Problem 1
Welfare analysis of tariff   (answers keys are on the second page)

a) Home's demand curve for wheat is D=100-20P, supply curve is S=20+20P. Derive Home's import demand. What would be the price of wheat in the absence of trade?

b) Now Foreign country's demand curve is D*=80-20P, supply curve is S*=40+20P. Derive Foreign's export supply curve. What would be the price of wheat in the absence of trade?

c) Now allow Foreign and Home to trade with each other, at zero transportation cost. What's equilibrium price under free trade? What's the world price? What's the volume of trade?

d) Now Home imposes a specific tariff of 0.5 on wheat imports, i.e. t=0.5. What's the new price of wheat in each country, the quantity of wheat supplied and demanded in each country, and what's the new volume of trade?

e) Now with all the results you've gotten so far, draw a graph similar to Figure 8-9 on page 190 in your textbook. Calculate consumer loss, producer gain and government revenue of Home country. What's the net welfare of tariff of Home in this case?

Problem 2
The following questions are related to the issue of *trade and inequality*.

The US imports huge amount of goods from China each year. Because labor cost in China is much cheaper (10% of US level according 2009 estimate), those imported goods tend to drive down the price of similar products in the US. Let's assume the US has two sectors: high-tech and low-tech, the latter of which is in direct competition with China.

a) What is the impact of China's imports on relative wages between the two sectors in the US? Explain within the context of Stolper-Samuelson (SS) theorem.

> **Answer:** China's exports will drive down the price of low-tech goods in the US. According to Stolper-Samuelson theorem, this increase of relative price of high-tech goods will increase the relative return of high-skilled labor, which is used more intensively in the high-tech sector. The return of the high-skilled labor is just the wage they earn. So cheap Chinese exports will bring an increase of relative wage of high-skilled workers vs. low-skilled workers, thus increasing the income inequality between the two groups.

b) If you were a top US policy maker and your goal is to keep US manufacturing industry strong so that it continues to provide job opportunities for the blue-collar workers. Meanwhile, you don't want to resort protectionist measures, which could potentially invoke a trade war with China and hurt consumers at home. What would be your policy proposition to President of the United States?
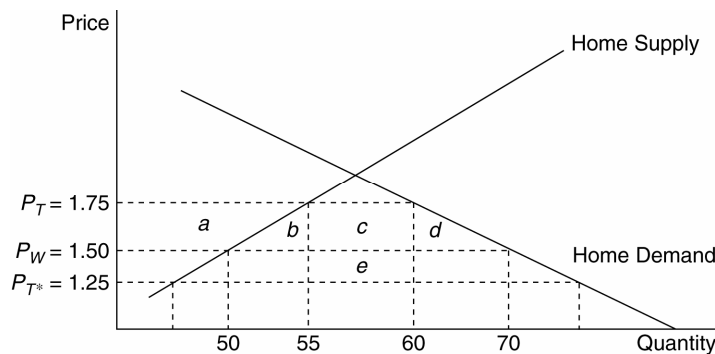
> **Answer:** Although China has low-cost advantage, but the US can offset the cost-advantage by increasing labor productivity. So a sensible policy recommendation would be to provide incentives for firms to invest in low-skilled industries in so that firms can increase <u>capital investment relative to labor, or (K/L) capital labor ratio</u>, e.g., by buying smart machines. This way, blue-collar jobs will stay at home and due to higher labor productivity, these workers will be paid higher wage, shrinking the gap with the high-skilled workers.

Answers to Problems 1

a. The import demand equation, *MD*, is derived from subtracting the home supply equation from the home demand equation. This results in $MD = 80 - 40 \times P$. Without trade, domestic prices and quantities adjust such that import demand is zero, or MD=0. Thus, the price in the absence of trade is 2.

b. Foreign's export supply curve, *XS=S*-D**, so $XS = -40 + 40 \times P$. In the absence of trade, XS=0 and the price is 1.

c. When trade occurs, export supply is equal to import demand, $XS = MD$. Thus, using the results from a and b, we have $P = 1.50$, and the volume of trade is 20.

d. The new *MD* curve is $80 - 40 \times (P + t)$ where *t* is the specific tariff rate, equal to 0.5. (*Note*: In solving these problems, you should be careful about whether a specific tariff or ad valorem tariff is imposed. With an ad valorem tariff, the *MD* equation would be expressed as $MD = 80 - 40 \times (1 + t)P$.)

    The equation for the export supply curve XS by the foreign country is unchanged. Solving again for MD=XS, we find that the world price is $1.25, and thus the internal price at home is $1.75 (=1.25+t). The volume of trade has been reduced to 10, and the total demand for wheat at home has fallen to 65 (from the free trade level of 70). The total demand for wheat in Foreign has gone up from 50 to 55.

e. The welfare of the home country is best studied using the combined numerical and graphical solutions presented below.

(note: the number 60 on the x-axis should be 65)

where the areas in the figure are:

a. $55(1.75 - 1.50) - 0.5(55 - 50)(1.75 - 1.50) = 13.125$

b. $(1/2)(55 - 50)(1.75 - 1.50) = 0.625$

c. $(65 - 55)(1.75 - 1.50) = 2.50$

d. $(1/2)(70 - 65)(1.75 - 1.50) = 0.625$

e. $(65 - 55)(1.50 - 1.25) = 2.50$

Consumer surplus change: $-(a + b + c + d) = -16.875$. Producer surplus change: $a = 13.125$. Government revenue change: $c + e = 5$. So net welfare change = $-16.875+13.125+5 = 1.25>0$. In this case, home country's term of trade gain, e, is bigger than deadweight loss (b+d), so we have a gain on net welfare.