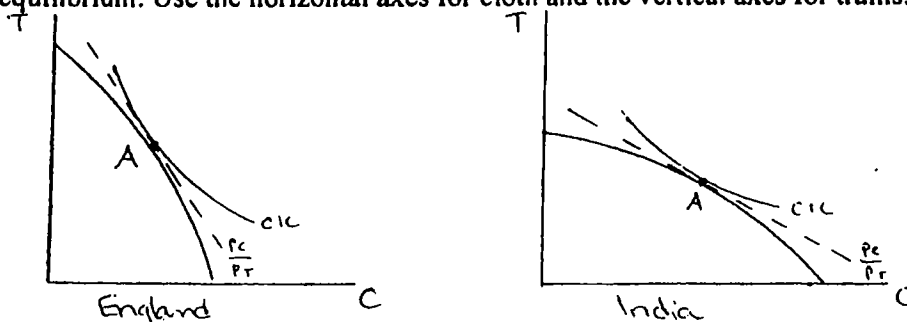


## Answer Key Problem Set 2

(I) Consider two countries (England and India) that can produce two goods (cloth (C) and trains (T)) using two factors (labor (L) and capital (K)). The technology to produce each good is the same in either country and allows for substitution among inputs (i.e. isoquants have a “nice” shape). Cloth production is labor intensive while train production is capital intensive. England is relatively capital abundant, and India is relatively labor abundant. All this implies that the production possibility frontier (PPF) in each country has a “nice” shape like the ones we did in lecture. Preferences in the two countries are identical: consumers like to consume both commodities (i.e. indifference curves also have a “nice” shape).

Justify your answers as fully as possible based on this information and make sure you use the proper graphs to accompany your explanation when possible.

- (1) Draw the PPF and the community indifference curves for each country and identify the autarky equilibrium. Use the horizontal axes for cloth and the vertical axes for trains.



- (2) What relationship do you observe between autarky relative prices ( $p_C/p_T$ ) in the two countries?

**Answer:** In autarky, the price of the good that uses the relatively more scarce factor is relatively more expensive. That is,  $(p_C/p_T)$  is larger in England, and smaller in India, because it is less expensive to produce cloth relative to trains the more labor you have available relative to capital. This is because the slope of the price ratio is equal to the slope of the PPF at the production point, and the slope of the PPF represents the opportunity cost of producing cloth (in terms of foregone trains).

- (3) What pattern of trade would result from free trade between these two countries?

**Answer:** The Heckscher-Ohlin theorem tells us that at prices that support free trade between these two countries, each country would specialize in and export the good that uses the factor intensively in which that country is relatively more abundant. So England would choose to specialize in trains (not completely specialize necessarily, but to produce more than in autarky) and export some to India in return for cloth imports. India would find it more profitable to export their cloth and import trains from capital intensive England.

- (4) What happens to the relative price of cloth in terms of trains ( $p_C/p_T$ ) in England after the country starts trading freely with India?

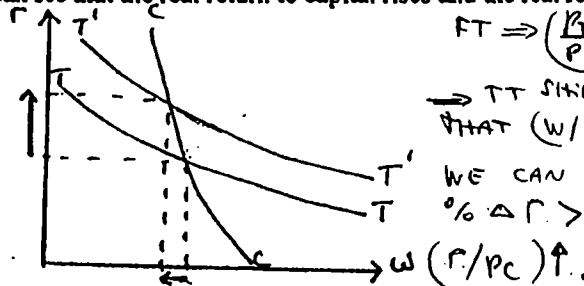
**Answer:** Since England now has the choice of importing cloth from India, where the opportunity cost of producing cloth is lower (and thus  $(p_C/p_T)$  is lower), we would expect  $(p_C/p_T)$  to fall in England after trading freely with India.

What happens to the relative price of cloth in terms of trains ( $p_C/p_T$ ) in India after the country starts trading freely with England?

**Answer:** The opposite of above: England is willing to pay a higher  $(p_C/p_T)$  in their country, so we would expect  $(p_C/p_T)$  to rise in India after trading freely with England.

(5) How do wages and the rental price of capital change in England when the country goes from autarky to free trade with India? Will English capitalists (i.e. the owners of capital) be in favor of free trade with India?

In England, the relative price of trains increases: since nominal values are indeterminate, we can assume this occurs from an absolute increase in the price of trains, and a constant price for cloth. From the above diagram, we can see that there will be incomplete specialization, so CRS still implies that  $p=AC$  in both industries. The following graph shows that the combinations of  $(w,r)$  that satisfy this condition in each industry. The increase in  $p_T$  associated with trade appears as an outward shift in the TT curve, as a result we can see that the real return to capital rises and the real return to labor (i.e. wages) falls.

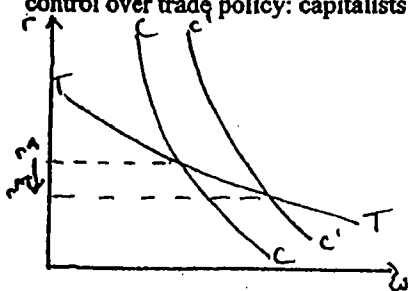


FT  $\Rightarrow \left(\frac{P_T}{P_C}\right) \uparrow$  IN ENGLAND. ASSUME  $P_T \uparrow$  AND  $P_C$  CONSTANT.  
 $\Rightarrow$  TT SHIFTS OUT AND  $w \downarrow, r \uparrow$ . IT IS EASY TO CONCLUDE THAT  $(w/P_C) \downarrow$  AND  $(w/P_T) \downarrow$ .  
 WE CAN SEE FROM THE DIAGRAM THAT THE  $\% \Delta r > \% \Delta p_T \Rightarrow (r/P_T) \uparrow$ . SINCE  $P_C$  CONSTANT  $\Rightarrow (r/P_C) \uparrow$ .

Since the real return to capital has risen, English capitalists will be in favor of free trade.

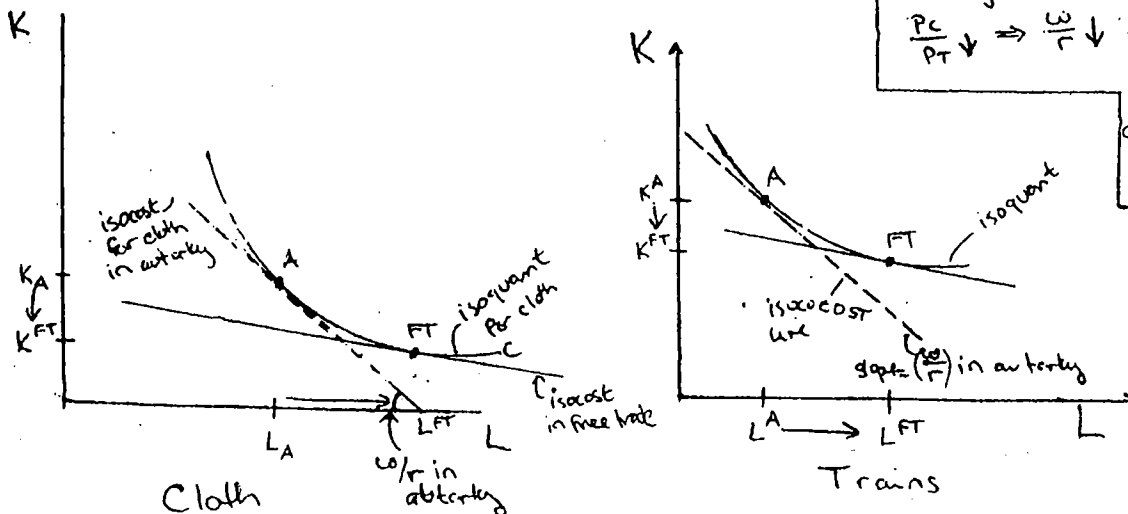
(6) How do wages and the rental price of capital change in India when the country goes from autarky to free trade with England? Will Indian capitalists (i.e. the owners of capital) be in favor of free trade with England?

In India, the relative price of trains has fallen. This can be shown as an inward shift of the TT curve. (It could also be shown as an outward shift of the CC curve, with the same result). Now we can see that the real return to capital has fallen, and the real wage has increased. So Indian capitalists are not in favor of free trade. Interesting fact: England has much freer trade than India. What group do you think has more control over trade policy: capitalists or workers? @



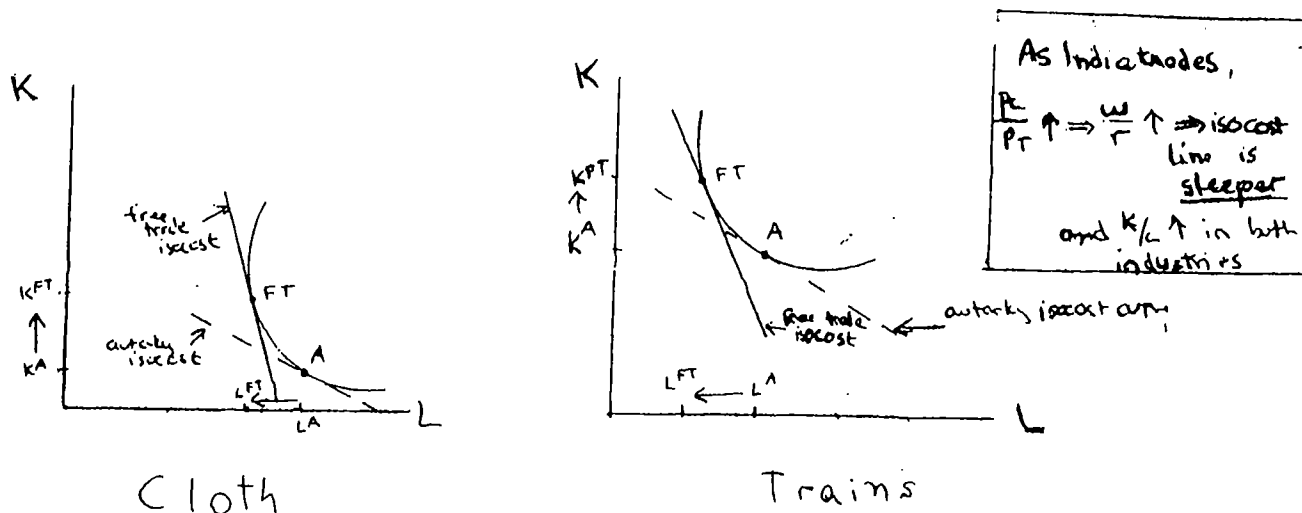
Free trade  $\Rightarrow \left(\frac{P_C}{P_T}\right) \uparrow$  so assume  $P_C \uparrow, P_T -$   
 then C shifts out. In this case,  $r \downarrow$ ,  
 so  $\frac{r \downarrow}{P_C \uparrow} \downarrow$  and  $\frac{r \downarrow}{P_T -} \downarrow$  so capitalists hurt

(7) What will happen to the capital labor ratio ( $K/L$ ) in the cloth and train sectors in England after opening to trade? Show on a graph.



As England opens to trade,  
 $\frac{P_C}{P_T} \downarrow \Rightarrow \frac{w}{r} \downarrow$  (above)  $\Rightarrow$  isocost line gets more flat  
 and  $K/L \downarrow$  in both industries

(8) What will happen to the capital labor ratio ( $K/L$ ) in the cloth and train sectors in India after opening to trade?. Show on a graph.



(9) Suppose the two countries were trading freely for several years at a fixed world price, do you expect to observe the same wages in England and India? Justify.

**Answer 1:** Yes. The assumptions in the beginning (2 goods, 2 factors, same technology, different endowments) are those of the Heckscher-Ohlin (H-O) model, and we know from the *factor price equalization theorem* that in the H-O model, trade will lead all factor prices ( $w$  and  $r$ ) to converge to the same level in the free trade equilibrium.

**Answer 2:** Yes. In the introduction we were told to assume that the technology to produce each good was the same in each country, so the only differences in average cost of production came about because of the relative availability of factors of production. Since we do not expect complete specialization in the HO model, both countries will be producing both goods even in the free trade equilibrium. So  $w/p = MPL$  and  $r/p = MPK$  must hold in both goods in both countries. Since the technology is the same in both countries, there is no overall productivity difference between England and India. Specialization will lead each country to allocate their resources until each country is using those factors with equal efficiency. Since trade equalizes prices across countries, which leads the  $MPL$  and  $MPK$  to be equalized, it must be the case that  $w$  and  $r$  are also equalized between countries as long as both goods are being produced in each.