International Economics
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Answer key

PROBLEM 1

1.1 False. In the Hecksher-Ohlin model production factors are not mobile across countries. Instead factor price equalization occurs because countries indirectly trade factors embodied in their exports.

1.2 True. Based on the factor content of trade, a country should be a net exporter of a production factor with which it is relatively abundantly endowed. Bowen, Leamer and Sveikauskas (1987) showed that the HO model fails such a test.

1.3 False. Export-biased growth in China tends to worsen China's terms of trade, which is to the benefit of Denmark.

1.4 True. The most productive firms sell higher quantities and earn higher profits, and the least productive firms cannot profitably produce. Economic integration corresponds to a larger market size which increases demand for the high productive firms and lowers demand for the low productive firms. Thus, the least productive firms are forced to exit (see Figure 8-7 in KOM).

1.5 True. First, integration in the form of increased trade means that a price fall increases demand by relatively more. Second, if unemployed factors are more mobile then they more easily move abroad which reduces the severity of unemployment.

1.6 False. First, if the country is large part of the effect of a tariff will be to lower foreign export prices rather than to raise domestic prices. Second, for domestic producers the tariff should be related to value added in production and not the price of the final good.

1.7 False. A free trade area has zero tariffs internally and each member country has its own external trade policy. The European Union has a common external trade policy, i.e., it is a customs union.

PROBLEM 2

There are two countries $i = 1, 2$, with total expenditures E_1 and E_2 in their markets for windmills. Four different types of firms operate in the windmill markets. Some firms (multinationals) operate a plant in both countries and a headquarter in one of the countries. Other firms (nationals) operate a plant and a headquarter in the same country and serve the other country by exporting. There is a fixed number of firms of each type: m_1 multinationals with headquarter in country 1, m_2 multinationals with headquarter in country 2, n_1 nationals in country 1, and n_2 nationals in country 2. All firms face a constant marginal cost of producing a windmill of c. Each firm produces its own differentiated windmill with perceived demand given by $x_i(p_i) = E_i p_i^{-\sigma}$, where $\sigma > 1$ is a constant demand elasticity. Trade costs are of the iceberg form, such that $\tau > 1$ units must be shipped for one unit to arrive. An alternative way to express trade costs is to use the "trade freeness"-parameter $\varphi \leq 1$. This means that firms serving the windmill market in country i by exporting from country j have a market share equal to φs_i, where s_i is the market share of firms with a plant in country i. Finally, there are fixed costs of setting up a plant and a headquarter of cF and cH respectively.

Question 2.1: *Answer the following questions for each of the four firm types: What is the marginal cost of serving country 1 and country 2? What is the market share in country 1 and country 2? What is the total fixed costs?*

See table 3.1 in Barba Navaretti and Venables (2004). If the firm has a plant in the country then the marginal cost is c. Otherwise it is τc. If the firm has a plant in country i then the market share is s_i, otherwise it is φs_i. Total fixed costs for national firms are $c(H + F)$, and for multinationals they are $c(H + 2F)$.

Question 2.2: *State the market i operating profit of a windmill producer with a plant in country i, and find the profit maximizing price. Given this price, show also that the operating profit can be written $\pi_i = \frac{s_i E_i}{\sigma}$, where $s_i = \frac{p_i x_i}{E_i}$ is the market share of the firm.*

The market i operating profit of a windmill firm in country i is given by

$$\begin{aligned} \pi_i &= p_i x_i - c x_i \\ &= E_i p_i^{1-\sigma} + c E_i p_i^{-\sigma}. \end{aligned}$$

Maximization with respect to p_i gives

$$\begin{aligned}\frac{\partial \pi_i}{\partial p_i} &= (1-\sigma)E_i p_i^{-\sigma} - \sigma c E_i p_i^{-\sigma-1} = 0 \\ &\Rightarrow \ (1-\sigma) - \sigma c p_i^{-1} = 0 \\ &\Rightarrow \ p_i = \frac{\sigma}{\sigma-1}c,\end{aligned}$$

so the price is a constant mark up over marginal costs. Equivalently we have $c = \frac{\sigma-1}{\sigma}p_i$, which may be substituted into the operating profit to give

$$\begin{aligned}\pi_i &= p_i x_i - \frac{\sigma-1}{\sigma}p_i x_i \\ &= \frac{p_i x_i}{\sigma} \\ &= \frac{p_i x_i}{E_i}\frac{E_i}{\sigma} \\ &= s_i \frac{E_i}{\sigma}.\end{aligned}$$

Now suppose there are one firm of each type ($n_1 = n_2 = m_1 = m_2 = 1$). Assume also that $\sigma = 2$, $c = 1$, $E_1 = E_2 = 210$, $F = 5$, $H = 20$, and $\varphi = \frac{1}{2}$.

Question 2.3: *Find the market shares, s_1 and s_2, and the total profit of each firm.*

Market shares in market i are identical for all firms with a plant in the market, while they are lower for exporters by a factor φ. Market shares sum to 1, i.e., for the market in country 1 we have

$$\begin{aligned}1 &= n_1 s_1 + m s_1 + n_2 \varphi s_1 \\ &= s_1 + 2s_1 + \frac{1}{2}s_1 \\ &\Rightarrow \ s_1 = \frac{2}{7},\end{aligned}$$

and likewise for market 2

$$s_2 = \frac{2}{7},$$

where $m = m_1 + m_2 = 2$ is the total number of multinationals.

The total profits (operating profits minus fixed costs) for the multinationals are identical irrespective of the location of their headquarter since fixed costs are identical and

they have the same market shares in the two markets. That is,

$$\begin{aligned}\Pi_1^M &= \Pi_2^M = \frac{s_1 E_1}{\sigma} + \frac{s_2 E_2}{\sigma} - (H + 2F) \\ &= \frac{2}{7}105 + \frac{2}{7}105 - (H + 2F) \\ &= 60 - (H + 2F) \\ &= 30\end{aligned}$$

The total profits for the national firms are

$$\begin{aligned}\Pi_1^N &= \Pi_2^N = \frac{s_1 E_1}{\sigma} + \frac{\varphi s_2 E_2}{\sigma} - (H + F) \\ &= \frac{2}{7}105 + \frac{1}{7}105 - (H + F) \\ &= 45 - (H + F) \\ &= 20\end{aligned}$$

Question 2.4: *Is it profitable for the two national windmill producers to merge their companies into a multinational? What would happen if trade is restricted (φ falls) or building a headquarter becomes more expensive (H rises)? Explain.*

After the merger the new market shares are

$$\begin{aligned}1 &= 3\overline{s_i} \\ \Rightarrow\ \overline{s_i} &= \frac{1}{3}.\end{aligned}$$

The total profit of a multinational is then

$$\begin{aligned}\Pi_1^M &= \Pi_2^M = \frac{s_1 E_1}{\sigma} + \frac{s_2 E_2}{\sigma} - (H + 2F) \\ &= \frac{1}{3}105 + \frac{1}{3}105 - (H + 2F) \\ &= 70 - (H + 2F) \\ &= 40\end{aligned}$$

Two national firms will find it profitable to merge into a multinational if

$$\Delta_1^A = \Pi_1^M(n_1 - 1, n_2 - 1, m + 1) - \Pi_1^N(n_1, n_2, m) - \Pi_2^N(n_1, n_2, m) > 0,$$

In our case this means that the two national firms are indifferent:

$$\Delta_1^A = 40 - 20 - 20 = 0.$$

If trade is restricted the marginal cost savings from being a multinational rises, and so this would make a merger profitable. If the firm level fixed costs rise, the savings from a merger rise, and it would be profitable to merge.

Question 2.5: *Suppose there is now free entry and exit of firms such that the numbers of firms and market shares are determined endogenously by a zero profit condition. What type of firms will then exist in equilibrium?*

Since the countries are symmetric, total profits are

$$\begin{aligned} \Pi^M &= \frac{2sE}{\sigma} - (H + 2F) \\ &= 210s - 30, \end{aligned}$$

and

$$\begin{aligned} \Pi^N &= \frac{s(1+\varphi)E}{\sigma} - (H + F) \\ &= \frac{315}{2}s - 25. \end{aligned}$$

Both types of firms cannot have zero profits simultaneously. If multinationals earn zero profits then the market share would be $s = \frac{1}{7}$. In this case, national firms would earn negative profits:

$$\begin{aligned} \Pi^N &= \frac{315}{2}\frac{1}{7} - 25 \\ &= -\frac{5}{2}. \end{aligned}$$

Conversely, if national firms earn zero profits then multinationals would earn positive profits. So in equilibrium only multinationals exist.