

## PROBLEM 1

- 1.1 False. The world was highly integrated before WW1, but trade was reduced by depression, protectionism and war.
- 1.2 True. This insight may be illustrated by use of a box diagram such as Figure 4-9 in Krugman and Obstfeld.
- 1.3 False. Trade policies typically favor the interest of small, concentrated groups over the general public. This may be explained by the problem of collective action.
- 1.4 True. In the strategic trade policy model of Brander & Spencer (1985) an export subsidy improves welfare. By introducing an export subsidy in a market with only one domestic and one foreign firm, the government is able to ‘steal’ profits from the foreign firm.
- 1.5 False. Joining a free trade area may lead to replacement of low-cost imports from outside the zone with higher-cost goods from member nations. This is called trade diversion.
- 1.6 False. Labor standards – that is, conditions that export industries are supposed to meet – may reduce the number of jobs in these industries. Labor standards may also be used as a protectionist tool by developed countries.
- 1.7 True. Labor moves from countries where it is abundant to countries where it is scarce. This raises total world output, but it also generates strong income distribution effects, so that some groups are hurt.
- 1.8 False. In the model of outsourcing by Feenstra and Hanson (2003) increased globalization can only be shown to increase wage inequality if the cost shares of capital are identical in the production of the two intermediate inputs or if the low skilled intensive input is also capital intensive.

## PROBLEM 2

**Question 2.1:** Show that (and explain why) the average cost of a firm may be written as a function of the number of firms such that  $AC = \frac{n}{2} + 2$ . Why are average costs increasing in the number of firms?

Since all firms are symmetric, in equilibrium they will all charge the same price, so that  $P = \bar{P}$ . From the demand function we then have  $Q = \frac{SC}{n}$ . Average costs may then be written

$$\begin{aligned} AC &= \frac{F}{Q} + c \\ &= \frac{nF}{SC} + c \\ &= \frac{n}{64} + 2. \end{aligned}$$

Average costs increases with the number of firms because each firm will produce less and so the fixed cost has to be spread over fewer units of output.

**Question 2.2:** State the firms' profit maximization problem. Show first that marginal revenues may be written  $MR = P - \frac{Q}{B}$ , where  $B$  is some constant, and find then the price charged by the firms as a function of the number of firms. How does the price depend on the number of firms and the marginal cost?

Profits may be written

$$\begin{aligned} \pi &= PQ - C \\ &= PQ - (F + cQ) \\ &= PQ - (100 + 2Q) \end{aligned}$$

which must be maximized subject to the demand function. Revenues are  $R = PQ$ , so marginal revenues are

$$MR = \frac{\partial R}{\partial Q} = P + Q \frac{\partial P}{\partial Q}.$$

The inverse demand function is

$$P = \frac{1}{n} - \frac{Q}{SC} + \bar{P},$$

so

$$MR = P - \frac{Q}{6400}.$$

Firms set marginal revenues equal to marginal costs ( $MC = 2$ ):

$$P - \frac{Q}{6400} = 2$$

or

$$P = 2 + \frac{Q}{6400}.$$

Again we can use that  $Q = \frac{S^C}{n} = \frac{6400}{n}$  due to symmetry, so the price is

$$P = 2 + \frac{1}{n}.$$

That is, the more firms there are in the industry, the lower the price each firm will charge. The price is a mark up over marginal cost.

**Question 2.3:** *In the long run firms earn zero profits. Find the long run number of firms,  $n^*$ , and illustrate graphically why the number of firms tends to move towards  $n^*$  in the long run.*

With zero profits the price must equal average costs:

$$\begin{aligned} AC &= P \\ \frac{n}{64} + 2 &= 2 + \frac{1}{n} \\ n^2 &= 64 \\ n^C &= 8 \end{aligned}$$

With this number of firms the equilibrium price must be

$$P^C = 2 + \frac{1}{8}$$

If  $n$  were less than  $n^C$  then the price would be higher than average costs. Firms would therefore earn positive profits and there would be entry. Conversely, if  $n$  were greater than  $n^C$  then the price would be lower than average costs and so firms would exit the industry, see Figure 6-3 in Krugman and Obstfeld.

**Question 2.4:** *What is the number of firms and the price of ice creams in Malmö before the bridge? What is the number of firms and the price of ice creams in the integrated market after the bridge? Interpret the results.*

We can use the same equations as above and get

$$\begin{aligned}AC &= P \\ \frac{n}{36} + 2 &= 2 + \frac{1}{n} \\ n^2 &= 36 \\ n^M &= 6\end{aligned}$$

With this number of firms the equilibrium price must be

$$P^M = 2 + \frac{1}{6}.$$

In the integrated economy the total sales of ice creams is  $S^T = 6400 + 3600 = 10000$ . Then the number of firms and price will be

$$\begin{aligned}AC &= P \\ \frac{n}{100} + 2 &= 2 + \frac{1}{n} \\ n^2 &= 100 \\ n^T &= 10\end{aligned}$$

With this number of firms the equilibrium price must be

$$P^T = 2 + \frac{1}{10}.$$

The integrated market supports more firms, each producing at a larger scale and selling at a lower price than either national market did on its own. In the integrated economy consumers have a wider range of choice, yet each firm produces more and is therefore able to offer its product at a lower price.