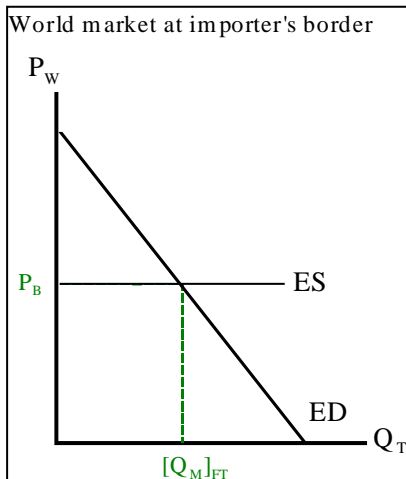


ECN330: TIPS FOR EXERCISE 1

TARIFF-QUOTA NON-EQUIVALENCE: CASE OF NON-HOMOGENEOUS GOODS

1. Volume quota

Step 1 is to graph the world markets (at the importer's border) for hard cheese (HC) and soft cheese (SC). The country is a small, so the world price implies that the ES curve for both cheeses is horizontal at the indicated price. The total import of cheese is $[Q_M]_{HC} + [Q_M]_{SC}$, or $[Q_M]_{Total}$. The graphs of the market for each cheese (at the importer's border) will look similar to that in the figure below.



Step 2 is to solve for the effect of the quota. The quota is on the total units of cheese imported, $[Q_M]_q$, and is clearly a binding constraint, i.e., less than $[Q_M]_{Total}$. Imports under the quota will be: $200 = [Q_M]_{HC}^1 + [Q_M]_{SC}^1$. The decision rule on importing hard cheese or soft cheese will depend on the potential rent to be earned on each unit of cheese. The quota rent on hard cheese is equal to $[P_D - P_B]_{HC}$, and the quota rent on soft cheese is equal to $[P_D - P_B]_{SC}$. Thus, the decision rule is to import whichever cheese provides the most rent until: $[P_D - P_B]_{HC} = [P_D - P_B]_{SC}$.

To solve for the equilibrium under the quota, use the quota import constraint and the decision rule:

- (1) $200 = [Q_M]_{HC}^1 + [Q_M]_{SC}^1$
- (2) $[P_D - P_B]_{HC} = [P_D - P_B]_{SC}$.

Then substitute in the world price of each good, which is a constant, in for $[P_B]_{HC}$ and $[P_B]_{SC}$, respectively.

$[ED]_{HC}$ is the quantity of hard cheese imported, so substitute in the right-hand side of the ED_{HC} into $[Q_M]_{HC}^1$ in equation (1). $[ED]_{SC}$ is the quantity of soft cheese imported, so substitute in the right-hand side of the ED_{SC} into $[Q_M]_{SC}^1$ in equation (1). This now leaves one with two equations with two unknowns, $[P_D]_{HC}$ and $[P_D]_{SC}$. That is, it is now possible to determine $[P_D]_{HC}$ and $[P_D]_{SC}$, and the respective import volumes of the two cheeses can be determined, $[Q_M]_{HC}^1$ and $[Q_M]_{SC}^1$.

Once the respective domestic prices are solved, it is possible to know the difference between the domestic price and the border price in each market, e.g., $[P_D - P_B]_{HC}$ and $[P_D - P_B]_{SC}$. The tariff equivalent of the quota for each market is also the difference between $[P_D - P_B]$ which equals τ_0 if the tariff is specific or $\{[P_D - P_B]/P_B\}$ which equals $\tau\%$ if the tariff is *ad valorem*.

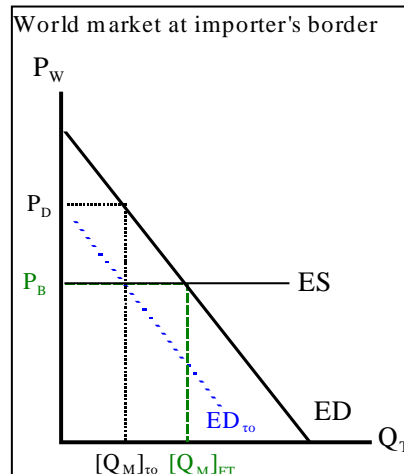
To solve for ED for the specific tariff equivalent, use the following method. The initial ED is of the following form:

$$(3) \quad ED = a - bP.$$

If the specific tariff is τ_0 , then use that to shock the ED equation as follows:

$$\begin{aligned} (4) \quad ED_{\tau_0} &= a - b \cdot (P + \tau_0) \\ &= a - bP - b\tau_0 \\ &= a' - bP \end{aligned}$$

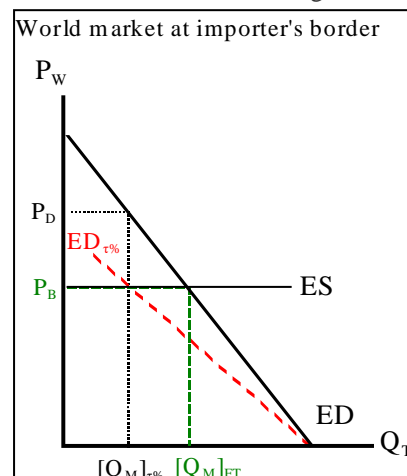
where $a' = a - b\tau_0$ and ED_{τ_0} is a parallel shift to the left of ED as shown in the figure below.



If the *ad valorem* tariff rate is $\tau\%$, then use that to shock the ED equation as follows:

$$\begin{aligned} (5) \quad ED_{\tau\%} &= a - bP \cdot (1 + \tau\%) \\ &= a - bP - b\tau\%P \\ &= a - b'P \end{aligned}$$

where $b' = b \cdot (1 + \tau\%)$ and $ED_{\tau\%}$ is a rotation of the curve left of ED as shown in the figure below.

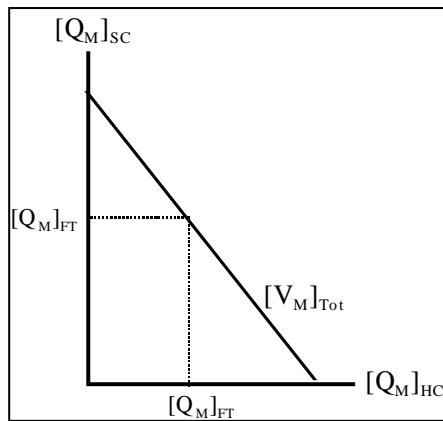


2. Value quota

A quota can also be applied as a restriction on the total value spent on imports, $[V_M]$. Step 1 is to determine the total amount that was spent on imported cheese under free trade, or

$$(6) [V_M]_{Total} = [P_B \cdot Q_M]_{HC} + [P_B \cdot Q_M]_{SC}.$$

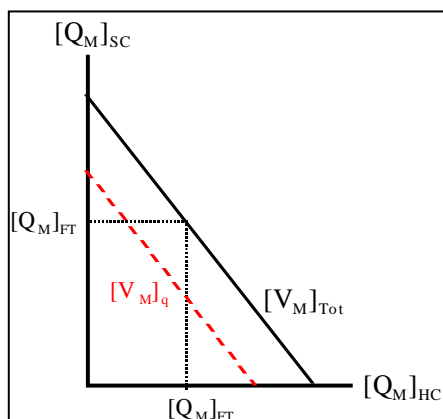
A graph of the total expenditure on imported cheese is presented in the graph below. The quantities imported will correspond with the quantities imported prior to the import restriction, $[Q_M]_{FT}$ for both hard and soft cheese. The slope of the expenditure line, $[V_M]_{Tot}$, is the ratio of the world prices of the two cheeses, $[P_B]_{HC}/[P_B]_{SC}$, which is equal to $[Q_M]_{SC}/[Q_M]_{HC}$.



Step 2 is to solve for the effect of the value quota. Policymakers must specify the ceiling on the value of expenditures on imported cheese. The value quota is on the total expenditure on imported cheese, $[V_M]_q$, and is clearly a binding constraint, i.e., less than $[V_M]_{Total}$. Expenditure on imports under the value quota will be:

$$(7) 6000 = [P_B \cdot Q_M]_{HC}^1 + [P_B \cdot Q_M]_{SC}^1.$$

The constraint on expenditures is shown in the figure below. The new combination of expenditures on hard and soft cheese will be along $[V_M]_q$. Since the country is small, $[P_B]_{HC}$ and $[P_B]_{SC}$ are given and are unaffected by the policy. Thus, the slope of $[V_M]$ line is unaffected but the reduction in expenditures implies a parallel shift to the left.



The values $[P_B]_{HC}$ and $[P_B]_{SC}$ can be substituted into equation (7) because they are constants. $[ED]_{HC}$ is the quantity of hard cheese imported, so substitute in the right-hand side of the ED_{HC} into $[Q_M]_{HC}^1$ in equation (7). $[ED]_{SC}$ is the quantity of soft cheese imported, so substitute in the right-hand side of the ED_{SC} into $[Q_M]_{SC}^1$ in equation (7). This now leaves equation (7) with an equality between $[P_D]_{HC}$ and $[P_D]_{SC}$. Using equation (7) with the quota constraint, equation (8):

$$(8) [Q_M]_{SC}/[Q_M]_{HC} = [P_B]_{HC}/[P_B]_{SC}$$

makes it possible to determine $[P_D]_{HC}$ and $[P_D]_{SC}$, and the respective import volumes of the two cheeses, $[Q_M]_{HC}^1$ and $[Q_M]_{SC}^1$. That is two equations with two unknowns.

Once the respective domestic prices are solved, it is possible to know the difference between the domestic price and the border price in each market, e.g., $[P_D - P_B]_{HC}$ and $[P_D - P_B]_{SC}$. The tariff equivalent of the value quota for each market is also the difference between $[P_D - P_B]$ which equals τ_0 if the tariff is specific or $\{[P_D - P_B]/P_B\}$ which equals $\tau\%$ if the tariff is *ad valorem*.

Repeat the process in part 1 to solve for the new ED curves to see what the implications of the value quota are in terms of tariff equivalence.