

Problem Set 5

This problem set is due on March 8, 2021 at 5pm CT.

Exercise 1

Determine whether the following statements are TRUE, FALSE, or UNCERTAIN, and justify your answer in one paragraph. Please be concise.

1. For any specific tariff there is an equivalent ad-valorem tariff, regardless of the price.
2. If a firm shifts into more R&D-intensive industries, it will internalize more of its supply chain.
3. A decrease in the fixed overhead cost f_D from the Helpman, Melitz, & Yeaple (2004) model will lead to less firms exporting in equilibrium.

Exercise 2

Consider an economy with two countries, the US and Japan, and two goods, cheeseburgers and sushi. Suppose that the US requires one unit of labor to make one cheeseburger and two units to make one roll of sushi. Suppose that Japan is the opposite: it requires one unit of labor to make one roll of sushi and two units to make one cheeseburger.

1. For each good, which country has the absolute advantage? Which country has the comparative advantage?
2. Suppose there are 20 units of labor in each country. Draw the world production possibilities frontier. (Put sushi on the vertical axis.)
3. Suppose consumers in both countries have identical Cobb-Douglas preferences:

$$U = D_c^{1/2} D_s^{1/2}.$$

Derive the pattern of trade. Compute the welfare of the representative consumer in each country under free trade.

In the next three questions, you can take as given that the pattern of specialization will remain unchanged.¹ Also, assume that each country's tariff revenue is rebated to its representative consumer.

4. Now suppose that the US imposed an ad-valorem tariff of 50% on sushi but Japan did not impose any tariffs of its own. Compute the new pattern of trade and the welfare of the representative consumer in each country under this regime.
5. Now suppose instead that Japan imposed an ad-valorem tariff of 50% on cheeseburgers but the US did not impose any tariffs of its own. Compute the new pattern of trade and the welfare of the representative consumer in each country under this regime.
6. Finally, suppose instead that the US imposed an ad-valorem tariff of 50% on sushi and Japan imposed an ad-valorem tariff of 50% on cheeseburgers. Compute the new pattern of trade and the welfare of the representative consumer in each country under this regime.
7. Use your welfare calculations from the last four questions to construct a payoff matrix that describes trade warfare between the US and Japan. Solve the game for the Nash equilibrium.

Exercise 3

Consider Helpman, Melitz, and Yeaple (2004) model. There are two countries. Firms can sell varieties in a domestic market and a foreign market (firms can do both). There is a fixed overhead cost of f_D units of labor per plant. There is also fixed cost of exporting of f_X units of labor. Export is subject to iceberg trade cost, τ . Instead of exporting, a firm can choose FDI. The fixed cost of FDI is $f_I = f_X + f_D$, and FDI is not subject to iceberg trade cost. Given its productivity level, a firm decides which market to serve. Profits are as below:

$$\text{Profit from domestic market: } \pi_D(\varphi) = B^D \varphi^{\sigma-1} - f_D$$

$$\text{Profit from exporting: } \pi_X(\varphi) = B^F \varphi^{\sigma-1} \tau^{1-\sigma} - f_X$$

$$\text{Profit from FDI: } \pi_I(\varphi) = B^F \varphi^{\sigma-1} - f_X - f_D$$

¹One can check this using a guess-and-verify approach, but it's not necessary for full credit.

where

$$B^i = \frac{1}{\sigma} \left(\frac{\sigma - 1}{\sigma} \right)^{\sigma-1} \frac{E^i}{\int_0^{M^i} p^i(v)^{1-\sigma} dv} \quad \text{for } i \in \{D, F\}.$$

Let $B^D = 3$, $B^F = 5$, $\sigma = 2$, $\tau = 1.25$, $f_D = 3$, and $f_X = 8$.

1. Draw the graph of the profit curve from serving the domestic market. Put $\varphi^{\sigma-1}$ on the x -axis and profit on the y -axis. Report the slope of the line. What is the minimum level of productivity for firms that serve the domestic market?
2. Draw the profit curve from exporting and report the slope. What is the minimum level of productivity for exporting firms?
3. Draw the profit curve from FDI and report the slope. What is the minimum level of productivity for firms that do FDI?

In what follows, assume that the distribution of productivity is Uniform(0,4).

4. What fraction of firms...
 - (a) do not produce at all?
 - (b) produce only for the domestic market?
 - (c) produce for the domestic market and export to the foreign market?
 - (d) produce for the domestic market and do FDI in the foreign market?
5. Suppose that τ increases and the distribution of productivity remains the same. For each of the four groups in the previous question, determine if the share of firms in that group goes up, down, or stays the same. Explain.