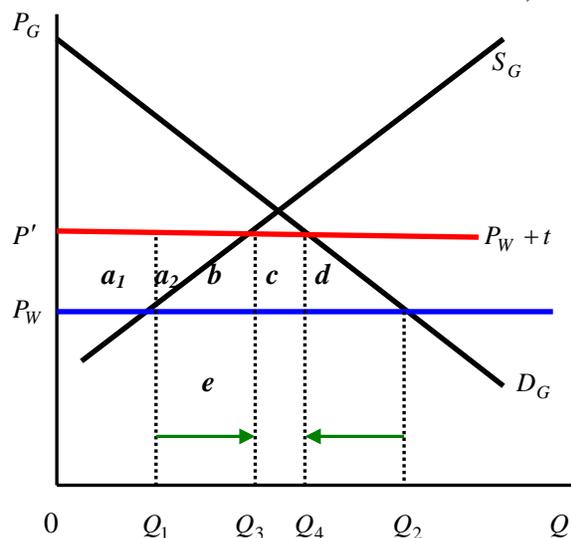
A third trade assistance program is the *Andean Trade Preference Act (ATPA)*, begun in 1991. This program provides Bolivia, Colombia, Ecuador, and Peru tariff-free access to U.S. markets for many goods. The purpose of this program is to provide economic alternatives to drug-crop production.

The most recent assistance program is the *African Growth and Opportunity Act (AGOA)*, signed into law in 2000. The program offers trade incentives for African countries to continue their efforts to open their economies and build free markets.

In addition to special tariffs applied to goods from developing countries, U.S. grants tariff concessions to countries with whom it has negotiated preferential trade agreements. In early 2003, U.S. had agreements in place with Canada and Mexico (NAFATA), Israel, and Jordan and had negotiated agreements with Chile and Singapore. These agreements provide for free trade among the signing countries, but with some tariffs going to zero only after a considerable phasing-in period. Examples of rates applied to these countries are identified with the letters IL, JO, CA, and MX, etc.

2) An Economic Analysis of Tariffs

To avoid confusion with our earlier notation, let's talk about the market of grapes (G).



Under free trade, the domestic production was only () units, while consumption was () units. Imports represented the difference between these two amounts. After the tariff, production rises from Q_1 to Q_3 units (note arrow). Why?

But, the total consumption of grapes falls from Q_2 to Q_4 units. Why?

So, tariff imposition causes a reduction of imports for two reasons. First, domestic output expands. Second, domestic consumption falls. The size of the first effect depends on the shape of supply curve, and the second on the shape of demand curve.

3) Welfare Cost of Tariffs

Because of the tariff imposition, consumers must pay a higher price for the grapes they consume. This implies a loss of consumer surplus. How much is lost? (). Domestic producers gain with the tariff. Their profits (or producer surplus) rise by ().

Who else gains or loses? Clearly, because the domestic government has found a new source of revenue, it gains. How much does it collect? (). Why? The government collects $\$t$ per unit of imports. The base of area c is equal to the level of imports when the tariff is in place. The side of area c is equal to the tariff. Consequently, area c is equal to tariff proceeds. If we assume that the government of this country redistributes the tariffs it collects to the economy, then the tariff revenues represent an internal transfer of income and are not lost to the economy. Thus, in our analysis of welfare we shall treat increases (or decreases) in government revenue as having equal welfare weight for the economy as increases (or decreases) in consumer or producer surplus. The net result of the tariff is that consumers lose $(\$a_1 + \$a_2 + \$b + \$c + \$d)$; domestic producers gain $\$a$; and domestic government gains $\$c$. Netting out these changes, we see that the economy *as a whole* has lost $\$(b + d)$.

How should this loss be interpreted? ().

Area b is known as the **production deadweight cost of tariff**. This amount represents the value of resources required to increase domestic output from Q_1 to Q_3 , in excess of what those units could be purchased for in the world market. How do we know this? Examine the graph carefully. We have already established that, because of the tariff, profits to domestic industry will rise by $\$(a_1 + a_2)$. Area a_1 represents the increased profits on units the industry would have sold even under free trade. That is, with free trade, domestic sales would be Q_1 units, each selling for P_w . With the tariff, each of those units now sells for $P_w + t$.

As we discussed before, the protective effect of the tariff allows the domestic industry to expand its production above free trade levels. This represents a second source of expanded profits to the domestic industry. Sales revenue rises by the amount equal to the increase in production (Q_1Q_3 units) times the price for each units ($P_w + t$), or, as labeled in the figure, $\$a_2 + \$b + \$e$. We know that a_2 is the producer surplus on the expanded output. The cost of the resources required to produce that output is given by areas $(b + e)$. Without the tariff, those units could have been purchased in the world market for $(\$e)$. Hence, $\$b$ represents the cost of resources devoted to expanding production in the higher-cost domestic industry rather than having those units provided by a lower-cost foreign industry.

Area d is the **consumer deadweight cost of tariff**. It represents the value of lost consumer satisfaction due to a shift in consumption to less-desired substitutes brought on by the higher price. That is, before the tariff, consumers purchased Q_2 units. After that, consumption falls to Q_4 units. Consumers lose $\$a + \$b + \$c$ because the amount they now buy costs them more. They lose an additional $\$d$ because their consumption of this product has declined and they shift their purchase to other products.

In presenting our analysis of the economic costs of tariffs, we have focused on a perfectly competitive market where imports can be purchased in unlimited amounts at constant prices. In such markets, it is easy to carry out the welfare calculations conforming to those illustrated in the diagram. Calculation of the welfare effects of tariffs or their removal has become a commonplace activity of trade economists.

4) Some Complications

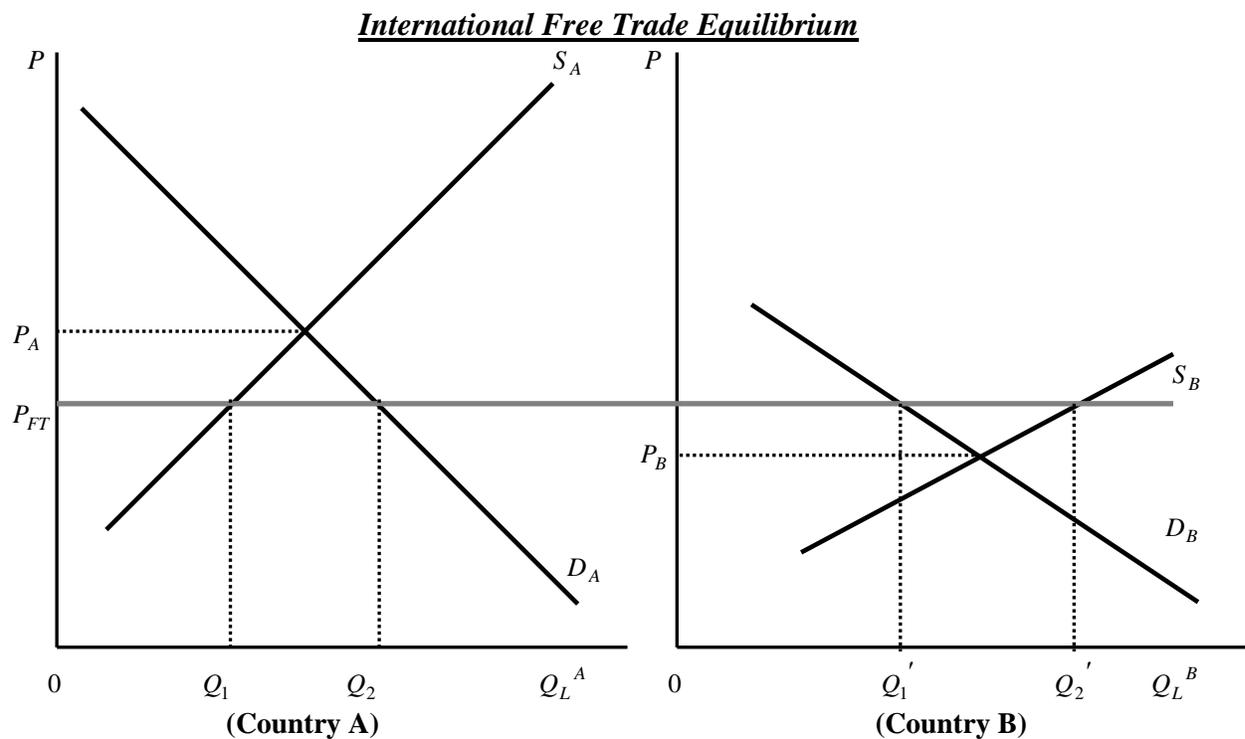
The analysis presented so far has relied on some rather strict assumptions both about the size of the economy imposing the tariff and about the number and the nature of the products involved. As a result,

some very strong conclusions have been reached about the effect of tariffs on a country. Now, we explore some issues that emerge when we relax these strict assumptions.

(A) The Optimal Tariff

Suppose that the country that imposes a tariff is a large country in the sense that it is a significant importer (or exporter) of the product in question. In that case, the tariff imposition could lead to a welfare improvement for the country, relative to free trade. In essence, because the country has market power, by imposing a tariff it is able to obtain the goods it continues to purchase at a lower world price. By forcing down the world price, the tariff-imposing country, in effect, shifts some of the burden of the tariff onto the exporting countries.

Assume that A is an economically large country and an important importer of lumber (L) and country B is an exporter to A.

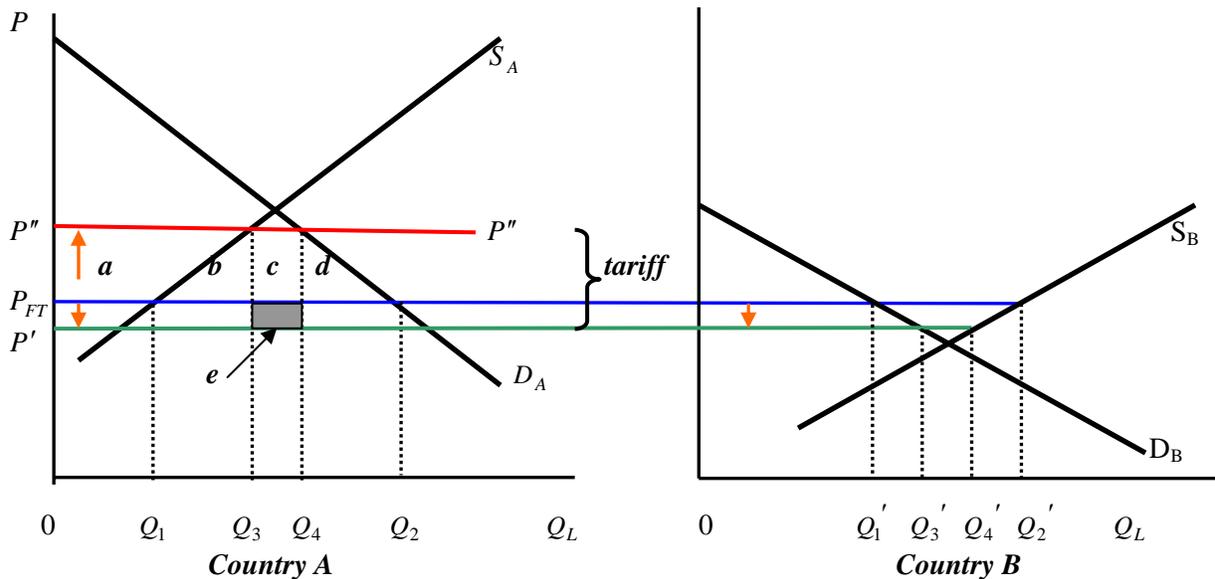


Simple inspection of the diagram would demonstrate that if trade were allowed to occur, then B would have comparative advantage in L and would export L to A. Clearly, at any price below P_A , country A would import L; at any price above P_B , country B would export L (P_{FT} is international trade equilibrium price. Why equilibrium?). At P_{FT} , $Q_1 Q_2 = Q'_1 Q'_2$, export equals import between A and B.

The fact that the markets in A and B interact in the way just described in order to determine the world price is the source of A's international market power. In particular, a change in A's demand for imported units of L will have a direct effect on the world price.

To see how this happens, we want to consider the following scenario: Suppose A imposes a tariff on imports of L that causes imports to fall to $Q_3 Q_4$ units. It's illustrated in the left-hand panel of diagram in the next page (price hike from P_{FT} to P'').

Illustration of a tariff for a Large Country



We need to note the effect A's tariff has on country B. Since A is an important customer of B's product, this causes the price in B to fall when A uses a tariff to reduce its demand. As drawn, the price will fall until world trade is balanced. This occurs at price (), where B's exports equal (), which exactly matches the () units of lumber demanded by A after it imposes the tariff.

With the higher price, consumers in A lose () in consumer surplus. Producer surplus rises by the amount (). What about government revenue? How much has it risen by? The answer is that government revenue rises by $\$(c + e)$. To see that, note first that by definition the size of the tariff equals the difference between the price consumers in A pay for the product (P'') and the price producers in B receive (P'). That is, the per unit tariff of $\$t$ equals (). Thus, we see that in this case the price has gone up in A, but by less than the full amount of the tariff. For example, if the tariff had been \$10 per unit, the actual price rise imposed on A's consumers would be less than \$10. What has happened is that A is such an important customer of B's product that producers in B attempt to maintain sales by absorbing some of the tariff in the form of price (). In the new equilibrium, the price received by producers in B falls from P_{FT} to P' .

This means that the lumber that country A imports comes into the country at a lower price. Then, once the tariff is imposed, the new price in A is $P'' (= P' + t)$. This leads to a convenient interpretation of the amount $\$(c + e)$.

$\$c$: the tariff proceeds paid (in effect) by A's consumers to the government of A.

$\$e$: the amount of the tariff paid (in effect) by B's producers.

What has been the impact on A's overall welfare due to the tariff?

Change in Consumer Surplus:

Change in producer Surplus:

Change in Government Revenue:

NET WELFARE CHANGE:

Is this amount always positive?

$\$(b + d)$: usual deadweight costs of the tariff.

$\$e$: tariff revenue of A's government from producers in B.

All of these amounts depend both on the slopes of the various demand and supply curves and on the size of the tariff imposed by country A. Thus, for a given set of demand and supply curves, it should be possible for the government of A to impose a tariff that raises A's welfare to the largest extent possible. That is, the tariff would be set to a level that maximizes the area $\$e - \$(b + d)$. Such a tariff is known as A's **optimal tariff**.

Under what conditions is a tariff likely to raise a country's welfare?

- 1) The country must be an important participant with market power in the world market. Highly elastic (inelastic) demand and supply conditions in the domestic (foreign) markets will lead to higher market power and greater ability to impose an optimal tariff.
- 2) Reaction that the tariff imposition will induce from the rest of the world.
Any retaliatory tariff measures? Or trade (or tariff) war? Reduction of world trade?
(See the Case Study regarding Trade War in 1930s)

Given the likelihood of retaliation, it is often the case that countries do not attempt to impose what would otherwise be optimal tariffs. There is no evidence, for instance, of any efforts by the United States – which certainly has the market power to do so – to exploit its market power in the implementation of commercial policy.* Examples of attempts to impose optimal export tariffs are more common. The OPEC's oil price increases of the 1970s, while not represented as such at that time, were qualitatively identical with attempts to raise internal (to OPEC) welfare by forcing the rest of the world to pay the tariff it had imposed.

(B) Effective Rate of Protection

The production of most goods involves the use of raw-material or semiprocessed material inputs. Autos require steel, glass, and rubber; computers require semiconductors and electrical wiring; and so on. We have seen that a tariff on a product protects the producers of that good and serves as an incentive to produce more locally. Suppose a country imposed a tariff on steel but not on autos. What sort of incentive would this have on the production of autos? A considerable amount of work has been devoted by economists to answering questions such as this one. In general, the challenge of this work has been to calculate the amount of protection afforded to individual products by the tariff structure of a country. In other words, what is the effective rate of protection (ERP) enjoyed by individual products, because there may or may not be tariffs on these goods or on the goods used in their production?

The ERP is an important and useful concept.

First, it helps to explain the structure of protection in many countries. It is commonplace for industrialized countries to have relatively low or even no protection on raw materials. Tariffs on semimanufactured products tend to be somewhat higher, while tariffs on final products typically are the highest. This structure is known as tariff escalation by stages of processing, and it tends to guarantee positive levels of ERP throughout all protected sectors of the economy.

Second, measures of ERP tell us something about the allocation of domestic resources. It would seem likely that resources will leave industries with low ERPs for industries with high ERPs.

Third, ERP is a valuable measure for politicians and trade negotiators.

* Recently however, the U.S. has shown an increased inclination to impose or to threaten to impose tariffs to encourage foreign governments to end what the U.S. considers to be "unfair" trade practices. The authority to impose these tariffs is found in Section 301 of the Trade Act of 1974 ("Super 301"), as amended.

(Example)

1. Assumptions

- a) In making a man's suit, it takes 5 yards of textiles.
- b) Let the amount paid to domestic primary factors used in the production of suits equal \$50 per suit, which is called **domestic value added** (e.g., wages, rent, and profits)
- c) Textiles are available from both domestic and foreign suppliers at a constant world price of \$20 per yard → The price of a suit under free trade and perfect competition is ().
- d) Government imposes a tariff of 20 percent on imported suits. Such a tariff raises the price of all suits by () assuming that domestic and imported clothes are perfect substitutes and that the tariff-imposing country is small in world markets for imported clothing and cloth.

Because textiles remain available from international sources at the world price of \$20 per yard, the increase in revenue per suit in the apparel industry will go to domestic primary factors in the form of higher wages, rents, or profits. That is, after the tariff on suits has been imposed, domestic producers receive () for each suit sold, but still pay only () for the textiles used to make the suit. The remaining \$80 goes to domestic factors. In this case, the tariff allows an increase in domestic value added from \$50 to \$80. Presumably, it is this increase in value added (including, of course, higher profits) that causes the industry to respond with higher output levels whenever there is an increase in tariff protection.

2. Definitions

$$\text{Nominal rate of protection (NRP)} = \frac{t}{P}$$

(amount that domestic producers can raise the price of their output and still compete with foreign production)

$$\text{Effective rate of protection (ERP)} = (v' - v) / v$$

(amount that domestic value added can rise relative to free-trade levels, while the domestic industry remains able to sell its product in the market)

, where t is tariff on the final product, P is (free-trade) price of the final good, v equals domestic value added under free trade, and v' equals domestic value added when tariffs are in place.

From the above example, $\text{NRP} = \$30 / \$150 = 20\%$ and $\text{ERP} = (\$80 - \$50) / \$50 = 60\%$ (tariff allows payments to land, labor, and capital to rise by a total of 60% over free-trade levels on a per unit basis).

Suppose now that the government imposes a second tariff – this time on textiles. Let that tariff equal only 10 percent. This tariff results in an increase in the price of textiles of 10 percent, from \$20 to \$22 per yard. The raw-material input cost of making a suit increases from \$100 to \$110. Can the suit producer pass these costs on to the public? The answer is no. With a 20 percent tariff on imported suits, foreign suits will still sell for \$180. To remain competitive, domestic suit producers must absorb the higher costs brought about by the tariff (on their input) in the form of lower profits or lower payments to other domestic factors. This is made clear by comparing the ERPs for apparel before and after the imposition of the tariff on textiles.

$$\text{ERP (0\% tariff on textiles)} = \$30 / \$50 = 60\%$$

$$\text{ERP (10\% tariff on textiles)} = (\$70 - \$50) / \$50 = 40\%$$

Because of the tariff on textiles, the ERP afforded to suits has fallen. This is an important lesson. It shows us that protection in one industry is affected not only by tariffs in that industry but by tariffs in related industries as well. A surprising feature of ERP is that even though NRP may be positive for the final product, ERP can be negative. For example, if the tariff is 50% on textiles, value added is \$30. And ERP will be - 40%. The implication of this is that due to the tariff structure, the cost of imported inputs has become so high that value added must be reduced to below the levels found in free trade for a country to compete with imports of the final products.