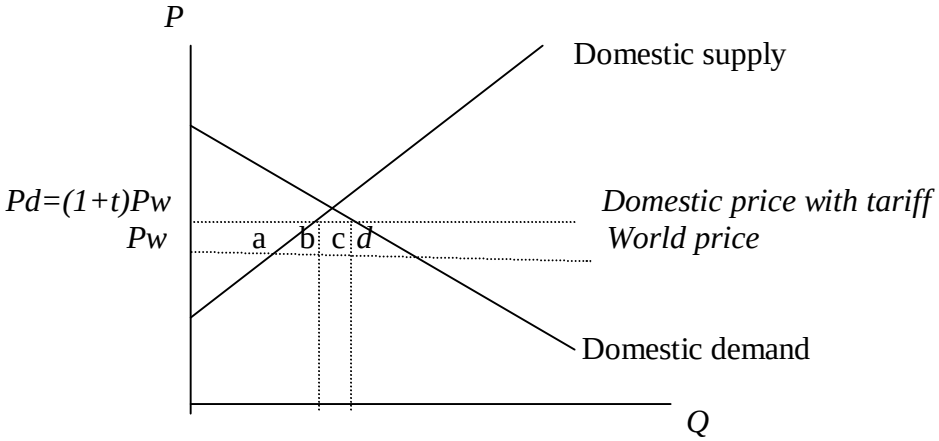
Econ 165 Stanford University
Winter 2002-03 TA: Kanda Naknoi

Answer for Midterm
February 12, 2003

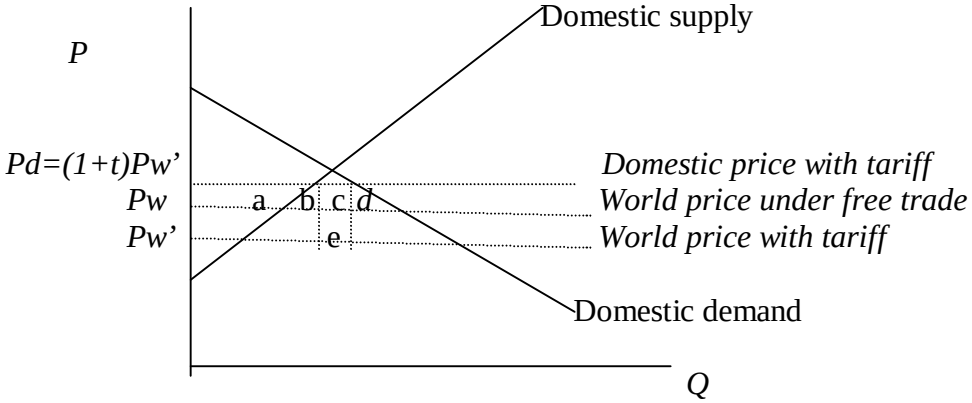
Question 1.a



In a small-country case, import tariff raises domestic price from *Pw* to *Pd*. Tariffs affects welfare of different groups inside the country in the following manner. Also, it is clear that the country as a whole loses from the import tariff.

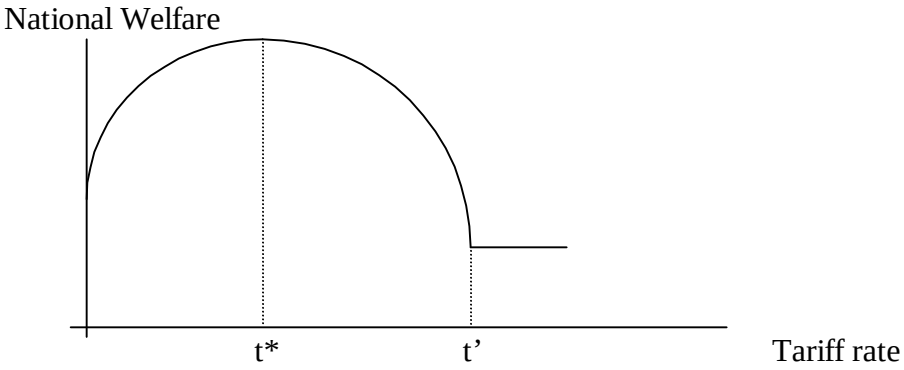
Domestic agent	Welfare change	Size of change
1. Consumer	Reduction in consumer surplus	-a –b –c-d
2. Producer	Increase in producer surplus	a
3. Government	Revenue from tariffs	c
Net	**Welfare loss**	**-b-d**

Question 1.b

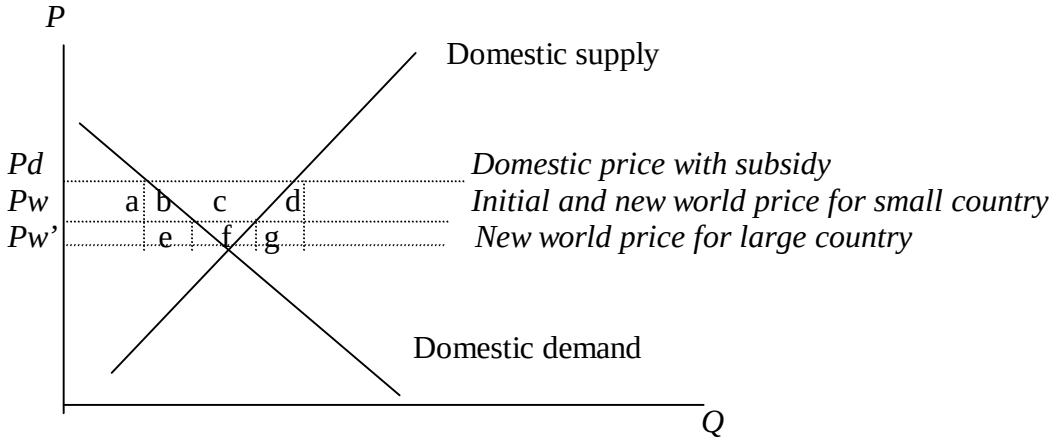


In a large-country case, import tariff will not only raise domestic price of imports, but also lower the world price. As shown in the diagram above, *Pw'* is lower than *Pw*. Comparing to a small country case, tariff revenue increases from "c" to "c+e," where "e" is always positive.

Hence, the net welfare change of the nation is "e-b-d." Government of a large country in fact can raise its national welfare by raising import tariff in such a way that "e" is greater than "b+d". We term the tariff rate, which maximizes "e-b-d," the "optimal tariff." The optimal tariff is characterized by *t** in the diagram below. As the tariff increases beyond its optimal level *t**, the country is worse off and national welfare becomes decreasing in tariff. When tariff is as high as *t'*, imports will complete stop. (*t'* is called the prohibitive tariff.) In that case, the country is worse off than free trade regime.



Question 1.c



In a small-country case, export subsidy raises domestic price from *Pw* to *Pd*. The subsidy affects welfare of different groups in the country in the following manner.

Domestic agent	**Welfare change**	**Size of change**
1. Consumer	Reduction in consumer surplus	-a –b
2. Producer	Increase in producer surplus	+a +b +c
3. Government	Subsidy expense	-b-c-d
Net	**Welfare loss**	**-b-d**

When the country is large, the government subsidy expense increases by "e+f+g." The increase is due to a fall in world price of exports and the resulting expansion of export. Therefore, the net welfare loss of a large country increases to –(b+d+e+f+g). It is clearly impossible for a country to raise national welfare by imposing any export subsidy. (Note: the term "optimal" export subsidy does not exist.)

Question 2.a

Assume that there is only one factor of production, which is labor. When one country can produce a unit of good with less labor than another country, we say that the first country has an absolute advantage in producing that good. When one country can produce a unit of good with less opportunity cost than another country, we say that the first country has comparative advantage in producing that good. Opportunity cost can be defined as relative labor cost of producing one good with respect to labor cost of producing another good. A country always has comparative advantage in producing some goods over other countries. But a country does not necessarily have absolute advantage in producing any good.

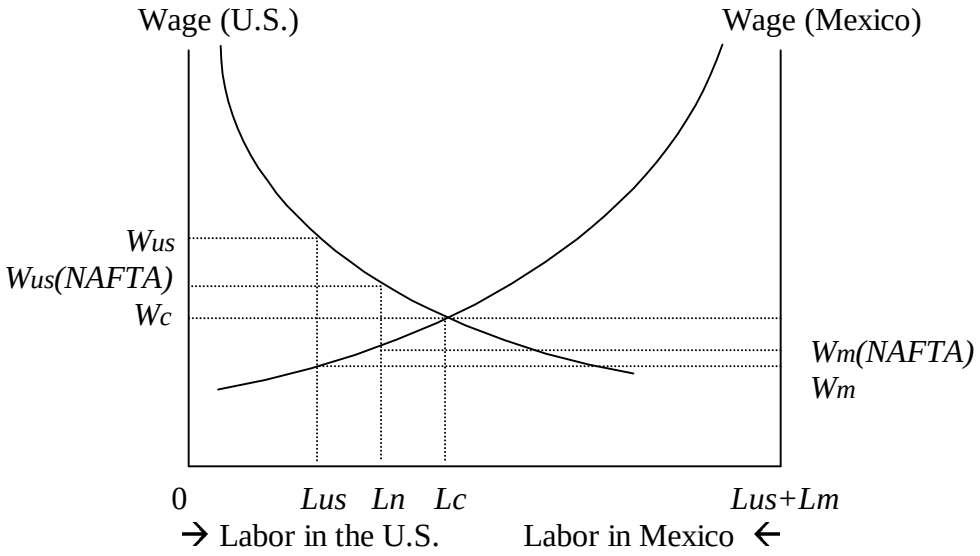
Wage in each country is equal to market value of labor productivity. Once we assume that trade in international goods markets is costless, price of traded goods is the same regardless of location. The gap of wages in Mexico and the U.S., which induces migration from Mexico to the U.S., in fact measures the difference of productivity of labor in the two countries. Since labor cost is simply the inverse of labor productivity, migration from Mexico to the U.S. manifests that the U.S. has absolute advantage over Mexico. It implies nothing about comparative advantage.

Question 2.b

The concept of factor price equalization (FPE) claims that, "free trade equalizes factor prices in both countries." There are 2 explanations for the violations of FPE in the Heckscher-Ohlin model.

(1) The endowments of two countries are far different.
(2) Contrary to the assumption in the H-O model, countries produce with different technologies.

Question 2.c



The width of the Neary-bucket measures total labor in the U.S. and Mexico. The x-axis measures labor employed in the U.S. Without migration, the wages in the U.S. and Mexico are *Wus* and *Wm*, respectively. It is clear that *Wus* > *Wm*, because of absolute advantage. Under current regime, with migration and NAFTA agreement, *Ln*-*Lus* of labor moves to the U.S. As a result, the wage in the U.S. falls to *Wus(NAFTA)*, while the wage in Mexico rises to

Wm(NAFTA). In order to assess changes in real terms, we have to deflate nominal wage with a price measure. Since prices of goods in both countries are equalized under NAFTA, changes in real wage follow the same direction as that in nominal wage. In other words, U.S. residents get hurt but Mexican residents gain from migration.

If the U.S. and Mexico form a common market, $L_C - L_n$ Mexicans will further migrate to the U.S. The equilibrium wage in the common market is W_C. Again, prices of goods are equalized in both countries. Therefore U.S. residents lose, but Mexican residents gain, in real terms. Certainly, Mexicans will favor a move to a common market.

Question 3.a

When one country exports products of one industry, but imports products of a different industry, we say the country engages in inter-sectoral trade. This is mostly observed in trade between developing and developed countries. In contrast, when one country exports a variety of products of one industry, and imports a different variety of products of the same industry, we say the country engages in intra-industry trade. Most of actual trade takes place among developed countries, and it is in fact intra-industry trade.

Inter-sectoral trade is explained by the old trade theory, which relies on comparative advantage. On the other hand, intra-industry is explained by the new trade theory. The new trade theory relies on increasing return to scale, similarities in income and in technology, and imperfect competition as factors explaining trade.

Question 3.b

The old trade theory predicts that countries with different technologies will engage in inter-sectoral trade according to their comparative advantage. Based on the old trade theory, we expect to see industrialized country trade heavily with developing nations. On the other hand, the new trade theory predicts that countries with similar income, similar technology and imperfect competition will engage in intra-industry trade. This is what we observed in actual trade data. Trade data actually suggest that the new trade theory has more explanatory power than the old trade theory.

Question 3.c

Measure of intra-industry trade for an industry *i*:

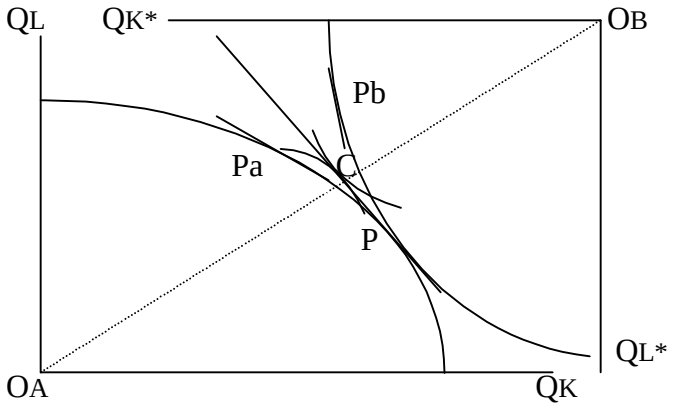
$$I(i) = 1 - |\text{Export}(i) - \text{Import}(i)|/[\text{Export}(i) + \text{Import}(i)]$$

If a country purely engages in intra-industry trade, the volume of export and import cancels out and $I(i) = 1$. If a country either exports or imports products of a particular industry *i*, $I(i) = 0$. For this particular industry,

$$I(i) = 1-[|17{,}149 - 14{,}170|/(17{,}149 + 14{,}170)]$$
$$= 1- 2{,}979/31319$$
$$= 0.9$$

Note: I do not think you need a calculator to compute this. You can round up numbers and quickly see that 2,979/31319 is approximately 0.1.

Question 4.a



Assume there are two factors - labor (L) and capital (K) - in two countries. Let country A be a capital-abundant country and B is a labor-abundant country. An asterisk denotes variables for B. Suppose agents in A and B have identical preference. Under autarky, A produces and consumes at Pa, while B produces and consume at Pb. The slope of the PPF at the production point is equilibrium relative price of goods. Under autarky,

$Pk/Pl < Pk^*/Pl^*$

where Pk is price of the capital-intensive good and Pl is price of the labor-intensive good.

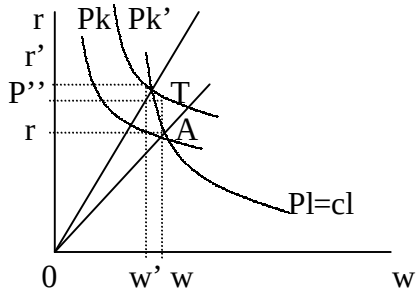
Under free trade, consumers in A and B get to consume at point C, where free trade factor price intersects with the diagonal and become tangent to indifference curves. Free trade production takes place at point P, as a result of a change in (relative) factor price equalization. In fact,

$Pk/Pl < Pk(f)/Pl(f) < Pk^*/Pl^*$

where Pk(f) and Pl(f) are good prices under free trade. Both countries gain from trade because trade allows them to consume outside their PPF's, and then attain higher utility level.

Question 4.b

Mussa Diagram



Pl is the zero-profit schedule for the labor-intensive industry. Pk is the zero-profit schedule for the capital-intensive industry. Pl and Pk have convex shape because they are concave in factor prices. A is the initial equilibrium. Suppose price of the capital-intensive good increases by m percent. This change results in a shift of the zero-profit schedule Pk to Pk', and the equilibrium moves from A to T. As a result, factor prices change from w to w', and from r to r'. The change in price of the capital-intensive good is P''-r. It is evident from the diagram that:

r'-r > P''-r > 0 > w'-w

Or,

change in price of capital	>	change in price of the capital-intensive good
	>	change in price of the labor-intensive good
	>	change in price of labor.

This is precisely the so-called "magnification effect."

In Question 3.a, free trade allows A to receive higher price of its export, i.e. the capital intensive good. As a result, change in prices in country A comparing to its autarky equilibrium follows the above Mussa diagram. According to the magnification effect, capital owners are better off in real terms. Although labors are worse off, country A is better off in aggregate under free trade because A is capital-abundant.

For country B, the price of its exports, i.e. the labor-intensive good, is also higher under free trade. A similar magnification effect applies to change in price of labor. Country B is also better off with free trade because the owners of its abundant factor, i.e. labor, are better off.

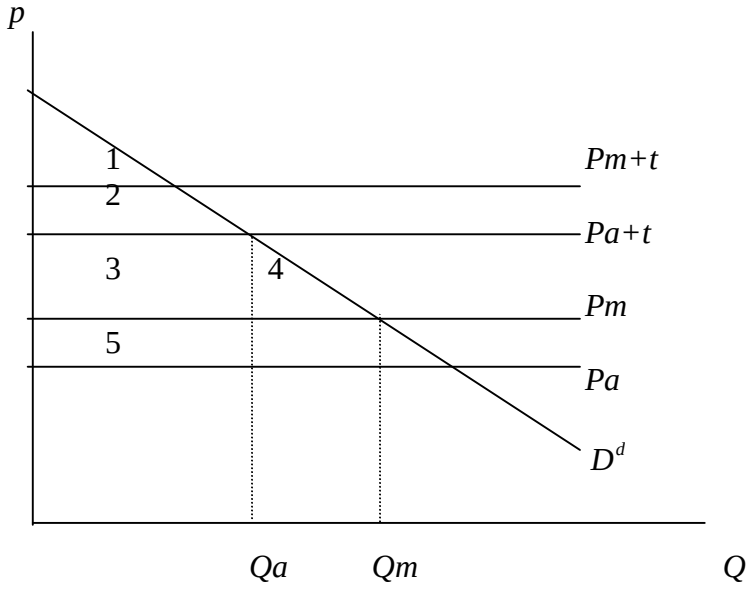
Question 4.c

There are two types of changes in national welfare generated by joining a PTA. One is "trade creation" and the other is "trade diversion."

1. *Trade creation* is welfare gain resulting from an increase in volume of trade following a formation of a PTA.
2. *Trade diversion* is welfare loss resulting from inefficiently switching trading partners to PTA members.

The total effect of forming a PTA depends on relative size of trade creation and trade diversion. If trade creation dominates trade diversion, a nation gains by joining a PTA, and vice versa. It can be illustrated by the following example.

Suppose the U.S. has formed NAFTA with Canada and Mexico. Suppose the diagram below represents the U.S. imports of oil. Let *m* denote Mexico and *a* denote Venezuela. Before NAFTA, the U.S. would import oil from Venezuela with the price *Pa+t*. Once NAFTA is formed, the U.S. does not impose tariff on imports from Mexico and then the U.S. will choose to import oil from Mexico instead of Venezuela. The effects of NAFTA on welfare are as follows.



	Pre-NAFTA	*Post-NAFTA*
Consumer surplus	area 1+2	area1+2+3+4
Tariff revenue	area 3+5	zero

The net welfare change is “4 – 5”. In fact, the area 4 depicts “trade creation.” On the other hand, the area 5 constitutes “trade diversion.”