

ECO 352 – International Trade – Spring Term 2010
Week 3 Precepts – February 15
INTRODUCTION, AND THE EXCHANGE MODEL – QUESTIONS

Question 1:

Here we construct a more general version of the comparison of differences in producer and consumer surpluses between trade and autarky, of which we looked at a numerical example for the U.S. auto industry.

Suppose the price under free trade is p^* , and the price under autarky would be p^a . Under free trade the quantity consumed is Q^c and domestic production is θQ^c where $\theta < 1$. Suppose that under autarky the domestic consumption and production equal Q^a . The domestic demand and supply curves are straight lines.

Find the expressions for the gain in domestic producer surplus, and the loss of domestic consumer surplus, in moving from free trade to autarky. Find the expression for the fraction of the consumer surplus loss that is gained by the producers. Examine how it depends on the various variables introduced above, and develop some economic intuitions for the findings.

Question 2:

We mentioned in class that the pure exchange model can be interpreted as a model of production in the very short run where all factors are fixed in their uses (intersectorally immobile). Here we develop some implications of this situation. Specifically, we ask who will gain and who will lose from trade.

There are two goods, X and Y . Each good is produced by capital and labor. The economy has given supplies of the two inputs in the two sectors, K_X and L_X specific to X -production, and K_Y and L_Y specific to Y production. The production functions are Cobb-Douglas with constant returns to scale:

$$X = (K_X)^{1/3} (L_X)^{2/3}, \quad \text{and} \quad Y = (K_Y)^{1/2} (L_Y)^{1/2}.$$

Let P_X and P_Y denote the prices of the two goods, and W_X the wage in sector X , R_X the return to capital in sector X , and similarly W_Y , R_Y in sector Y .

All producers are price-takers and maximize profit. Find the relationships this implies between the prices of outputs and the returns to the inputs in each sector.

Now suppose the economy is exporting good X . What are its terms of trade?

If the terms of trade improve, which factors benefit and which factors lose?

What are the implications for class conflict between capital and labor in this economy?

Question 3:

Consider a economy with two goods X and Y , and Cobb-Douglas preferences given by the utility function

$$U(X, Y) = X Y.$$

The economy has endowments of 6 units of X and 2 units of Y . Find the equation of its offer curve, and sketch it in a graph.

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 INTRODUCTION, AND THE EXCHANGE MODEL – SOLUTIONS

Question 1:

$$\begin{aligned}\text{CS loss} &= \frac{1}{2} (P^a - P^*) (Q^c + Q^a) \\ \text{PS gain} &= \frac{1}{2} (P^a - P^*) (\theta Q^c + Q^a)\end{aligned}$$

Therefore

$$\text{Ratio} = \frac{\theta Q^c + Q^a}{Q^c + Q^a} = \frac{\theta + Q^a/Q^c}{1 + Q^a/Q^c}$$

Therefore:

[1] For a given Q^a/Q^c , the ratio is larger when θ is larger, i.e. domestic production is still relatively important under trade,

[2] For a given θ , the ratio is larger when Q^a/Q^c is larger, i.e. when demand is relatively inelastic, and correspondingly, domestic supply is more elastic (so trade hurts domestic production more).

[3] The ratio is independent of P^* and P^a ; this is a special feature that arises because of the linear demand and supply curves.

Question 2:

Profit maximization implies equality of the return to a factor and the value of its marginal product. Therefore we have the following factor demand conditions:

$$P_X \frac{1}{3} (K_X)^{-2/3} (L_X)^{2/3} = R_X, \quad P_X \frac{2}{3} (K_X)^{1/3} (L_X)^{-1/3} = W_X,$$

and similarly

$$P_Y \frac{1}{2} (K_Y)^{-1/2} (L_Y)^{1/2} = R_Y, \quad P_Y \frac{1}{2} (K_Y)^{1/2} (L_Y)^{-1/2} = W_Y.$$

In equilibrium, the factor demands must equal the given factor supplies. Therefore the same equations immediately give solutions for the factor prices in terms of the given output prices and factor quantities.

Incidentally, note that the left hand sides depend only on the ratio (K/L) in each situation, not on the absolute scale of production. This is because of constant returns to scale in production. (Analogous to homothetic preferences in consumption.)

The economy's terms of trade are the ratio P_X/P_Y .

Now consider each worker in the X sector. His budget constraint is

$$P_X X + P_Y Y = W_X.$$

or

$$X + \frac{P_Y}{P_X} Y = \frac{W_X}{P_X} = \frac{2}{3} (K_X)^{1/3} (L_X)^{-1/3}.$$

When P_X/P_Y increases, P_Y/P_X falls, but W_X/P_X remains unchanged as we see from the factor demand equation. Therefore the budget constraint moves outward as shown in Figure 1. Therefore workers in the X sector become better off.

Similarly owners of capital in the X sector also become better off.

Workers and capital owners in the Y sector lose.

Thus there is conflict with regard to the effects of trade in this economy, but it is not a “class conflict” between capital and labor. The interests of capital and labor in each sector are perfectly aligned. The conflict of interest is along sectoral lines: all factors in the exporting sector are unanimous in preferring trade, and all factors in the import-competing sector would prefer autarky.

Question 3:

The budget constraint is

$$P_X X + P_Y Y = 6 P_X + 2 P_Y.$$

With the utility function $U(X, Y) = XY$, half of income is spent on each good. Therefore

$$P_X X = 3 P_X + P_Y, \quad P_Y Y = 3 P_X + P_Y,$$

or

$$X = 3 + (P_Y/P_X), \quad Y = 3 (P_X/P_Y) + 1.$$

The offer curve connects all points (X, Y) that arise in this way for all possible values of (P_X/P_Y) . Therefore to get its equation we eliminate P_X/P_Y between these two equations. Observe

$$X - 3 = (P_Y/P_X), \quad Y - 1 = 3 (P_X/P_Y).$$

Therefore

$$(X - 3) (Y - 1) = 3.$$

This is the equation we seek. Figure 3 graphs it. It is a rectangular hyperbola with the vertical line $X = 3$ and the horizontal line $Y = 1$ as its asymptotes, and passing through the endowment point (6,2).

Note that the offer curve extends to both sides of the endowment point. This is because whether the economy chooses to export X or import it depends on the relative price. If (P_X/P_Y) is flatter than the MRS at the endowment point, the economy will take to importing X .

Figure 1

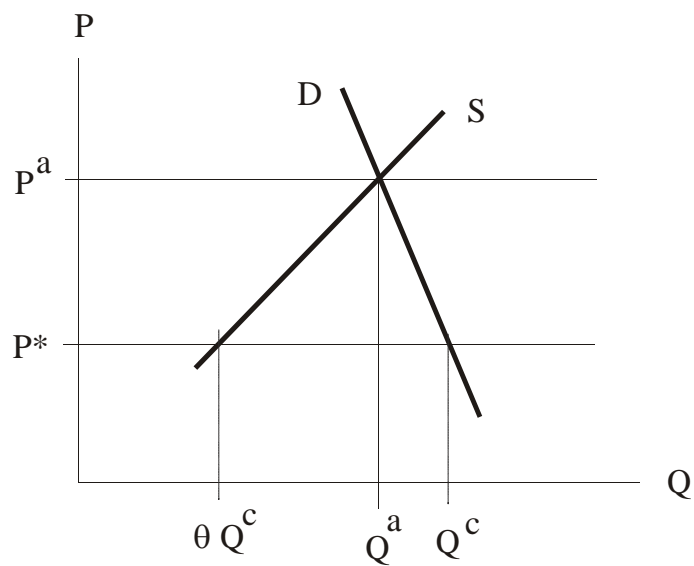


Figure 2

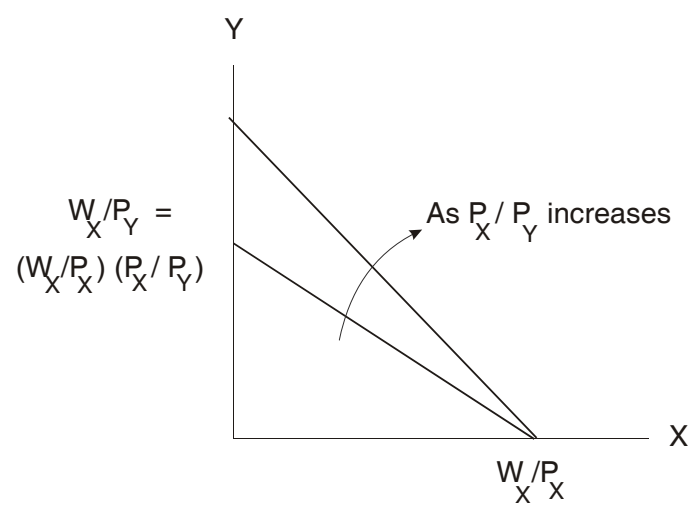


Figure 3

