International Economics
June 2015
Answer key

PROBLEM 1

1.1 *Low wage countries continue to pay low wages even as their productivity increases, putting high wage countries at a cost disadvantage.*

False. Evidence shows that low wages are associated with low productivity, which is consistent with the Ricardian model, where relative wages reflect relative productivities.

1.2 *An increase in the relative price of a good raises the real return of the specific factor used in producing that good.*

True. In the specific factors model an increase in the relative price of a good will attract the mobile factor to this sector which will increase the marginal product of the specific factor.

1.3 *The Hecksher-Ohlin theorem is about the pattern of trade.*

True. The Hecksher-Ohlin theorem states that each country exports the good that is relatively intensive in its relative abundant factor, so it is a statement about who sells what to whom, i.e., the pattern of trade.

1.4 *Fair Trade is a problematic concept because consumers are not willing to pay a higher price for goods produced in a socially responsible way.*

False. Survey evidence shows that most consumers are willing to pay 15-30% more for Fair Trade coffee. Experimental evidence also shows that demand is higher for Fair Trade coffee at a given price.

1.5 *The disadvantage from merging with a foreign firm is a reduction in the market share.*

True. A merger of two firms leads to a market share which is smaller than the combined market shares of the two original firms.

PROBLEM 2

Consider the production of a new aircraft, z, by two countries France and USA. In each country there is one firm producing the good with constant marginal costs c. The two firms sell the good abroad in the world market (i.e. no domestic consumption), and they compete in quantities (Cournot competition). The output of the firm in France is denoted x and the output of the firm in USA is denoted y, so that the total quantity sold in the world market is $z = x + y$. The demand for z by airline companies in the world market is given by the following (inverse) demand curve $p = a - bz$. The French government subsidizes exports of the French firm by s per unit.

Question 2.1: *Given this subsidy, state the two firms' maximization problems and show that the French and American firm's reaction functions are given by $x = \frac{a-by-c+s}{2b}$ and $y = \frac{a-bx-c}{2b}$ respectively.*

The French firm's profit is

$$\pi = (a - b(x + y))x - (c - s)x.$$

Maximization with respect to x yields the first order condition

$$\frac{\partial \pi}{\partial x} = a - b(x + y) - bx - (c - s) = 0,$$

which can be solved to give the French firm's reaction function $x = \frac{a-by-c+s}{2b}$. The American firm's profit is

$$\pi^* = (a - b(x + y))y - cy.$$

Maximization wrt. y yields

$$\frac{\partial \pi^*}{\partial y} = a - b(x + y) - by - c = 0,$$

which can be solved to give the American firm's reaction function $y = \frac{a-bx-c}{2b}$.

Question 2.2: *Find the Cournot Nash equilibrium price and quantities. How does the subsidy affect the price and quantities? Illustrate graphically the impact of increasing the subsidy level from 0 to s.*

The Cournot Nash equilibrium is determined by the intersection of the two reaction functions. Solving the two equations for x and y we get $x = \frac{a-c+2s}{3b}$ and $y = \frac{a-c-s}{3b}$. Thus the total quantity in the market is $z = x+y = \frac{2(a-c)+s}{3b}$ and the price is $p = a - b\frac{2(a-c)+s}{3b} = \frac{a+2c-s}{3}$.

From these expressions it is seen that the subsidy increases x, decreases y and increases the total volume sold, $x + y$. Since the total volume increases, the price falls.

The subsidy changes only the French firm's reaction function, by shifting it to the right as in Figure 1 in Brander and Spencer (1985). It is clear from this picture that the subsidy increases the output of the French firm and reduces the output of the American firm.

Question 2.3: *Find the profits of the two firms. How does the subsidy affect the these profit levels? Discuss this result.*

Inserting the equilibrium price and quantities into the profit function of the French firm one gets

$$\begin{aligned}\pi &= (p-c+s)x \\ &= \left(\frac{a+2c-s}{3} - c + s\right)\frac{a-c+2s}{3b} \\ &= \left(\frac{a-c+2s}{3}\right)\frac{a-c+2s}{3b} \\ &= \frac{(a-c+2s)^2}{9b}.\end{aligned}$$

Likewise the American firm's profit is

$$\begin{aligned}\pi^* &= (p-c)y \\ &= \left(\frac{a+2c-s}{3} - c\right)\frac{a-c-s}{3b} \\ &= \frac{(a-c-s)^2}{9b}.\end{aligned}$$

From these expressions it is clear that the subsidy increases profits of the French firm and reduces profits of the American firm. Thus by introducing the subsidy the French government may "steal" profits from the American firm.

Assume that welfare in France is measured by profit of the French firm minus the cost of the subsidy, $G = \pi - sx$.

Question 2.4: *Find the subsidy that maximizes French welfare. Is it beneficial for the*

French government to subsidize exports? Discuss why this result differs from the impact of export subsidies on welfare in models with perfect competition.

Inserting the expressions from above into the welfare function one gets

$$\begin{aligned} G &= \pi - sx \\ &= \frac{(a-c+2s)^2}{9b} - s\frac{a-c+2s}{3b} \\ &= \frac{a-c+2s}{3b}\left(\frac{a-c+2s}{3} - s\right) \\ &= \frac{a-c+2s}{3b}\frac{a-c-s}{3}. \end{aligned}$$

Differentiate with respect to s to obtain the first order condition

$$\begin{aligned} \frac{\partial G}{\partial s} &= -\frac{1}{3}\frac{a-c+2s}{3b} + \frac{2}{3b}\frac{a-c-s}{3} \\ &= \frac{a-c-4s}{9b} = 0 \end{aligned}$$

such that the optimal subsidy is $s = \frac{a-c}{4} > 0$. Imperfect competition gives the French government an incentive to subsidize exports, because by doing so it is able to capture profits from the firm in USA. At $s = \frac{a-c}{4}$ welfare is maximized (and so is higher than without a subsidy).

Under perfect competition there are no rents to be captured by the governments, so they are left with the expenses for the export subsidy. At the same time there will be efficiency losses from distortion of the behaviour of consumers and producers. For large countries there will also be a terms of trade loss due to the fact that export prices are reduced as a consequence of the subsidy. So all in all export subsidies have a negative impact on welfare under perfect competition.

Suppose the French government no longer subsidizes the French firm. Assume instead that the French firm is the first mover (i.e., the French firm is the Stackelberg leader and the American firm is the Stackelberg follower).

Question 2.5: *Find the Stackelberg equilibrium and discuss how this solution relates to the optimal subsidy from the previous question.*

The Stackelberg equilibrium is found by maximizing the French firm's profits subject to the constraint that the firm picks a point on the American firm's reaction function:

$$
\begin{aligned}
\max \pi &= (a - b(x+y))x - cx \\
st.\ y &= \frac{a - bx - c}{2b}
\end{aligned}
$$

which corresponds to maximizing

$$
\begin{aligned}
\pi &= (a - b(x + \frac{a - bx - c}{2b}))x - cx \\
&= (a - bx - \frac{a - bx - c}{2})x - cx \\
&= (\frac{a - bx + c}{2})x - cx \\
&= \frac{a - bx - c}{2}x
\end{aligned}
$$

with respect to the quantity x. We get

$$
\begin{aligned}
\frac{\partial \pi}{\partial x} &= \frac{a - bx - c}{2} - \frac{b}{2}x \\
&= \frac{a - 2bx - c}{2} = 0
\end{aligned}
$$

so that $x = \frac{a-c}{2b}$ is the Stackelberg quantity of the French firm.

This solution corresponds to the Nash equilibrium quantity with the optimal subsidy:

$$
\begin{aligned}
x &= \frac{a - c + 2s}{3b} \\
&= \frac{a - c + 2\frac{a-c}{4}}{3b} \\
&= \frac{a - c}{2b}
\end{aligned}
$$

The reason is that the optimal subsidy shifts the French firm's reaction function to the Stackelberg point where welfare is maximized. The French firm cannot obtain this outcome without a subsidy because in that case the French firm has an incentive to deviate.