

Extensions and Applications of the Heckscher-Ohlin Model

In this chapter, we use the set up and implications of the H-O model of trade in order to analyze several important issues in international trade:

1. How do the trading partners fare as a result of "uneven" growth in one economy?

a. Can growth in one country hurt that country or its trading partner?

b. How do the implications of the analysis change if the country in which the uneven growth takes place is a "small" economy?

2. How does an import tariff or an export subsidy affect the terms of trade and welfare of trading partners?

3. What are the effects of tariffs or export subsidy if the country is "small"?

We will address both questions by using a relative demand/relative supply graphical analysis.

1. How do the trading partners fare as a result of "uneven" growth in one economy?

Consider two countries, U.S. and Brazil in a H-O world. Each country produces two goods coffee (C) and machinery (M), using two factors of production, labor and capital. We assume here that good C is relatively labor intensive while M is the relatively capital intensive activity. We also assume that the U.S. is the relatively capital abundant country.

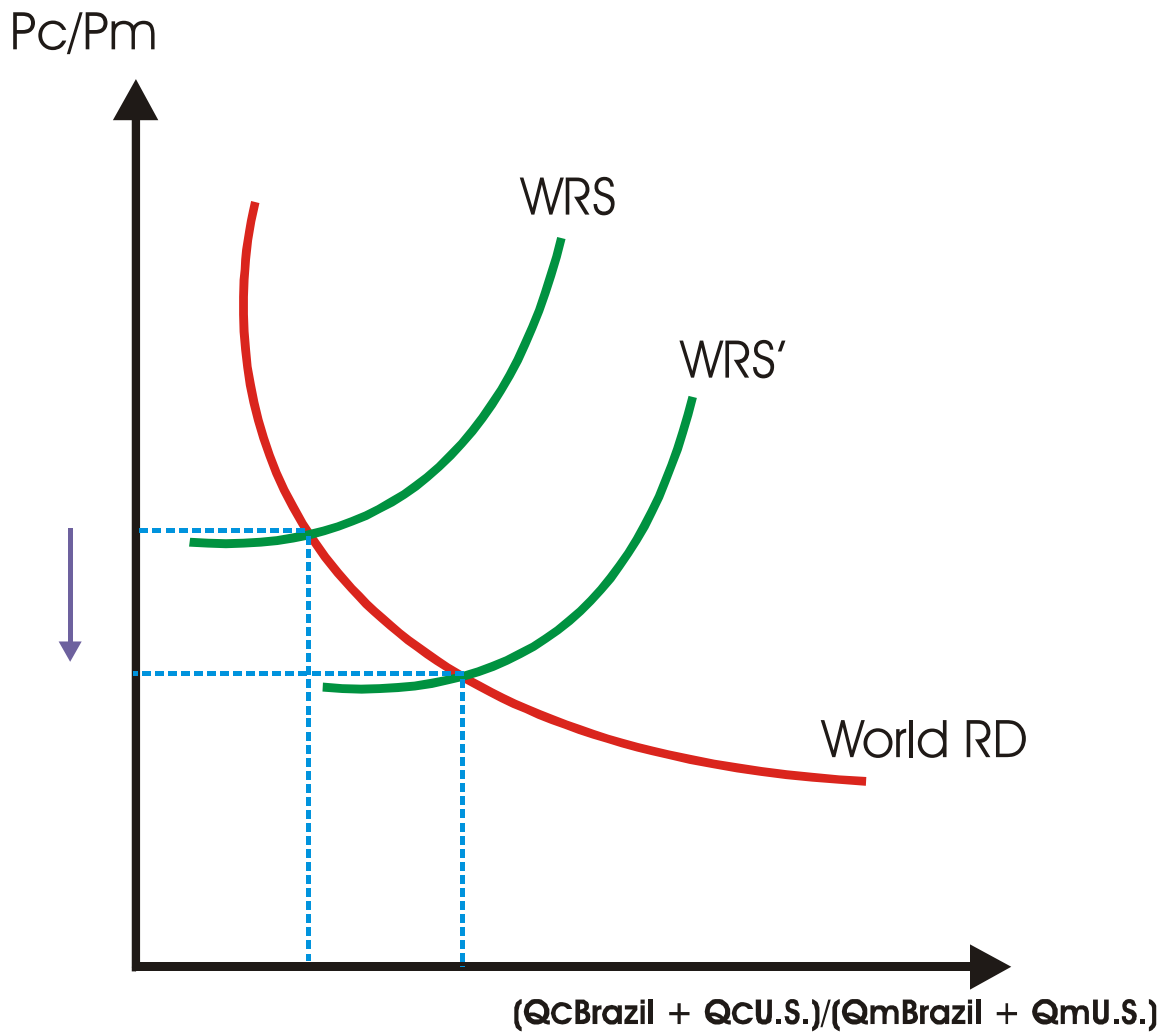
a. Can growth in one country hurt that country or its trading partner?

a1. The effects of an uneven growth in the export sector:

Let's consider the state of free trade between two countries. Now suppose there is growth in the export sector of Brazil, which is coffee. To generate this increase, we can refer to Rybczynski effect and recall that when there is an increase in the amount of one factor of production-- in the H-O world--the amount of the good using that factor intensively goes up by a greater proportion of the increase in the amount of factor itself and, the amount of the other good produced falls.

Therefore, let's assume that there is an increase in the supply of labor in Brazil. According to the Rybczynski effect, all else kept constant, the production of coffee rises and the production of Machinery falls in Brazil. Using the world relative supply/world relative demand graph below, we can show the effects of the increase in the supply of labor and hence the growth of export sector in Brazil on the relative price of coffee in the world (which is the terms of trade for Brazil).

Graph 4-1



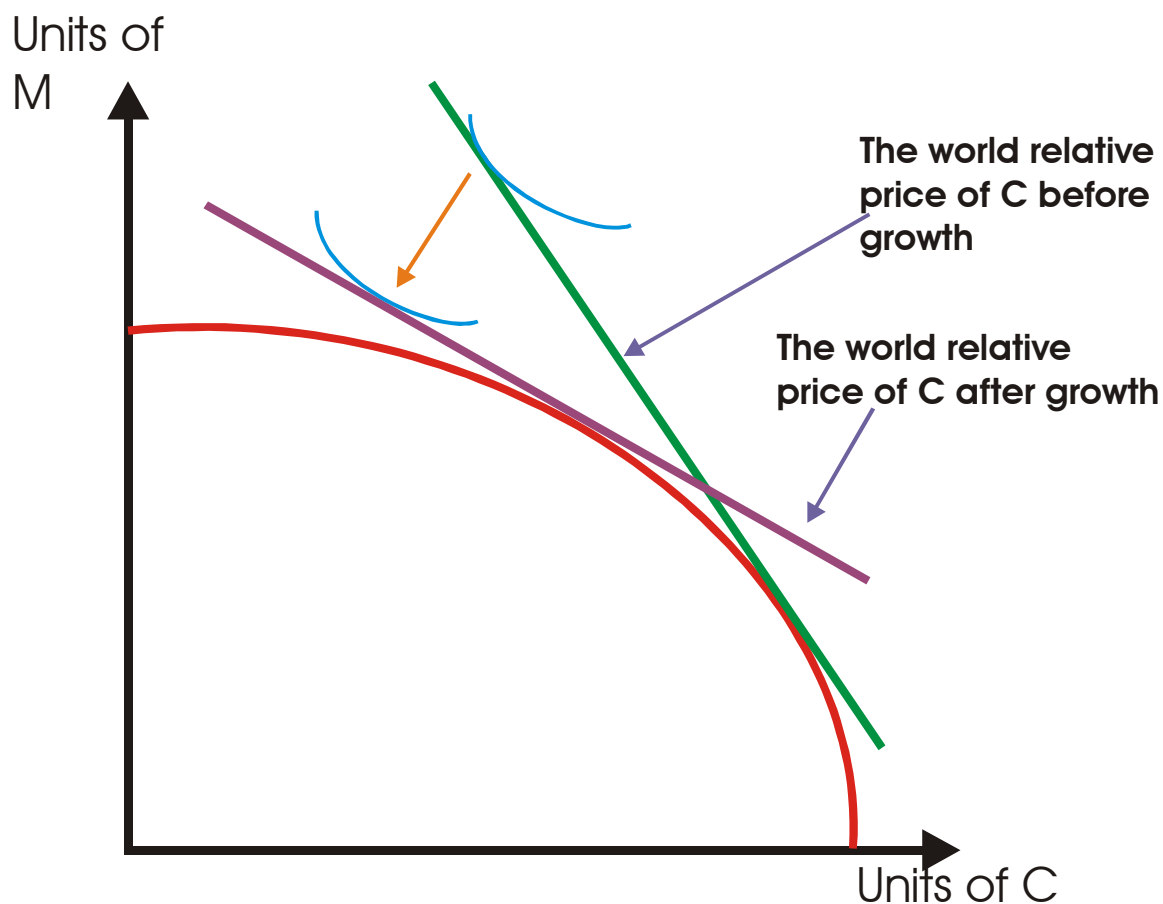
Since the WRS shifts to the right, the TOT of Brazil falls. How is Brazil's welfare affected by this change in its TOT?

Note that there are two effects here: one is the effect of growth in a factor of production which shifts the PPF outward and hence tends to increase the welfare for Brazil. This is synonymous with the increase in the amount of good C produced in Brazil.

The other effect is the fall in the TOT of Brazil which has a negative welfare effect. Here the fact that Brazil is supplying more of its export good to its trading partner leads to a fall in the price of this good, and thus a fall in the TOT for Brazil.

Graph 4-2

Pure Welfare Effect of TOT Change in Brazil



What is the net effect on Brazil from this growth? It depends on which of the two effects, growth effect, or, the TOT effect is larger. If the increase in production outweighs the fall in the TOT, then the net welfare effect on Brazil is positive.

However, if the drop in the price outweighs the increase in production, then the growth has indeed led to a fall in the welfare level for Brazil. This odd result is called, "immiserising growth". Here Brazil fares worse in free trade (compared to its state of before growth) once it experiences a boom in its export sector. This would happen if the demand for coffee by the U.S. is inelastic, that is an increase in output leads to a greater percentage drop in the price, reducing the revenues for the seller.

This type of analysis explains why countries who sell certain products in the world market prefer not to have a boom in their export sector!¹ Members of the OPEC, for instance, attempt to coordinate a cut in the production of their oil so that its price rises. Having an inelastic demand for oil at least in the short run, implies that if the level of production rises, price falls by a greater percentage, reducing the export revenues to the oil exporting countries. In fact, export booms, by leading to a drop in the price, have lowered the export revenues of the oil exporting countries in the past which explains the reason for their attempt to agree to cut production of oil and produce the opposite effect.

Similar efforts have been underway for raising the price of cocoa among the large producers and that of steel initiated by the U.S. administration in early 2002.

Case in Point

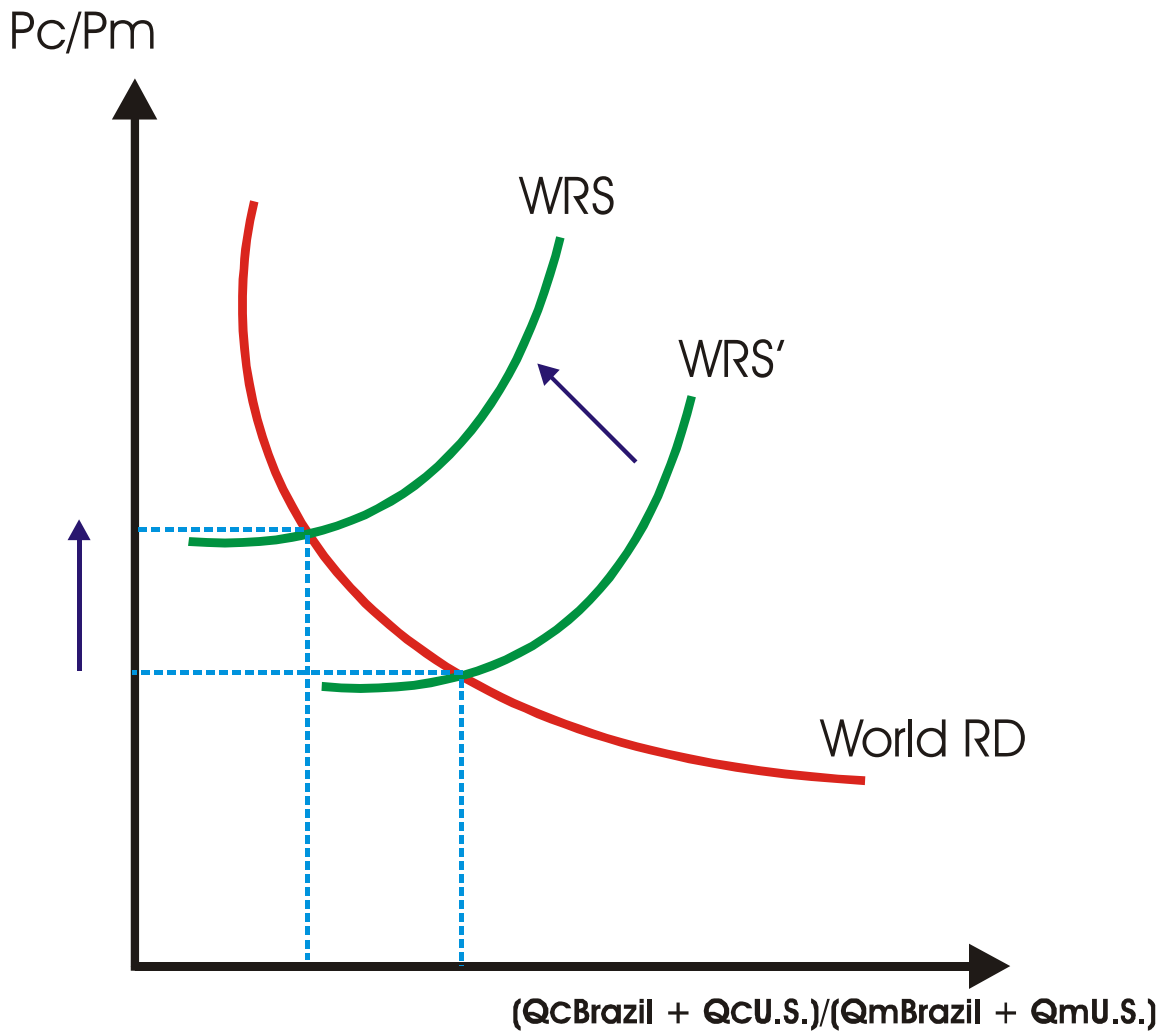
As the Wall Street Journal reports (Monday July 8, 2002), an oversupply of coffee has reduced the export revenues for the Latin American and African producers, negatively affecting the level of welfare of its population. An excerpt from the article reads, "In lush coffee growing regions from Central America to Africa, the collapse of world coffee prices is contributing to societal meltdown affecting an estimated 125 million people. In former Cold War proxy battlefields such as Nicaragua, the result is a combustible brew of unemployment, hunger, and migration. In countries such as Uganda and Burundi, which get 70% of their export earnings from coffee, the severe price drop has blunted benefits from international debt relief."

What are the welfare effects of a coffee boom in Brazil on the U.S., the country which imports coffee? We have an easy answer to give here: as TOT of U.S. rises due to fall in the relative price of coffee, welfare level in the U.S. will increase.

a2. The effects of an uneven growth in the import sector:

Now Suppose that instead of the boom in the export sector of Brazil, the import competing sector in Brazil, the machinery sector, expands. This could of course happen due to an increase in the amount of capital in Brazil. According to the Rybczynski effect, an increase in the amount of capital in Brazil--all else kept constant--will increase the level of production of the capital intensive good, machinery, more than proportionately and reduce the production of the other good. The effect on the world relative supply curve (WRS) is to shift this curve to the left as quantity of coffee produced by Brazil falls and that of machinery increases.

Graph 4-3



The effect on the TOT for Brazil: it goes up. What is the welfare effect of this change and the growth element (pushing PPF outward)? They both go in the same upward direction and so Brazil is definitely better off if it experiences growth in its import sector, implying less reliance (lower demand) for the product of its trading partner, the U.S.

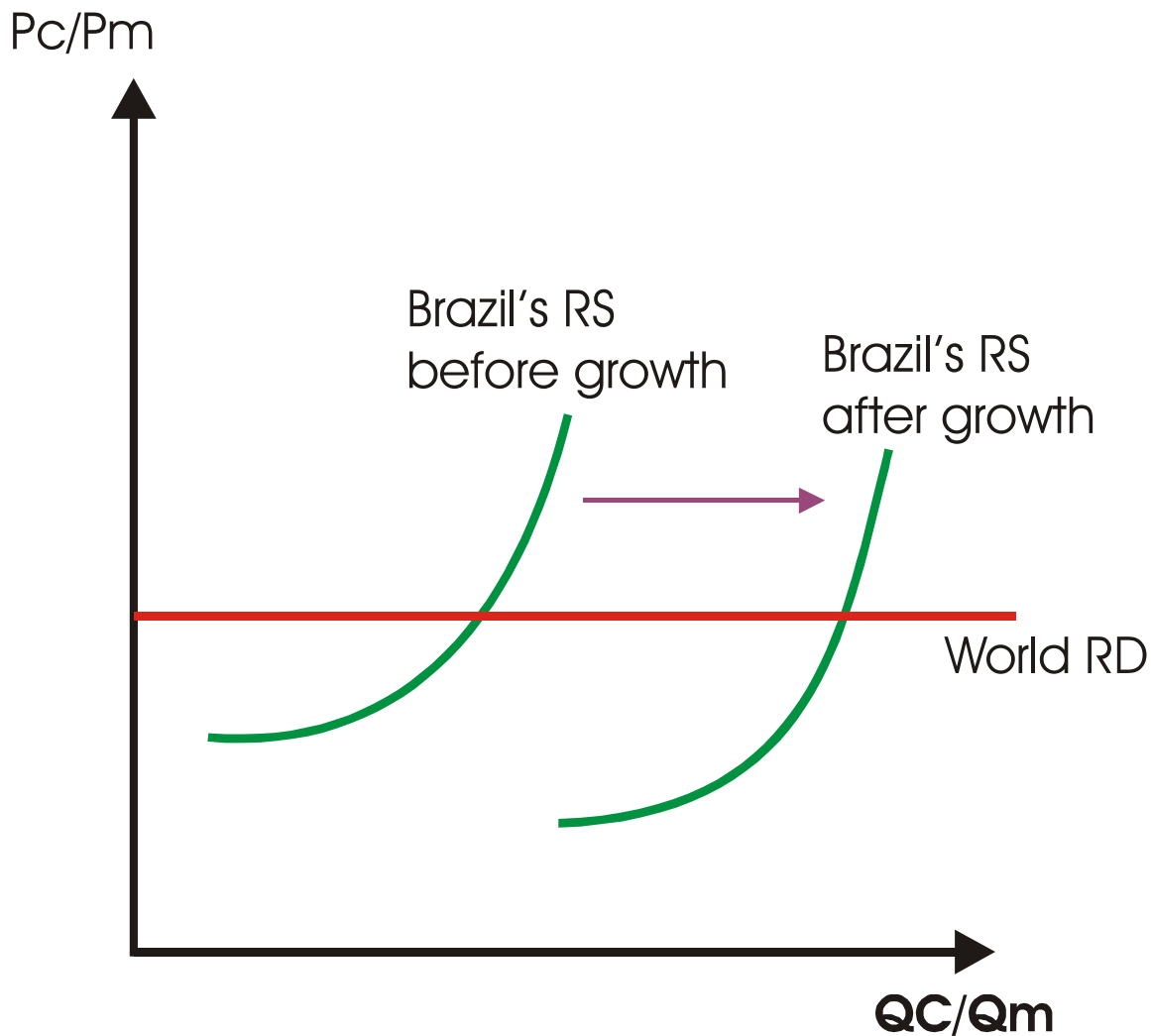
What is the welfare effect of this event on the U.S.? The TOT for the U.S. deteriorates and so the welfare level in the U.S. falls. Therefore, the growth in the import competing sector of a trading partner lowers welfare for an economy in the H-O world.

b. How do the implications of the analysis change if the country in which the uneven growth takes place is a "small" economy?

Now consider Brazil operating in a world where it is one of many producers of coffee and there are many buyers of coffee as well. That is, consider Brazil acting similar to a perfectly competitive firm, where the product the firm produces is competitively produced by many firms (i.e., countries that export coffee) and there are also many buyers (countries who import coffee).

How does an increase in labor, leading to a disproportionate increase in amount of coffee in Brazil affect Brazil's TOT and its level of welfare? The graph of world RS and world RD would be transformed to the following, similar to that of behavior of a single competitive firm in a market:

Graph 4-4



Just like a competitive producer of a good, here, Brazil faces a perfectly elastic demand for its good. Therefore as a result of an increase in the production of coffee, its TOT does not change. Indeed the definition of a small country is one where the TOT for the economy is not affected by changes or actions that country takes (such as export sector growth, import sector growth, tariffs, etc.).

So how is the welfare of Brazil affected in this instance? Due to growth, Brazil's level of welfare goes up.

How does the rest of the world fare? Nothing happens there! So the trading partners, U.S. and many other countries who are buyers of the internationally competitive coffee produced are left unaffected by the changes in Brazil.

In short, a small country, by experiencing a change in its structure of output or by changing its (trade) policies will only affect itself, not the rest of the world as the TOT, or the world relative prices are left unchanged.

2. How does an import tariff or an export subsidy affect the terms of trade and welfare of trading partners?

a. The effects of a tariff

Again consider U.S. and Brazil trading freely in an H-O world. Suppose that the U.S. decides to impose an import tariff on imports of coffee from Brazil. How does this policy affect the TOT and welfare of both countries?

To begin, note that when U.S. levies an import tariff, the relative price of coffee inside the U.S. will rise, creating a wedge between world relative price of coffee and the internal relative price of coffee in the U.S. We can use the same RS/RD graphical analysis to answer questions regarding the TOT and welfare effects of a tariff on coffee in the U.S.

The important distinction to be made here is that a tariff affects not just producers, but also consumers in the U.S.

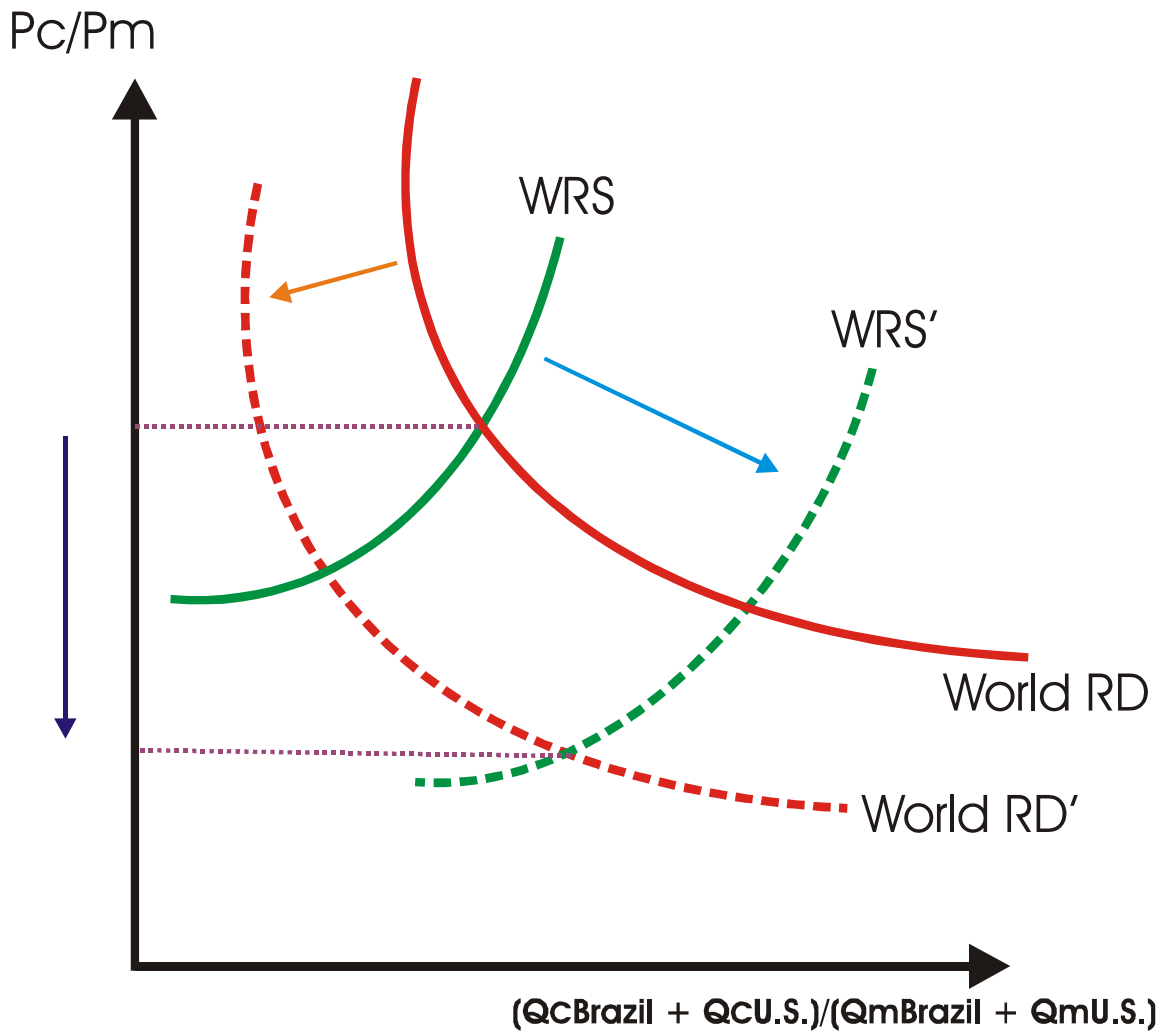
For producers, as the relative price of coffee rises inside the U.S., production shifts towards coffee and away from machinery. This causes the world relative supply to move to the right as the denominator of the ratio expressing the values on the x-axis would fall.

There is also a consumer (demand) reaction. As the relative price of coffee rises inside the U.S., consumers will turn away from coffee and substitute for it by buying more machinery. This will shift the world RD to the left as the numerator of the ratio expressing demand for coffee falls.

The effect of these two shifts, as can be seen from the graph below, is that the world relative price of coffee falls! This is indeed the TOT of Brazil, which due to the tariff action by the U.S. has indeed declined. Thus the answer to the question of how does Brazil fare if the U.S., its trading partner imposes a tariff against its export good is that TOT of Brazil will fall and so will its level of welfare. Essentially, here, the U.S., by imposing the tariff has decreased its demand for Brazil's export good, causing the price of this good in the international market to fall. Conversely, the relative price of machinery, the TOT for the U.S. rises.

Does the welfare in the U.S. rise due to the tariff? Well, it depends! As the TOT for the U.S. rises, we would expect this to positively contribute to a rise in the welfare in the U.S. (at the cost of an equivalent fall in welfare in Brazil due to the TOT decline there!). However, as we shall study in chapter 7 on tariffs, the U.S. has also created a distortion in its economy the result of which is dead weight, or, efficiency losses due to tariff. This tends to lower welfare in the U.S. So the net result for the U.S. is ambiguous: if the TOT improvement exceed the efficiency loss, then U.S. is better off due to tariff. Note however, that for the world as a whole, tariff produces net loss (any gains in TOT by the U.S. are canceled by losses in TOT for Brazil and then there is the distortion created by the tariff).

Graph 4-5



Therefore, the imposition of a tariff by the U.S. leaves U.S. with an improved TOT against its trading partner, but with an overall ambiguous welfare result as the U.S. economy becomes more distorted! Brazil definitely loses due to the TOT decline, the fall in the price of its export good, coffee.

b. The effects of an export subsidy

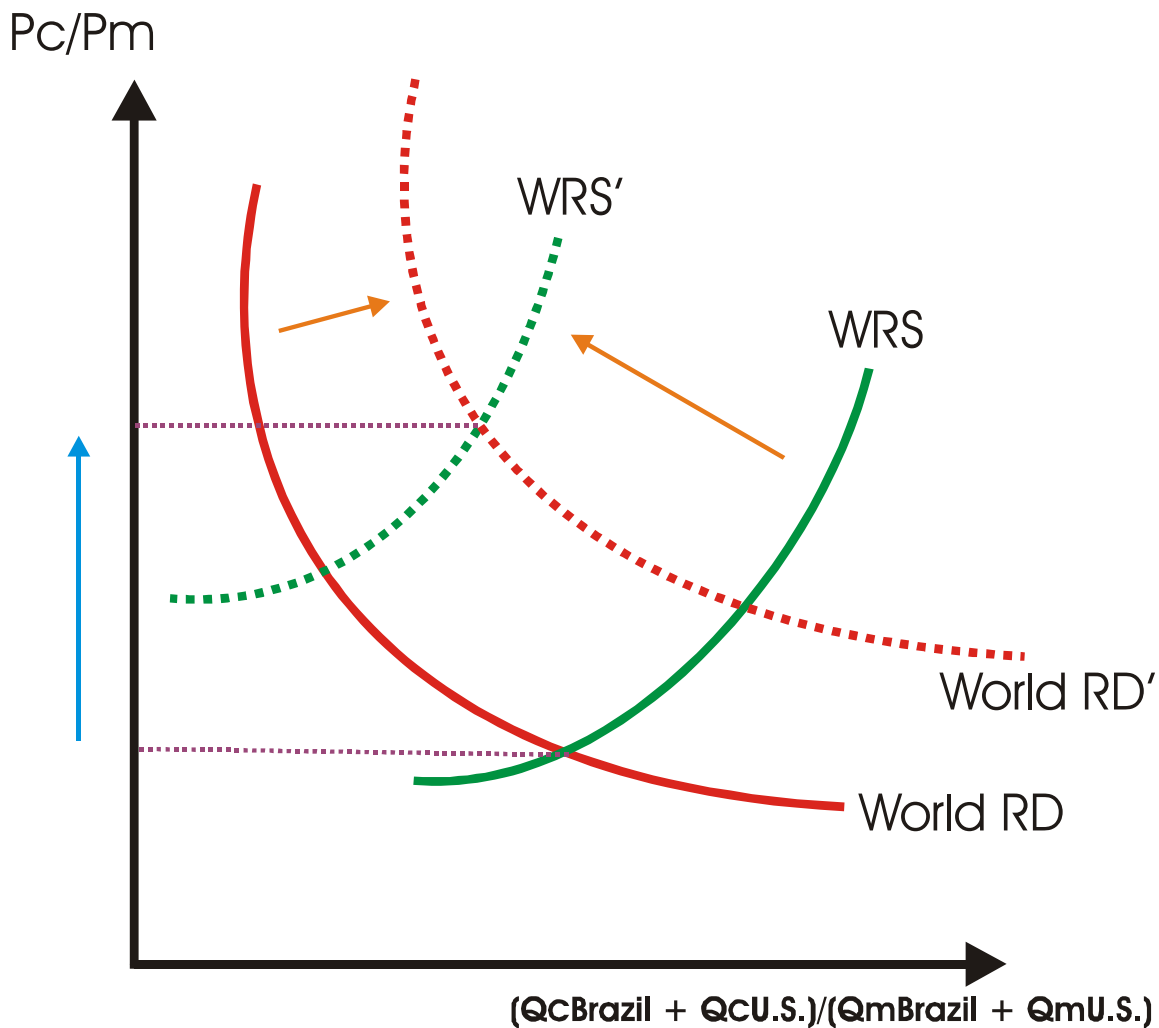
How would an export subsidy by the U.S., to boost the production of its export sector, machinery affect the TOT and the welfare of both countries?

The export subsidy is designed to raise the price of the export good inside U.S. (similar to the import tariff which raises the price of the import good inside the country), thereby increasing the output of the export good, machinery. This policy is pursued by countries who wish to increase their exports to the world market, and to provide incentives for their exporters to increase production.

How does an export subsidy on machinery imposed by the U.S. government affect the TOT and welfare level for U.S.? An export subsidy on machinery raises the relative price of machinery inside the U.S. The reaction of producers would be to shift production towards machinery and away from coffee. On the graph below (Graph 3.7), the effect of the export subsidy on machinery in the U.S. is shown by a corresponding fall in the world RS, or, a shift of the world RS to the left (machinery is in the denominator of the ratio explaining the x-axis).

On the demand side, since the relative price of machinery rises inside U.S., consumers in the U.S. cut back on their consumption of machinery and turn to increased consumption of coffee. Therefore, the world relative demand, expressed as the ratio of coffee to machinery increases. That is, world RD shifts to the right.

Graph 4-6



What is the effect of the export subsidy on machinery in the U.S. on the world relative price of coffee? The world relative price of coffee, or the TOT of Brazil rises while the TOT of U.S. falls. In this case, Brazil's welfare is improved due to its TOT improvement, while U.S. experiences a decline in its level of welfare. There are of course two reasons for the welfare effect of an export subsidy in the U.S.: one is the

TOT deterioration, the other is the distortion, or the dead weight loss, created by the export subsidy. So U.S. gets a double whammy of welfare decline!

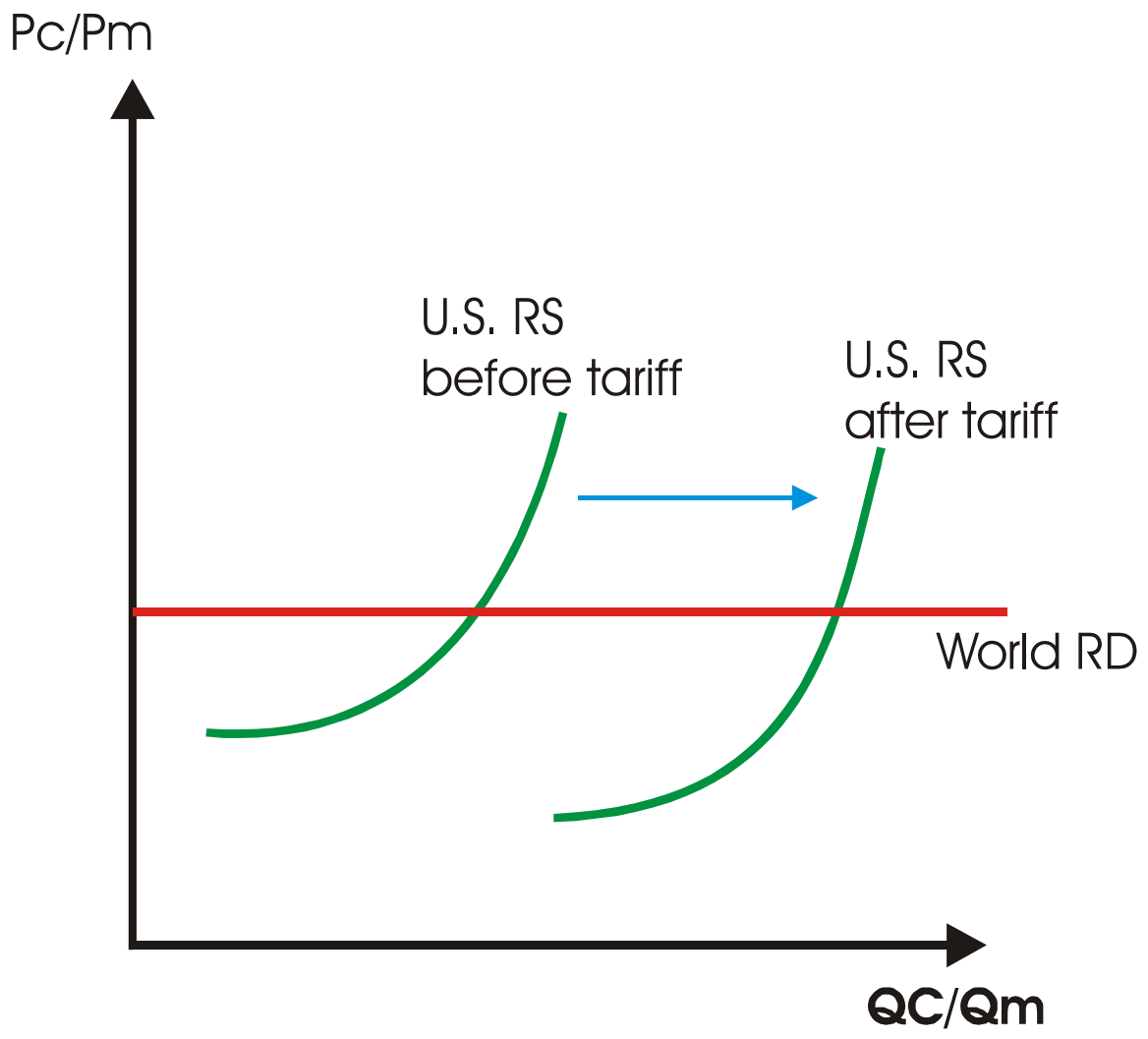
The intuitive explanation is that in a world where there are two partners (in a H-O world), the increase in the export supply of the U.S., prompted by the export subsidy, will reduce the price of the export good in the world market. Therefore, while the price of machinery rises inside the U.S. due to the export subsidy, it falls on the world market! Hence the TOT decline for the U.S. and the TOT improvement for Brazil.

3. What are the effects of a tariff or an export subsidy if the country is "small"?

a. The Effect of an import tariff in a "small" country

Suppose now, the U.S. is a "small" country. This implies that U.S. is one of many importers of coffee, where there are also many exporters of coffee in the world. Note that we have always assumed that coffee and machinery in each country are produced by perfectly competitive firms. The difference here is that with a "small" country assumption, there are also many countries as trading partners who produce and consume coffee. In this case, the U.S., by imposing a tariff can not change its TOT, since the relative price of machinery (or its inverse, the relative price of coffee) is set by a competitive world market force; it is no longer a matter of trade between two giant countries. So while a tariff on coffee imports raises the price of coffee inside the U.S., it will do nothing to the world price of coffee. We can show the supply reaction for machinery versus coffee in the graph below:

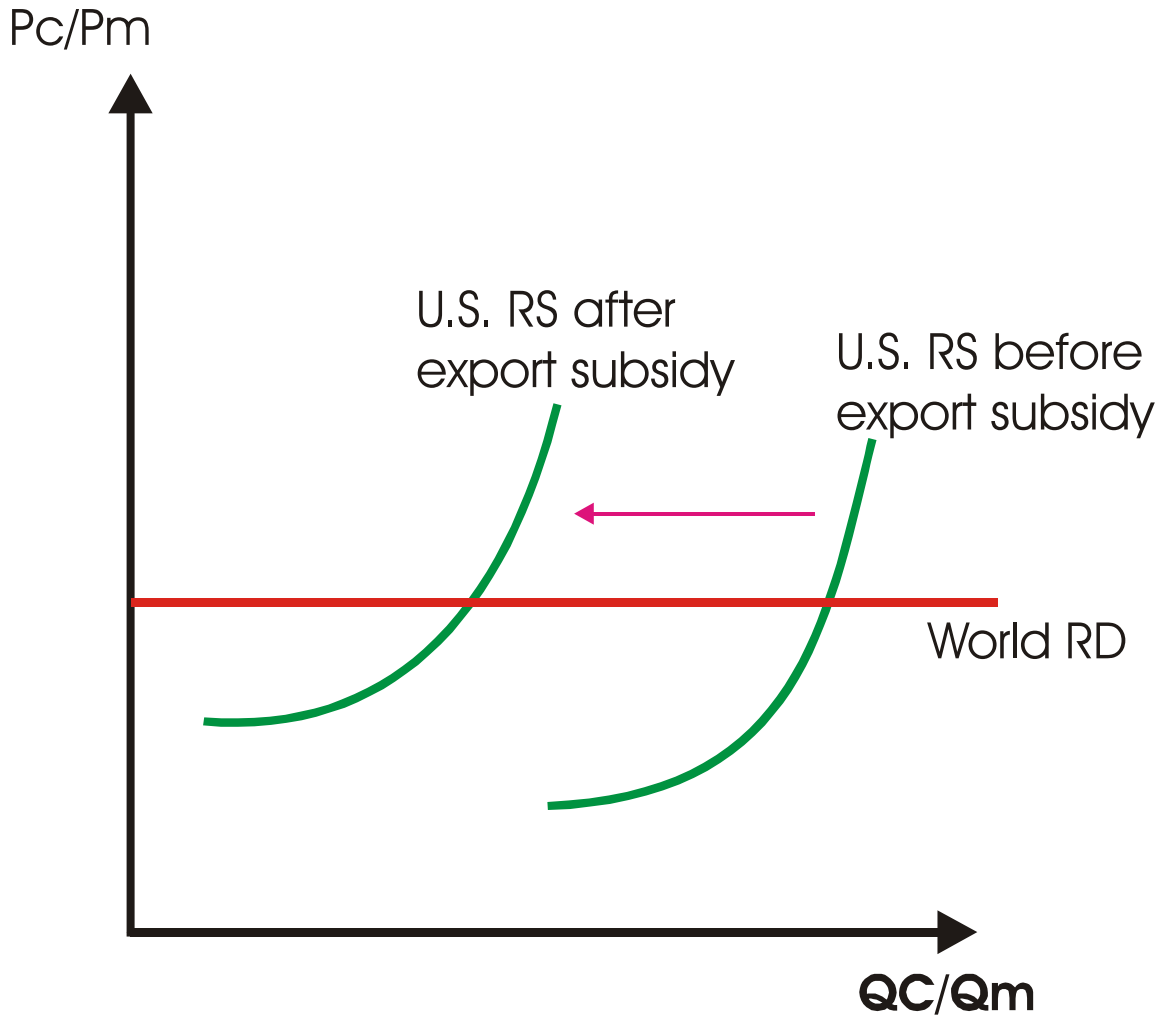
Graph 4-7



b. The effect of an export subsidy in a small country

Now let's consider the U.S. to be a small supplier of machinery. This means that we consider many other countries to be producers of machinery and there are also many buyers in the international market. In this case, machinery is produced by perfect competition among countries (each industry inside a country is already perfectly competitive). Therefore, we can treat the behavior of U.S. as a supplier of machinery to the world market similar to that of a perfectly competitive firm. Therefore, as the U.S. promotes its production of machinery, the RS of U.S. shifts to the left on the graph below:

Graph 4-8



As can be seen from the graph, there is no TOT effect from the export subsidy, therefore the rest of the world is unaffected. However in the U.S., the resulting distortion prompted by the export subsidy creates allocation inefficiency and leads to a fall in the level of welfare. In effect, small countries, by creating domestic distortions via an import tariff or an export subsidy, hurt their own level of welfare. They may of course have a particular agenda or goal by engaging in this type of policy (such as protecting the income of a certain group such as the income of the scarce factor, or increasing their

market share in the world market, etc.), but the fact is that there will be a net welfare loss from this type of policy, the cost to the rest of us from a government policy to protect special interest groups, workers or whole industries.

Endnotes

1. In the case of commodities like coffee (and cocoa), producer countries such as Brazil, Colombia, Guatemala, and a few others have attempted to form an OPEC like cartel, whereby they agree on production cuts to raise the price of their commodities in the world market. For articles on this issue look up:
 - a. The Wall Street Journal, “Brazil, Colombia To Seek Control On Coffee Exports”, Monday March 20, 2000
 - b. The Wall Street Journal, “Coffee, Cocoa Groups Aim To Boost Prices, OPEC-Style”, Tuesday, April 25, 2000