

## Problem Set 03

**Instructions:** Answers must be submitted online through the designated Canvas assignment. This Problem Set is due on **January 29 at 01:59pm**. Please write as legible and clearly as possible. You will not be given full credit if your answers cannot be easily understood.

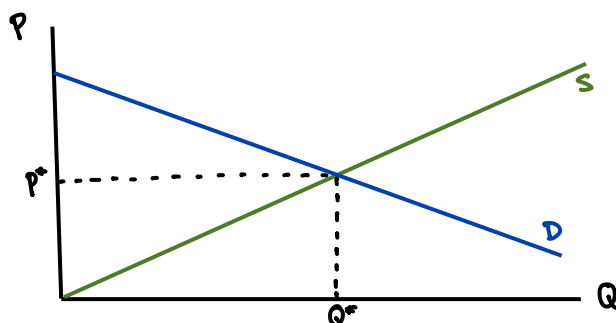
### Questions

1. Suppose we are considering the market for an imported good at Home. Use the following demand and supply functions for solving the various equilibrium scenarios:

$$\text{Demand: } P = 120 - \frac{4}{7}Q_d \quad ; \quad \text{Supply: } P = \frac{1}{4}Q_s$$

Consider the **Autarky Scenario** first

- (a) [4 points] Sketch the supply and demand curves, with the appropriate labeling for the equilibrium point and surplus regions. *There are no values yet, keep it as variables.*



- (b) [5 points] Report the coordinates of the equilibrium point, which represent the **price** and **quantity** the market operates at.

Set Supply = Demand  $\rightarrow$

$$120 - \frac{4}{7}Q = \frac{1}{4}Q$$

$$120 = \left(\frac{1}{4} + \frac{4}{7}\right)Q$$

$$120 = \frac{23}{28}Q$$

$$Q^* = \frac{120 \cdot 28}{23} = 146.09$$

Plug  $Q^*$  into either supply or demand

$$P = \frac{1}{4}(146.09)$$

$$P^* = 36.52$$

- (c) [3 points] Calculate the consumer and producer surplus values under autarky. What is the total welfare for the economy?

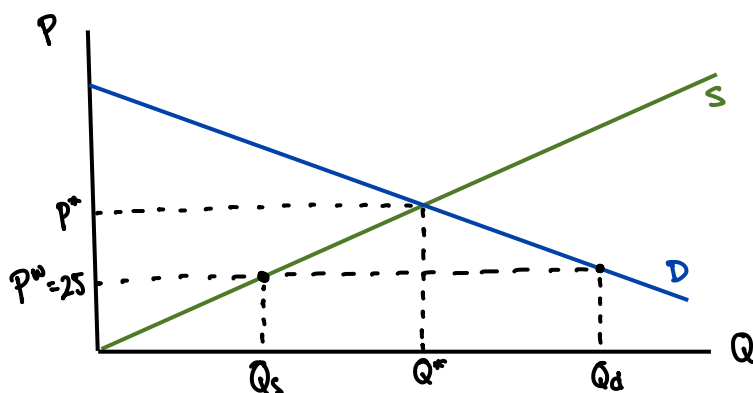
$CS = \frac{1}{2}(120 - 36.52) \cdot 146.09$	$PS = \frac{1}{2}(36.52 - 0) \cdot 146.09$	Welfare = CS + PS
$CS = \frac{1}{2}(83.48) \cdot 146.09$	$PS = \frac{1}{2}(36.52) \cdot 146.09$	Welfare = 6097.797 + 2667.60
$CS = 6097.797$	$PS = 2667.60$	Welfare = 8765.397

2. Using the same demand and supply functions as before, answer the following:

**Demand:**  $P = 120 - \frac{4}{7}Q_d$  ; **Supply:**  $P = \frac{1}{4}Q_s$

Suppose Home opens up to **free-trade** and becomes exposed to a world price,  $P_w = 25$ . Be sure to complete every part.

- (a) [4 points] Sketch the market with the **new price line** and corresponding equilibria points for **quantity demanded and supplied**.



- (b) [6 points] Calculate the equilibrium values for quantities, imports, and surplus values.

Need to find  $Q_d, Q_s$  at  $P_w = 25$

<p><u>Demand</u></p> $25 = 120 - \frac{4}{7}Q_d$ $\frac{4}{7}Q_d = 120 - 25$ $Q_d = \frac{95 \cdot 7}{4} = 166.25$	<p><u>Supply</u></p> $25 = \frac{1}{4}Q_s$ $Q_s = 100$	$CS = \frac{1}{2}(120 - 25) \cdot 166.25$ $CS = \frac{1}{2}(95) \cdot 166.25 = 7896.88$ $PS = \frac{1}{2}(25) \cdot 100$ $PS = 1250$
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- (c) [4 points] What is the change in welfare, relative to **autarky**

Free-trade Welfare =  $CS + PS = 7896.88 + 1250 = 9146.88$

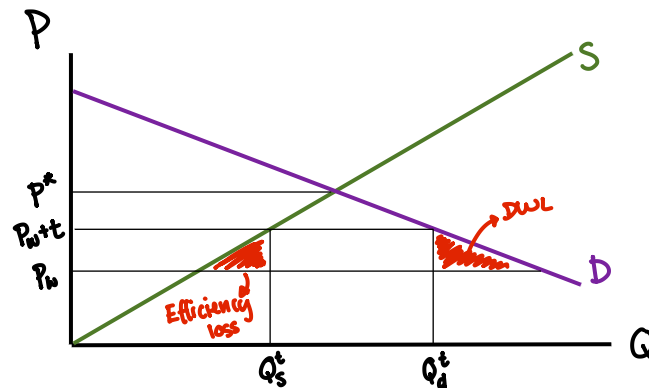
Change is  $9146.88 - 8765.40 = 381.48$

3. Using the same demand and supply functions as before, answer the following:

$$\text{Demand: } P = 120 - \frac{4}{7}Q_d \quad ; \quad \text{Supply: } P = \frac{1}{4}Q_s$$

Consider the case in which **the government intervenes, setting a tariff rate of  $t = 4$** . Be sure to complete every part.

- (a) [4 points] Sketch the updated demand & supply curves. Label it properly and highlight which regions are the efficiency and dead-weight loss areas



- (b) [6 points] Calculate the equilibria for **quantity supplied, quantity demanded, imports, and surpluses (consumer, producer, government)**.

Supply

$$P^t = \frac{1}{4}Q_s$$

$$29 + 4 = \frac{1}{4}Q_s$$

$$116 = Q_s$$

Demand

$$29 = 120 - \frac{4}{7}Q_d$$

$$\frac{4}{7}Q_d = 120 - 29$$

$$\frac{4}{7}Q_d = 91$$

$$Q_d = \frac{91 \cdot 7}{4} = 159.25$$

Imports

$$Q_d - Q_s$$

$$= 159.25 - 116$$

$$= 43.25$$

$$CS = \frac{1}{2} [120 - 29] \cdot 159.25 = 7245.88$$

$$PS = \frac{1}{2} [29] \cdot 116 = 1682$$

$$\text{Govt Rev} = t \cdot \text{imports} = 4 \cdot 43.25 = 173$$

- (c) [4 points] What is the **change in welfare**, relative to free-trade?

Welfare w/ Tariff:  $CS + PS + \text{Govt Rev.}$

$$7245.88 + 1682 + 173 = 10955.8$$

$$\text{Change in Welfare: } 10955 - 9146.88 = 1808.12$$

Variable	No Tariff	+ Tariff on Final Good	+ Tariff on Input Good
Price of Domestic Final Good	2220	2775	2775
Value of Imported Inputs	670	670	750
Domestic Value-Added	1550	2105	2025
Effective Rate of Protection, %	0	35.8	30.65

4. [10 points] Complete the table above and express the effective rate of protection in **each case**. **Tariffs on the final good are 25% and tariffs on the input good are 12%.** Show your work in the space provided below

### Final Good Tariff

$$\text{Price of Final Good} \rightarrow 2200 \cdot 1.25 = 2775$$

Value of Imported Good does not change

$$\text{Effective RP} \rightarrow \frac{2105 - 1550}{1550} = 35.8$$

### Input Good Tariff

Price of Final Good does not change

$$\text{Value of Imported Good} \rightarrow 670 \cdot 1.12 = 750$$

$$\text{Effective RP} \rightarrow \frac{2025 - 1550}{1550} = 30.65$$