Problem Set 2

1   Standard Trade Theory

Home and Foreign produce machinery and food. The relative price of machinery P_M/P_F is 1 in the initial world-trade equilibrium.

- Suppose Home exports machinery and imports food. Draw the trade line (isovalue curve) and according indifference curves for Home. Depict a point of optimal consumption for Home.

- Now suppose Home imports machinery and exports food. Draw the according indifference curves for Home and depict a point of optimal consumption for Home.

- Return to the case of Home being a machinery exporter. The relative world-market price of machinery P_M/P_F rises to 2. How do production and consumption change? Is an increase in the terms of trade unambiguously beneficial? How would your answer be different if Home were a machinery importer so that its terms of trade fell?

- Suppose Home is a *large open economy* and a machinery exporter. Machinery production is capital-intensive and Home's capital endowment increases. Use a relative-supply-relative-demand diagram to show how Home's terms of trade respond.

- Suppose Home is a *small open economy* and a machinery exporter. Home subsidizes its machinery sector, paying a subsidy on every unit sold. How are Home's terms of trade affected? How is Home's welfare affected?

- Suppose Home is a machinery exporter. Home now also subsidizes its imports so that internal (domestic) relative prices are the same as world-market relative prices. How are Home's terms of trade affected? Does it matter whether Home is a small or large economy? What is the effect on Home welfare?

2   Intraindustry Trade

Monopolistic chair makers produce with a total cost function

$$\mathrm{TC} = F + c \cdot Q_C,$$

where $F = 500,000$ and $c = 100$.

- What are the average and marginal cost functions of a chair maker?

Each of n chair makers faces residual demand of

$$Q_C^d = S \cdot [1/n - b \cdot (P_C - \bar{P}_C)],$$

where $S = 50,000$, $b = 1/1,000$ and $\bar{P}_C$ is average equilibrium price.

- What are marginal revenues? [*Hint*: You may use the formula in the textbook. Otherwise, reformulate demand so that $P_M = P_M(Q_M^d)$ and derive total revenue; differentiate total revenue with respect to quantity.]

- Graph the average-cost-variety (CC) and the price-variety (PP) schedules for this industry in a diagram that shows price, average cost and the number of firms (varieties).

- Find the number of firms (varieties) in this industry in the absence of trade. What is price in a symmetric autarky equilibrium?

- Chairs can be traded with other countries at not cost. Using the average-cost-variety (CC) and the price-variety (PP) schedules above, show how equilibrium price and the equilibrium number of firms change after trade.

- How could you measure the gains from trade? Explain briefly.

3 Monopolistic Competition and Dumping

A machinery monopolist produces with a total cost function

$$\text{TC} = F + \frac{c}{2} \cdot (Q_M)^2,$$

where $c = 1/150$. You may suppose that $F = 0$.

- What are the monopolist's average and marginal cost functions?

Demand for machines at Home is

$$Q_M^d = S - Sb \cdot P_M,$$

where $S = 50,000$ and $b = 1/1,000$. World demand is perfectly elastic at a world-market price of $P_M^* = 500$.

- What are the monopolist's marginal revenues? [*Hint*: You may use the formula in the textbook. Otherwise, reformulate demand so that $P_M = P_M(Q_M^d)$ and derive total revenue; differentiate total revenue with respect to quantity.]

- The monopolist chooses to export at the world-market price $P_M^* = 500$. Determine total output, domestic sales and exports in a suitable graph and show that the monopolist's best strategy is dumping on the world market.

- Use the graph to show that domestic consumers suffer from high monopoly price. [*Hint*: Consumer surplus is the area below the demand curve. Draw it before and after dumping.]

- Free trade in machinery exposes the domestic monopolist to perfect competition at $P_M^* = 500$. Show that Home consumers are better off after trade, while the monopolist is worse off. [*Hint*: Consumer surplus is the area below the demand curve. Identify consumer rents before and after free trade.]

- Can the monopolist remain in business if $F > 0$?

4   Horizontal Foreign Direct Investment

A domestic machinery monopolist faces no competition in the Home market but can sell to the world market at a price P^*. The monopolist's total costs are

$$\text{TC} = \tfrac{c}{2} \cdot Q^2,$$

and domestic demand is

$$Q_M^d = S - Sb \cdot P_M,$$

where $c = 1/150$, $S = 50,000$ and $b = 1/1,000$.

- Calculate, and depict in a price-quantity diagram, the *effective marginal revenues* of this monopolist, considering the exporting opportunity.

- Calculate, and depict in a price-quantity diagram, the optimal amount of goods that the monopolist will choose to sell to the domestic market and the optimal amount of goods the monopolist will export in the absence of transportation costs.

- Now suppose there are transportation costs $\tau = \tfrac{1}{2}c$ per unit shipped across borders. Calculate and depict monopoly profits from exports.

- Alternatively, the monopoly can open a foreign subsidiary and sell to the world market from the new location at no transportation cost. Calculate and depict profits at the foreign subsidiary. If there are some fixed costs to open a foreign subsidiary, how large can they be at most to make horizontal FDI worthwhile?

5   Vertical Foreign Direct Investment

A domestic machinery monopolist faces no competition in the Home market and a domestic demand function

$$Q_M^d = S - Sb \cdot P_M,$$

where $S = 50,000$ and $b = 1/1,000$.

The monopolist has three choices to make or buy its product for the domestic market.

1. To produce at the Home establishment under a cost function

$$\text{TC}_1 = \tfrac{c}{2} \cdot Q^2,$$

   where $c = 1/150$.

2. To acquire a Foreign subsidiary and to produce at the foreign location under a cost function

$$\text{TC}_2 = \frac{c^*}{2} \cdot Q^2,$$

where $c^* = c/2 = 1/300$.

3. To enter a contract with Foreign suppliers but facing hold-up costs so that the effective cost function of Foreign supplies including *hold-up costs* becomes

$$\text{TC}_3 = \frac{4c^*}{3} \cdot Q^{\frac{3}{2}},$$

where $c^* = c/2 = 1/300$.

There are transport costs $\tau = \frac{1}{2}c^*$ per unit shipped across borders. There are no fixed costs.

- Provide an example of a hold-up problem that deters a foreign supplier from supplying the right quality to the monopolist.

- Calculate, and depict in a price-quantity diagram, the marginal revenues of the domestic monopolist.

- Calculate, and depict in the price-quantity diagram, the marginal costs of the domestic monopolist under the three alternative make-or-buy choices.

- Calculate and depict profits under the alternative make-or-buy choices. Which of the three choices is profit maximizing?

- Depict a measure of the internalization advantage.