

Large country tariff optimization

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Report on tariff optimization homework for Quantitative Agriculture Police Analyze

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Demand and Supply functions Country A:

$$Q_s^a = \alpha_0^a (p^a)^{\alpha_1^a} (w^a)^{\alpha_2^a}$$

$$Q_d^a = \beta_0^a (p^a)^{\beta_1^a} (I^a)^{\beta_2^a}$$

Demand and Supply functions Country B:

$$Q_s^b = \alpha_0^b (p^b)^{\alpha_1^b} (w^b)^{\alpha_2^b}$$

$$Q_d^b = \beta_0^b (p^b)^{\beta_1^b} (I^b)^{\beta_2^b}$$

Consider:

- Country A

- $\alpha_0^a = 1$; $\alpha_1^a = 3$; $\alpha_2^a = -0.9$;
- $\beta_0^a = 5$; $\beta_1^a = -0.5$; $\beta_2^a = 1.2$;
- $w^a = 2$; $I^a = 10$;

- Country B

- $\alpha_0^b = 11$; $\alpha_1^b = 1.2$; $\alpha_2^b = -0.8$;
- $\beta_0^b = 40$; $\beta_1^b = -0.5$; $\beta_2^b = 0.9$;
- $w^b = 2$; $I^b = 10$;

1. (a) Based on the free trade equilibrium price and quantity traded, what are the elasticities of excess supply and demand? Interpret these two elasticities.

The price and quantity traded in the free trade equilibrium are:

$$pw = 5.902626$$

$$qw = 77.58966$$

To get the elasticities I used the following equations:

$$\varepsilon_{ES} = \frac{\partial ES(Pw)}{\partial Pw} \frac{Pw}{Qw} \quad \text{and} \quad \varepsilon_{ED} = \frac{\partial ED(P)}{\partial P} \frac{Pw}{Qw}$$

$$\varepsilon_{ES} = (\alpha_1^a \cdot \alpha_0^a (pw)^{(\alpha_1^a-1)} (w^a)^{\alpha_2^a} - \beta_1^a \cdot \beta_0^a (pw)^{(\beta_1^a-1)} (I^a)^{\beta_2^a}) \times \frac{pw}{qw}$$

$$\varepsilon_{ED} = (\beta_1^b \cdot \beta_0^b (pw)^{(\beta_1^b-1)} (I^b)^{\beta_2^b} - \alpha_1^b \cdot \alpha_0^b (pw)^{(\alpha_1^b-1)} (w^b)^{\alpha_2^b}) \times \frac{pw}{qw}$$

Using the world price and quantity as parameters in the elasticities functions we find the following results:

$$\text{Elasticity excess supply (country A)} = 4.471335$$

$$\text{Elasticity excess demand (country B)} = -1.665381$$

The above elasticities represent the percentage change in supply and demand following a 1 percent change in price. Therefore, for each 1 percent increase in price, the supply will increase by 4.48% and the demand will decrease by 1.67% and vice-versa.

(b) Based on the comparison of elasticities, the implementation of taxes will have a bigger impact in the prices of Country B due to a relatively less elastic demand curve compared with the more elastic supply curve of Country A.

2. Does the specific tariff of homework 4.1 maximize revenue?

No, in order to maximize government revenues, the tariff should be 2.8, producing government revenues of 103.94. This value is bigger than the 95.88 produced by a tariff of 2.

3. Does the specific tariff of homework 4.1 maximizes welfare?

No, the optimal specific tariff of 1.13 produces a bigger net welfare (11.59) for Country B than the tariff of 2 specified in Homework 4.1 (5.31).

4. Compare the optimal tariffs and tariff revenues from questions 2. and 3. and provide an economic interpretation

Optimal tariffs and revenues:

| | Tariff | Revenue |
|-------------------------------|--------|---------|
| Tariff revenue max welfare | 1.131 | 68.233 |
| Tariff revenue max revenue | 2.806 | 103.942 |

The intuition tells us that a higher Tariff (T) will increase the Tariff revenue (TR) once $TR = T \times \text{Quantity traded}$. However, a too high Tariff would decrease the Quantity traded and therefore influence negatively the TR . In the present situation the value that produces the maximum revenue is $T = 2.8$. For Tariffs different than that, the TR will be smaller than 103.942.

On the other hand, the Tariff that maximizes welfare (1.13), is a function of the efficiency losses of producers and consumers and it aims to produce the maximum net welfare for the importing country. In that way, the optimum tariff that minimizes the producers and consumers efficiency losses is smaller than the optimum tariff that maximizes tariff revenue.