

ECON/EEP 181: INTERNATIONAL TRADE MIDTERM SOLUTIONS

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PART I. Short-Answer.

(30 points). Please explain your work whenever possible. All questions are worth 5 points each. For problem (6), you have a choice to do (a) OR (b).

1. True or False? The Heckscher-Ohlin framework implies the following: if the United States is well endowed in capital and labor-scarce, then when the USA opens up to trade and the price of capital-intensive goods rises relative to the price of labor-intensive goods, we shall see (1) an increase in the return to capital relative to labor and (2) all sectors will become more capital-intensive.

FALSE. The first conclusion is correct; according to the Stolper-Samuelson theorem, opening up to trade increases returns to a country's abundant factor (in this case, capital) and decreases returns to a country's scarce factor (in this case, labor), so the return to capital relative to labor (r/w) goes up. However, the second conclusion is incorrect. Since r/w increases, the cost to firms of using capital relative to labor increases, and firms in all sectors substitute towards using more labor and less capital. Therefore, all sectors become less capital-intensive.

2. One of the articles in your reader points out that "Low wages do not guarantee economic success". Please explain. How does the Ricardian model "explain" the fact that some countries could have lower wages than others? What does the evidence suggest?

The Ricardo model shows that goods are produced where it costs the least to produce them - in other words, where the unit labor cost (ULC) is lowest. It also explains that wages reflect productivity. Since $ULC = w * ULR$ (unit labor cost = wage x unit labor requirement), a country with a low wage will have a high ULR, so it will not necessarily be able to produce a lot of goods at a low ULC. In addition, in the Ricardo model, countries with low productivity have low wages and therefore low incomes. Empirical evidence confirms that there is a strong correlation between wages and productivity. This article was pointing out that since low wages likely reflect low worker productivity, a country with low wages is therefore likely to have a low income.

3. (Ricardo). If the opportunity cost of x in terms of y is 3, and the unit labor requirement to produce one unit of x is 6 hours, what is the unit labor requirement to produce good y ? If goods x and y could be exchanged in a barter economy, how much y would have to be given up in order to get one unit of x ?

The opportunity cost of x in terms of y means how many units of y we have to give up to get one

unit of x (units y /units x) and is equal to a_x/a_y . We therefore have

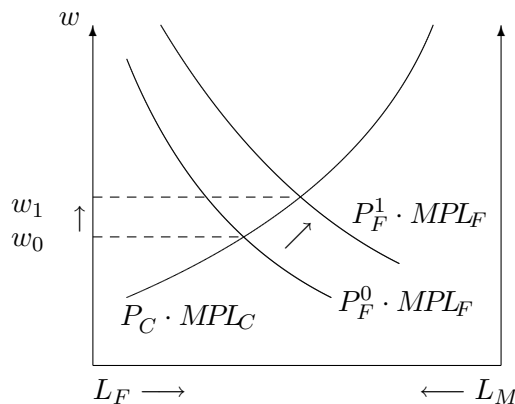
$$\frac{a_x}{a_y} = \frac{6 \text{ hours/unit } x}{a_y} = 3 \Rightarrow a_y = 2$$

In a barter economy, we would have to give up 3 units of y to get one unit of x (the opportunity cost of x).

4. Assume that Utopia has 3 factors of production: labor, land, and capital. Labor is the mobile factor. Utopia is relatively well endowed with land, which is used to produce flowers. Capital is used to produce cars. If Utopia opens up to trade, is labor better or worse off? Will your answer change if you are told that workers prefer to buy flowers instead of cars?

When Utopia opens up to trade, the price of flowers relative to cars will increase. Since only relative price matters, we can assume that the price of flower (P_F) increases while the price of cars (P_C) does not change. Figure 1 shows the initial wage w_0 . When P_F increases, the wage increases to w_1 , but the increase in wage is not as large as the increase in P_F . The real returns to labor therefore fall in terms of flowers ($\frac{w}{P_F} \downarrow$) and rise in terms of cars ($\frac{w}{P_C} \uparrow$). Labor may be better or worse off, depending on consumption patterns. If we know that workers prefer flowers instead of cars, then we know that the negative effect is stronger, so labor is more likely to lose from trade (but we still don't know for sure).

Figure 1: QUESTION 4: RETURNS TO LABOR

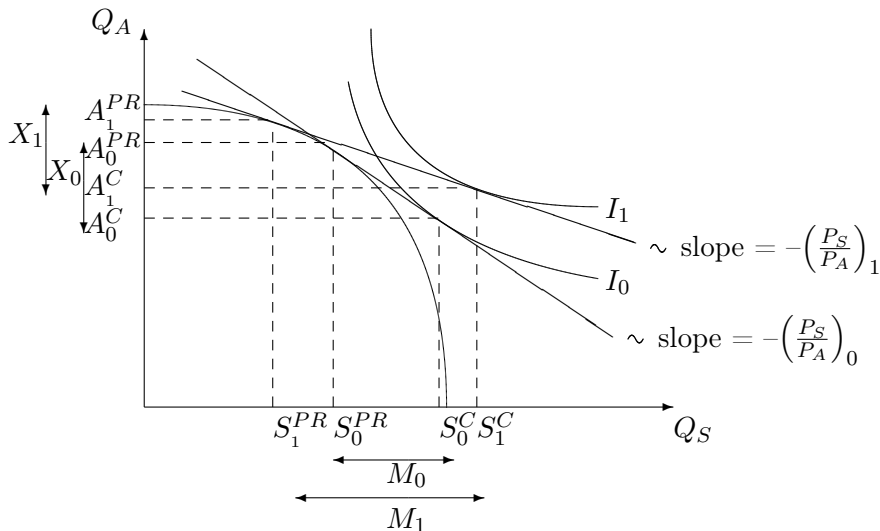


5. Define terms of trade. Show whether an increase in terms of trade improves or worsens a country's welfare. Use as your example a country which exports aircraft and imports steel. Make sure all your axes (for quantities consumed and produced, as well as relative prices) are clearly labeled, and that indifference curves are also clearly drawn.

Terms of trade (TOT) is equal to the price of a country's exports divided by the price of its imports $\frac{P_X}{P_M}$. Figure 2 shows a country that exports aircraft and imports steel. Its TOT are $\frac{P_X}{P_M} = \frac{P_A}{P_S}$. The quantities of aircraft and steel produced are given by A^{PR} and S^{PR} , while the quantities of aircraft and steel consumed are given by A^C and S^C . Initially, the country faces the relative price P_S/P_A ,

and is on indifference curve I_0 . When its TOT increase, P_A/P_S rises, so P_S/P_A falls, and the budget constraint becomes flatter. The country now produces more aircraft and less steel, and consumes on a higher indifference curve I_1 . Therefore, an increase in TOT improves a country's welfare.

Figure 2: QUESTION 5: TERMS OF TRADE



6. (a) Give a general specification for the gravity model. Does the model work well? Why or why not? The basic gravity model is:

$$T_{ij} = \frac{AY_iY_j}{D_{ij}}$$

You could also have written down the estimating equation in logs or levels (logs are shown below):

$$\ln(T_{ij}) = \ln(A) + \beta_1 \ln(Y_iY_j) - \beta_2 D_{ij}$$

where T_{ij} is the volume of trade between countries i and j , A is a constant, Y_i and Y_j are the GDP of countries i and j , respectively, and D_{ij} is the distance between countries i and j . The model does work well at explaining the volume of trade between countries; it predicts that countries that are larger in terms of GDP trade more, and that countries that are farther apart trade less, which is what we observe empirically. However, the model cannot explain the pattern of trade (i.e., which countries export or import which goods).

OR (DON'T DO BOTH (a) and (b)!)

(b) True or false? To ensure that globalization helps the poor, governments only need to open up their economies to trade.

FALSE. There are several reasons why trade openness is not a sufficient condition for alleviating poverty. First, although the HO model predicts that trade may decrease inequality (and by extension, decrease poverty) in certain countries (e.g., unskilled-labor abundant countries such as China),

it also predicts that trade may increase inequality in other countries (e.g., natural resource abundant countries such as South Africa). Second, even if trade can reduce poverty, there are many other factors, such as poor infrastructure and corruption, that can prevent the gains from trade from reaching the poor. Third, there is evidence that (at least in the short run) labor may not be mobile between sectors, so trade may increase poverty if the poor are concentrated in import-competing sectors. Finally, it is hard to find robust empirical evidence linking trade openness to poverty reduction.

PART II. Problems.

1. *Ricardo (30 points)* We are given the following labor input requirements for Uruguay and Chile:

| | Uruguay | Chile |
|------------|---------|-------|
| Insulation | 5 | 2.5 |
| Grain | 15 | 30 |
| Beef | 30 | 30 |
| Video Tape | 2 | 3 |

- (a) (8 points). What is the order of products from greatest to least comparative advantage for Uruguay relative to Chile?

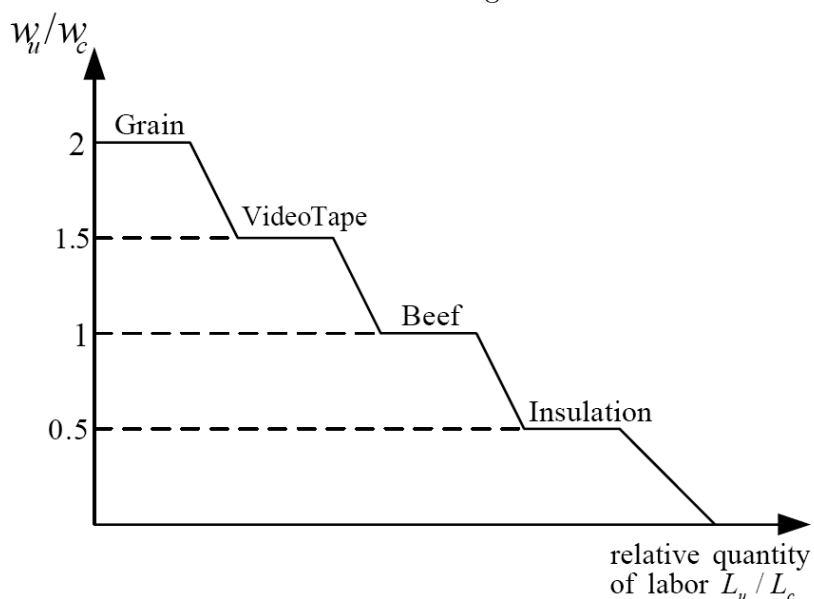
To answer this question, we need to calculate the ratio of Chile's unit labor requirement (ULR) to Uruguay's ULR (a_i^C/a_i^U). The higher the ratio, the greater a comparative advantage for Uruguay relative to Chile.

| | Uruguay | Chile | $\frac{a_i^C}{a_i^U}$ |
|------------|---------|-------|-----------------------|
| Insulation | 5 | 2.5 | 1/2 |
| Grain | 15 | 30 | 2 |
| Beef | 30 | 30 | 1 |
| Video Tape | 2 | 3 | 3/2 |

Based on the above table, the order of products from greatest to least comparative advantage for Uruguay relative to Chile: Grain, Video Tape, Beef and Insulation.

- (b) (10 points) Use the numbers provided to draw the relative demand for labor. The y-axis of the diagram should display the relative wage of Uruguay to Chile (w_u/w_c)

Figure 3: DEMAND FOR LABOR



- (c) (9 points) In equilibrium both Uruguay and Chile produce Video Tapes. What other products are produced by Uruguay, and what other products are produced by Chile?

Since we are told that both Uruguay and Chile produce Video Tapes, we know that Uruguay must also produce goods in which it has a greater comparative advantage than in Video Tapes, and that Chile must produce the other goods. Therefore, Uruguay produces Grain, and Chile produces Beef and Insulation.

- (d) (3 points) What is the relative wage (w_u/w_c) for Uruguay to Chile when the equilibrium results in both countries producing Video Tapes?

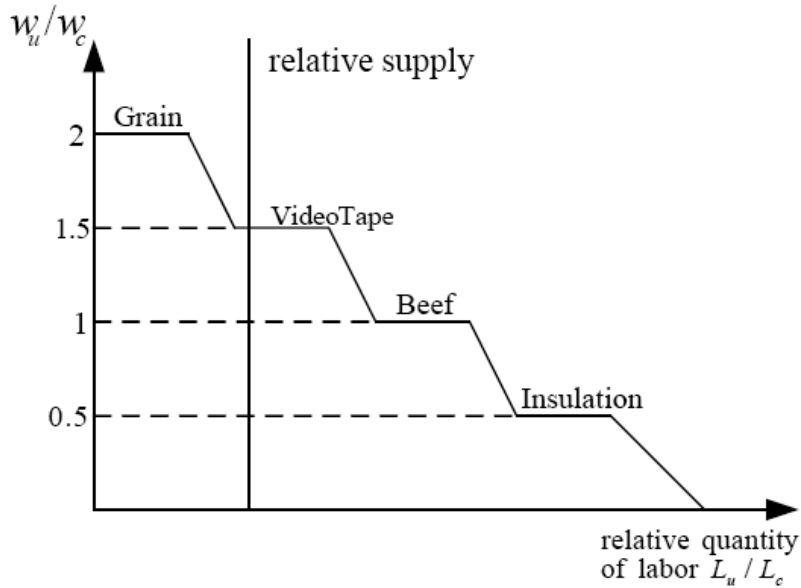
If both countries produce Video Tapes, then the unit labor cost (ULC) in both countries must be the same for Video Tapes:

$$ULC_U = a_V^U * w_U = a_V^C * w_C = ULC_C$$

$$2 * w_U = 3 * w_C \Rightarrow \frac{w_U}{w_C} = \frac{3}{2}$$

We can see this graphically by graphing a relative labor supply curve, as shown in Figure 4. We know that the relative supply of labor in Uruguay to Chile must pass through the flat part of the demand curve corresponding to Video Tapes because both countries produce Video Tapes. From the vertical axis, we then see that the relative wage w_U/w_C must be $3/2$.

Figure 4: LABOR MARKET EQUILIBRIUM



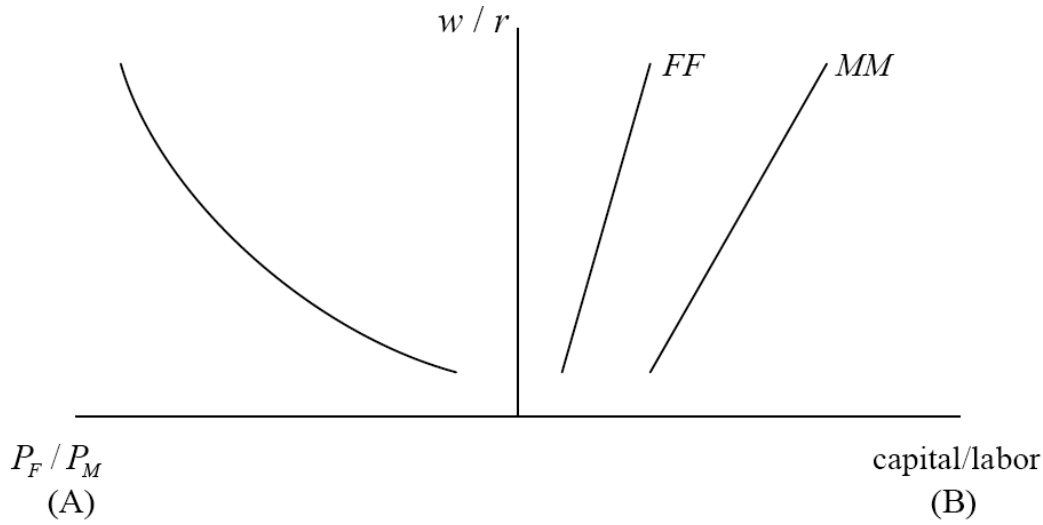
2. *Heckscher-Ohlin (20 points) 7 points each for parts (a) and (c), 3 points each for (b) and (d). India can produce flannel (F) or coffee mugs (M). The right hand side diagram above shows the production choices in these two industries. India is labor-abundant, compared with its potential trade partners in South East Asia. The return to labor is the wage (w) and the return to capital is (r). Begin by assuming that India is not trading with SE Asia.*

- (a) (7 points) *Complete the diagram, labeling the axes (A) and (B), as well as adding the appropriate curve in the left quadrant.*

See Figure 5. Axis (B) is labeled K/L (capital/labor). The right quadrant illustrates the relationship between the wage/return to capital ratio (w/r) and the capital/labor (K/L) ratio. As the relative cost of labor to capital increases, both industries want to use more capital and less labor.

Axis (A) is labeled P_F/P_M . The left quadrant illustrates the Stolper-Samuelson relationship. As the price of flannel relative to the price of mugs goes up, the return to the factor used intensively in flannel (labor) goes up and the return to the other factor (capital) goes down so w/r goes up.

Figure 5: HECKSCHER-OHLIN DIAGRAM



- (b) (3 points) Which industry is capital-intensive?

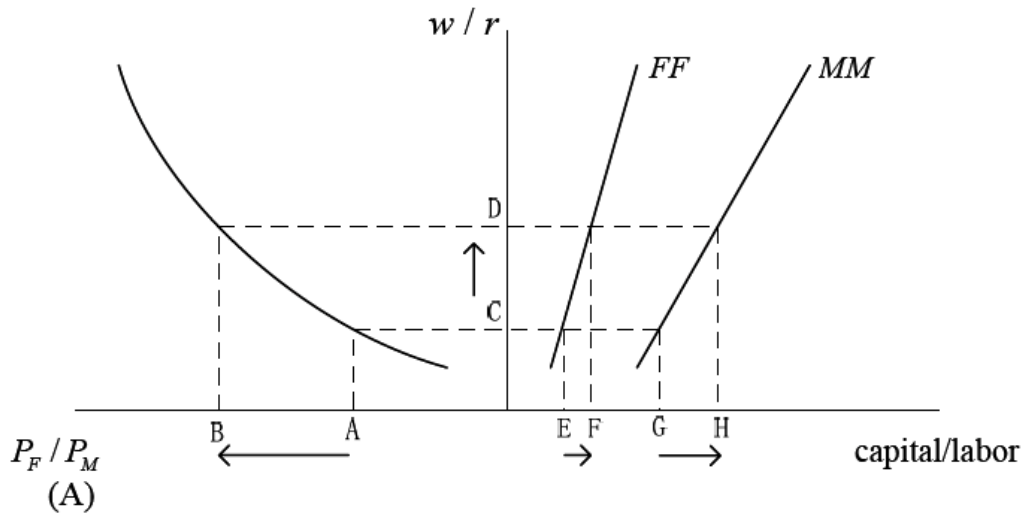
Coffee mugs is the capital-intensive industry, because the MM line lies to the right of the FF line. As shown in the right quadrant, at any given w/r ratio, the coffee mugs industry uses a higher capital/labor ratio.

- (c) (3 points) Will trade cause (w/r) to rise or fall?

The Stolper-Samuelson theorem tells us that when India opens up to trade, there will be an increase in the return to its abundant factor (labor) and a fall in the return to its scarce factor (capital). Therefore, since w increases and r decreases, w/r must rise. We can see this graphically from the left quadrant of Figure 6. Since India is labor-abundant, we know that the price of the good that uses labor intensively, flannel, must increase when India opens up to trade. Therefore, if P_F/P_M increases from A to B, then w/r increases from C to D.

- (d) (7 points) Now suppose that India opens free trade with SE Asia. Explain how trade will affect the capital-labor ratio within each sector in India. Make reference to your diagram, showing how the old equilibrium is changed.

Figure 6: HO DIAGRAM: OPENING UP TO TRADE



As shown in part (c), opening to trade causes w/r to increase from C to D . The right quadrant of Figure 6 shows that the increase in w/r causes both industries to shift towards a higher capital/labor ratio (from E to F in flannel and from G to H in mugs).

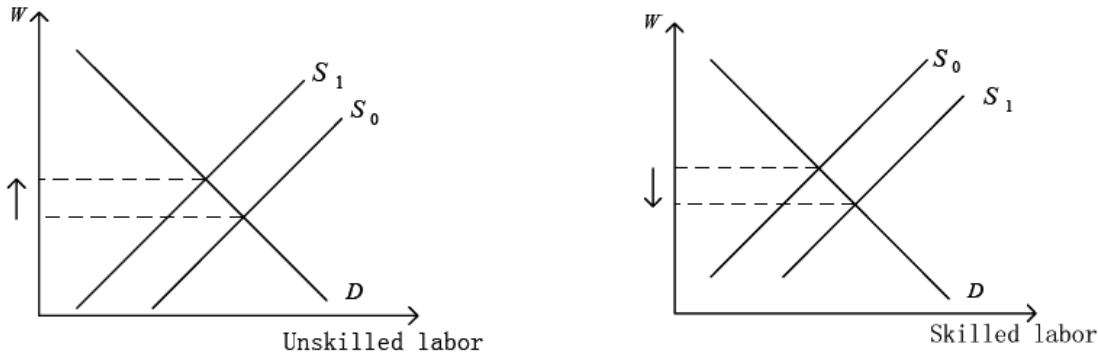
3. III. Trade and inequality (20 points)

In your reader, an article by David Brooks highlights the important role educational policies. In this problem, you are asked to show how different policies could affect inequality.

- (a) (5 points) Imagine that there is a big push in the United States to graduate more college educated workers, who are considered “skilled workers”. Show, using labor market diagrams for equilibrium in the skilled and unskilled labor market, how expanding the opportunities for a university education affects inequality.

A big push to graduate more college educated workers will shift the supply for skilled labor to the right. In equilibrium, the wage for skilled workers will go down. Conversely, the supply of unskilled workers will fall, pushing up the wage for unskilled workers. Figure 7 illustrates both of these shifts. Since the wages of skilled workers (who presumably make more money than unskilled workers) go down relative to the wages of unskilled workers, the push for university education would decrease wage inequality in the United States.

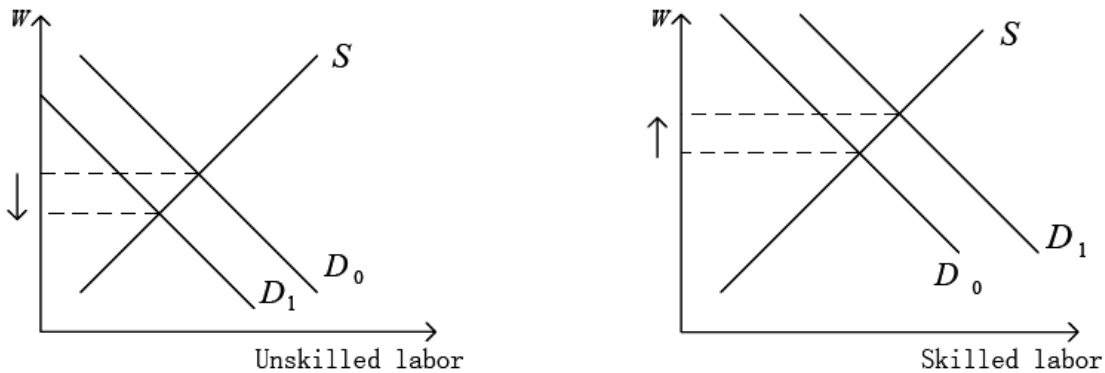
Figure 7: EDUCATION AND LABOR MARKETS



(b) (5 points) Now show how either increasing trade or skill biased technical change (SBTC) affect inequality. Assume that trade and SBTC increase the demand for skilled workers and reduce the demand for unskilled workers.

Since both trade and SBTC increase the demand for skilled workers and reduce the demand for unskilled workers, the wages of unskilled labor go down (the demand curve shifts downward) and the wages of skilled labor go up (the demand curve shifts upward). Figure 8 illustrates both shifts. Therefore, wage inequality between skilled and the unskilled workers increases.

Figure 8: TRADE AND LABOR MARKETS

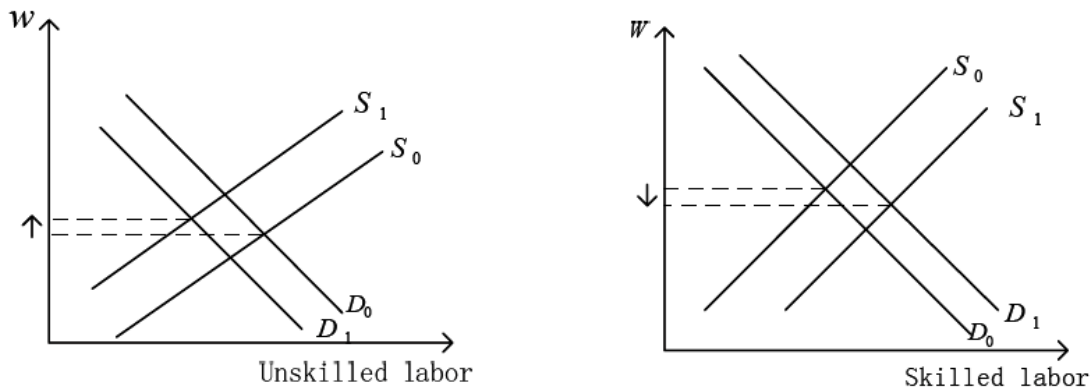


(c) (5 points) In his article, Brooks refers to the “race” between the skills gap and the technology gap. If we can close the skills gap quickly relative to the technology gap, Brooks argues that we can reduce inequality. Show this with the diagrams you used in (a) and (b).

As shown in part (a), closing the skills gap via education increases the supply of skilled labor and decreases the supply of unskilled labor in the economy. As shown in part (b), the technology gap increases the demand for skilled labor and decreases the demand for unskilled labor. However, if the skills gap is closed quickly relative to technology gap, the outward shift in the supply of skilled labor will be bigger than the outward shift in the demand for skilled labor, so the wage for skilled labor will stay constant or go down (as shown in Figure 9). Similarly, the inward shift

in the supply of unskilled labor will be bigger than the inward shift in the demand for unskilled labor, so the wage for unskilled labor will stay constant or go up. Therefore, wage inequality will decrease.

Figure 9: THE RACE BETWEEN SKILLS AND TECHNOLOGY



- (d) (5 points) In light of your answers above, what does increasing globalization imply about the need for education? Is this need more or less important for societies that are more tolerant of inequality?

As discussed in part (b), globalization increases wage inequality by shifting out the demand for skilled workers. Therefore, as the economy becomes more globalized, we should increase education in order to offset rising wage inequality, as shown in part (c). The need for education will be less important for societies that are more tolerant of inequality, since they are less likely to be concerned about increasing wage inequality.