

Homework for Session 11

In this exercise we use the core model of international trade to better understand why trade can be a good thing. This exercise will be more useful (and easier) if you read the Krugman & Obstfeldt chapter first.

Imagine that there are two goods in the world: textiles (T) and computers (C). For simplicity, further assume that there is only one factor of production, labor, needed to produce textiles and computers.

Now imagine a country (Country A) where firms can produce 2 units of textiles for every unit of labor, and 1 unit of computers for every unit of labor.¹

$$\begin{aligned}Q_t &= 2L_t \\ Q_c &= L_c\end{aligned}$$

Since profits are simply revenue minus costs, we can write the following profit function for a textile firm:

$$\begin{aligned}\text{Profit} &= \text{Revenue} - \text{Costs} \\ \Rightarrow \text{Profit}_t &= P_t Q_t - wL_t\end{aligned}$$

The revenue is the number of units of textiles the firm produces (Q_t) times the price for each unit of textiles (P_t). The only costs in this model are labor costs: the wage paid per unit of labor (w) times the amount of labor employed (L_t).

Assume markets are competitive. This means that firms don't earn profits -- they compete each others' profits away. Using our production function for textiles, and the fact that profits are zero due to competition, we can rewrite firms' profits as:

$$\begin{aligned}\text{Profit}_t &= P_t(2L_t) - wL_t && \text{(put the production function in the profit function)} \\ 0 &= P_t(2L_t) - wL_t && \text{(profits are zero due to competition)} \\ \Rightarrow w &= 2P_t\end{aligned}$$

That is, the wage (the amount paid for a unit of labor) is twice the price for a unit of textiles.

We can repeat this analysis for a computer producing firm and derive the following relationship between the wage and the price of computers:

¹ Krugman and Obstfeldt write their production functions in terms of *unit labor requirements*. That is, they ask, "how much labor is necessary to produce 1 unit of a good?". I am writing things instead in terms of *labor productivity*. That is, I ask, "how much of the good can be produced by 1 unit of labor?". These concepts are obviously related – one is the inverse of the other. When I write $Q_t = 2L_t$, 2 is the labor productivity, and $\frac{1}{2}$ is the unit labor requirement. I think it's clearer to write things in terms of labor productivity, because this is something we care more directly about. In particular, as we will see, labor productivity is identical to the wage in a competitive market.

$$\begin{aligned}\text{Profit}_c &= P_c Y_c - w L_c \\ 0 &= P_c(L_c) - w L_c \\ \Rightarrow w &= P_c\end{aligned}$$

Finally, let's assume that workers can move without cost between textile production and computer production. Then the wage in both sectors must be the same. Therefore, we can establish the relative price of computers in terms of textiles in this country:

$$\begin{aligned}w &= P_c \text{ and } w = 2P_t \\ \Rightarrow P_c &= 2P_t\end{aligned}$$

Computers are twice as expensive as textiles.

We can also say something about how well-off workers are in this economy. In particular, we can see directly how much workers can consume in return for a unit of work. For 1 unit of labor, a worker earns enough to buy either 1 computer or 2 units of textiles.

2. Now imagine a second country that can also produce textiles and computers. This new country (Country B) has the following production functions for these goods

$$\begin{aligned}Q_t &= 5L_t \\ Q_c &= 5L_c\end{aligned}$$

- a. Which country (A or B) has an absolute advantage in the production of both goods?
- b. Which country has a comparative advantage in the production of textiles?
- c. Assuming these countries do *not* trade, what is the relative price of computers in terms of textiles in Country B? (Hint: Repeat the analysis we did for Country A above.)
- d. How many computers can a worker in Country B buy for one unit of labor?
- e. How many units of textiles can she buy?
- f. Is Country B rich or poor relative to Country A?

3. Now we're going to let these two countries trade. People in Country A might be afraid of trade: after all, Country B has a large absolute advantage in the production of everything. How can workers in Country A compete? Similarly, people in Country B might be afraid of trade: all those people in Country A earn so little for a unit of work. All those high paying jobs in Country B are going to go to Country A!

For simplicity, let's assume that the international price of textiles turns out to be

$$P_c = 1.5P_t$$

- a. With these international prices, does Country A specialize in textiles or computer production?
- b. Which product does Country B specialize in?
- c. Now how many computers can a worker in Country A buy for one unit of labor? How many textiles can she buy?
- d. How many computers can a worker in Country B buy for one unit of labor? How many textiles can she buy?
- e. Did workers in Country A become richer or poorer once trade was allowed?
- f. Did workers in Country B become richer or poorer?
- g. Now think about these results. People in rich countries often seem to be afraid of trade because they don't think they can compete with cheap labor. They seem to think that "our jobs will go abroad". Meanwhile, people in poor countries often seem afraid of trade because they don't think they can compete with highly productive firms in richer countries. They also seem to think that "our jobs will go abroad". What is the fundamental error in those lines of reasoning? (What happened to employment in this model?)