EI135: International Trade I
Spring 2025
Problem Set 2

Due Date: Monday, May 19, 17h00 (by email)

Note: You may work alone or in pairs. If the latter, each team should submit a single response. Typewritten answers are preferred. If you choose to write by hand, please make sure it is neat and legible.

1. Tariffs and quotas

The president of the U.S.A. has on numerous occasions proposed to increase protection of the U.S. car industry in order to seduce voters in car producing states. His argument is that protection will generate welfare gains for the U.S. and increase domestic employment. One of the options considered by the president is a possible quota on car imports from the rest of the world. You have been hired as an economic advisor to assess the welfare impact of such a quota. Follow the steps bellow to estimate the welfare effects of this policy.

For the entire question you shall assume that the U.S. is a small country. All prices will be expressed in thousands of U.S. dollars and all quantities will be expressed in millions of cars. The demand for automobiles in the U.S. (in millions of cars) is given by

$$D(P) = 200 - 10P \tag{1}$$

1. Suppose that the U.S. automobile industry is perfectly competitive with the following supply curve (also in millions of cars)

$$S(P) = 50 + 5P \quad \text{for} \quad P \geq 0 \tag{2}$$

   (a) Derive the U.S. import demand schedule. Solve for the autarky price of automobiles in the U.S. What is the equilibrium number of cars sold in autarky?

   (b) The U.S. imports automobiles from the rest of the world at the price of \$5,000 per car (i.e. $P = 5$). Find the equilibrium under free trade and graph it for the U.S. and World markets. How much does the U.S. import under free trade? What is the supply of U.S. producers under free trade? What is the demand of U.S. consumers under free trade?

   (c) Now suppose that the U.S. introduces an import quota that limits the imports to 30 million cars (i.e. $M = 30$). Calculate the new equilibrium and graph it for the U.S. and World markets. What is the new price in the U.S. market? What is the supply of U.S. producers?

   (d) Calculate the quota rents, the deadweight loss and the total effect on U.S. welfare of the quota. Assume that there is rent seeking so that quota rents are wasted. What would be your advice to President Trump?

   (e) Without explicitly re-calculating the effect, discuss if and how your advice in item (iv) would be different if, instead of the quota, the U.S. introduces an equivalent import tariff on car imports.

2. After a thorough economic analysis of the U.S. car market, you realise that this market is not perfectly competitive. Rather, it is dominated by one domestic monopolist, the General Motors. The monopolist faces the same demand function as before (given by equation (1)) and his marginal cost function is

$$MC(Q) = \frac{Q}{5} - 10 \tag{3}$$

   (a) Show that in the presence of the same import quota ($M = 30$), the monopolist produces $Q = 67.5$ million cars and charges a price of $P = 10.25$ thousand USD.

   (b) Graph the monopoly equilibrium with the quota considered above for the U.S. market.

   (c) Recall that under free-trade, the U.S. monopolist produces the same quantity and charges the same price as a perfectly competitive industry. Thus, under free trade, the production level of the U.S. monopolist is the same as that obtained in item (a)(ii)).[1] Why is the U.S. production lower under the quota than under free trade? What can this tell us about the effect of the quota on U.S. employment?

   (d) Without explicitly calculating, discuss which policy would be preferable for U.S. welfare in the presence of a U.S. monopolist: an import quota or an equivalent import tariff?

2. Subsidies

Switzerland is a small country and its economy has been hit hard by the Covid-19 pandemic. You are a trade-policy expert advising the Swiss government on various policy alternatives for the Swiss widget industry.

The Swiss supply of widgets can be characterized by the following equation

$$S(P) = 100 + 10P \quad \text{for} \quad P \geq 0 \tag{4}$$

The consumer demand for widgets in Switzerland can be characterized by the following equation

$$D(P) = 600 - 10P \tag{5}$$

The Swiss government is *a priori* a social welfare maximiser, i.e. it maximises the following objective function

$$W = CS + PS + R \tag{6}$$

where CS stands for consumer surplus, PS stands for producer surplus and R for government's revenue (which may be positive or negative).

That said, the widget industry has a very powerful lobby which may induce the government to put a higher weight on producer surplus in which case the objective function of the government becomes

$$V = W + 0.2PS = CS + 1.2PS + R \tag{7}$$

1. **Autarky**: Compute the autarky price of widgets in Switzerland. Graph the autarky equilibrium.

[1] Notice that the monopolist's marginal cost function coincides with the supply function given by equation (2) in item (a).

2. **Free trade**:

   (a) Let the world price of widgets be $P_w = 10$. Calculate the domestic demand and supply under free trade. Is Switzerland an importer or exporter of widgets at the given world price? What is the volume of trade (imports or exports)? Graph the free trade equilibrium.

   (b) Calculate the consumer surplus (CS), producer surplus (PS), total social welfare (W) and government's surplus (V) under free trade.

3. **Import tariff analysis**: Consider a specific import tariff $t = 5$.

   (a) Graph the equilibrium with the tariff. What is the level of demand, supply and the volume of trade under such a tariff?

   (b) Calculate the consumer surplus (CS), producer surplus (PS), tariff revenue (R), total social welfare (W) and the government's surplus (V) under such a tariff.

   (c) Compare the outcomes to the free trade scenario calculated above: If the government maximizes W, is the tariff a good idea? If the government maximizes V, is the tariff a good idea? What is the intuition for this result?

4. **Production subsidy analysis**: Consider a production subsidy $s = 5$.

   (a) Graph the equilibrium with the production subsidy. What is the level of demand, supply and the volume of trade with the production subsidy in place?

   (b) Calculate the consumer surplus (CS), producer surplus (PS), revenue (R), total social welfare (W) and the government's surplus (V) with the production subsidy in place.
   Hint: the government's revenue corresponds to the subsidy expenditure and so is negative in this case.

   (c) Compare the outcomes to the free trade scenario calculated above: If the government maximizes W, is the production subsidy a good idea? If the government maximizes V, is the production subsidy a good idea? What is the intuition for this result?

   (d) How do the effects of the production subsidy compare to the import tariff considered above (compare effects on CS, PS, W and V)? Which principle does this illustrate?

5. **Optimal production subsidy**:

   (a) Write down expressions for consumer surplus, producer surplus and revenue as functions of a subsidy s.

   (b) Show that the government's surplus V can be written as

$$V = 14900 - 4s(s - 10) \tag{8}$$

   (c) Solve for the optimal production subsidy which maximizes V.

   (d) Given the above analysis, what is your policy recommendation to the Swiss government who maximizes V?