International Economics
June 2011
Answer key

PROBLEM 1

1.1 True. This follows from the Stolper-Samuelson Theorem and the fact that trade leads to a rise in the relative price of the good that is intensive in the use of a country's abundant factor.

1.2 False. Import-biased growth abroad means that the production possibility frontier shifts out more in the direction the good which is imported. This means that the world relative supply of this good decreases, which in turn decreases the relative price of the imported good. Seen from the domestic country's point of view this means a worsened terms of trade, which reduces welfare.

1.3 False. A condition for trade is that the monopoly price is high enough to cover the marginal cost of exporting. Otherwise trade would not be profitable.

1.4 False. Europe's Common Agricultural Policy is likely to reduce welfare in Europe, because it works like an export subsidy. Export subsidies have negative welfare effects under perfect competition because the cost of the subsidy and the consumer loss more than outweigh the producer gain.

1.5 False. A VER has no potential to improve welfare of the importing country because the rents are earned by the foreigners, and consumers lose more than the producers gain.

1.6 True. If trade policy is made on a purely domestic basis taking other countries policies as given, governments have incentives to introduce protective measures. As a result they may end up in a suboptimal prisoner's dilemma outcome. Under international trade policy negotiations these outcomes may be avoided.

1.7 False. It is true that FDI flows have grown more rapidly than trade flows and GDP over recent decades, but world trade flows are still much higher than world FDI flows, and FDI goes predominantly to advanced countries (but the share of developing countries has been rising).

PROBLEM 2

Consider the production of cell phones, z, by two countries Finland and Sweden. In each country there is one firm producing the good with constant marginal costs $c = 1$. The two firms sell the good in a third country, Denmark, and they compete in quantities (Cournot competition). The output of the Finnish firm is denoted x and the output of the Swedish firm is denoted y, so that the total quantity sold in Denmark is $z = x + y$. The demand for z by consumers in Denmark is given by the following (inverse) demand curve $p = 25 - z$.

Question 2.1: *State the maximisation problems of the two firms and show that the Finnish and Swedish firm's reaction functions are given by $x = \frac{24-y}{2}$ and $y = \frac{24-x}{2}$ respectively.*

The Finnish firm's profit is

$$\pi = (25 - (x + y))x - x.$$

Maximization with respect to x gives

$$\frac{\partial \pi}{\partial x} = -x + (25 - x - y) - 1 = 0,$$

which can be solved to give the Finnish firm's reaction function $x = \frac{24-y}{2}$. Similarly, the Swedish firm's profit is

$$\pi^* = (25 - (x + y))y - y.$$

Maximization wrt. y yields

$$\frac{\partial \pi^*}{\partial y} = -y + (25 - x - y) - 1 = 0,$$

which can be solved to give the Foreign firm's reaction function $y = \frac{24-x}{2}$.

Question 2.2: *Find the Cournot Nash equilibrium price, quantities, and profits.*

The Cournot Nash equilibrium is found by solving the equations given by the two reaction functions for x and y. We get $x = \frac{24-y}{2} = \frac{24-\frac{24-x}{2}}{2} = 8$ and $y = 8$. Thus the total quantity in the market is $z = x + y = 16$ and the price is $p = 25 - 16 = 9$. The profits are $\pi = \pi^* = 9 * 8 - 8 = 64$.

Question 2.3: *Illustrate graphically the Nash equilibrium. Is it a stable equilibrium? Explain the reasons for your answer.*

In a diagram with x on the horizontal axis and y on the vertical axis, the Nash equilibrium is found where the two reaction functions intersect. It is a stable equilibrium because starting from any arbitrary initial quantity pair, the series of best responses by the two firms will approach the Nash equilibrium. The reason is that with the given assumptions the quantities are strategic substitutes ($\pi_{xy} = -1 < 0$ and $\pi^*_{yx} = -1 < 0$) and furthermore the following inequalities hold: $\pi_{xx} < \pi_{xy}$ and $\pi^*_{yy} < \pi^*_{yx}$. This ensures that the Finnish firm's reaction function cuts the Swedish firm's reaction function from above.

The Finnish government now subsidises exports of the Finnish firm by s per cell phone.

Question 2.4: *Show that Finnish firm's reaction function changes to $x = \frac{24-y+s}{2}$. Find the new Cournot-Nash equilibrium price, quantities and profits. How does the subsidy affect the profits of the two firms?*

The Finnish firm's profit now is

$$\pi = (25 - (x + y))x - x + sx.$$

Maximization with respect to x gives

$$\frac{\partial \pi}{\partial x} = -x + (25 - x - y) - 1 + s = 0,$$

which can be solved to give the Finnish firm's reaction function $x = \frac{24-y+s}{2}$. The Swedish firm's reaction function is unchanged so the new Cournot-Nash equilibrium quantities are $x = \frac{24-\frac{24-x}{2}+s}{2} = \frac{24+2s}{3}$ and $y = \frac{24-x}{2} = \frac{24-\frac{24+2s}{3}}{2} = \frac{24-s}{3}$. The price is $p = 25 - \frac{24+2s}{3} - \frac{24-s}{3} = \frac{27-s}{3}$. The profits are $\pi = (p - 1 + s)x = (\frac{27-s}{3} - 1 + s)\frac{24+2s}{3} = \left(\frac{24+2s}{3}\right)^2$, and $\pi^* = (p - 1)y = (\frac{27-s}{3} - 1)\frac{24-s}{3} = \left(\frac{24-s}{3}\right)^2$. Thus, the subsidy shifts profits from the Swedish firm to the Finnish firm.

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

Question 2.5: *Find the subsidy that maximises welfare in Finland. Is it beneficial for Finland to subsidise exports? Explain.*

Substitution of expressions from above gives

$$
\begin{aligned}
G &= \pi - sx \\
&= \left(\frac{24+2s}{3}\right)^2 - s\frac{24+2s}{3} \\
&= \frac{24+2s}{3}(\frac{24+2s}{3} - s) \\
&= \frac{24+2s}{3}\frac{24-s}{3} \\
&= \frac{1}{9}\left(24^2 + 24s - 2s^2\right)
\end{aligned}
$$

Maximisation with respect to s implies

$$\frac{\partial G}{\partial s} = \frac{1}{9}\left(24 - 4s\right) = 0$$

such that the optimal subsidy is $s = 6$.

The optimal subsidy shifts the Finnish firm's reaction function to the right such that x rises and y falls. This outcome corresponds exactly to the Stackelberg equilibrium, where the Finnish firm maximises profits subject to the constraint that it has to select a point on the follower's reaction function, see figure 1 in Brander and Spencer (1985). In this way the optimal subsidy selects the Nash equilibrium that maximises welfare in Finland.