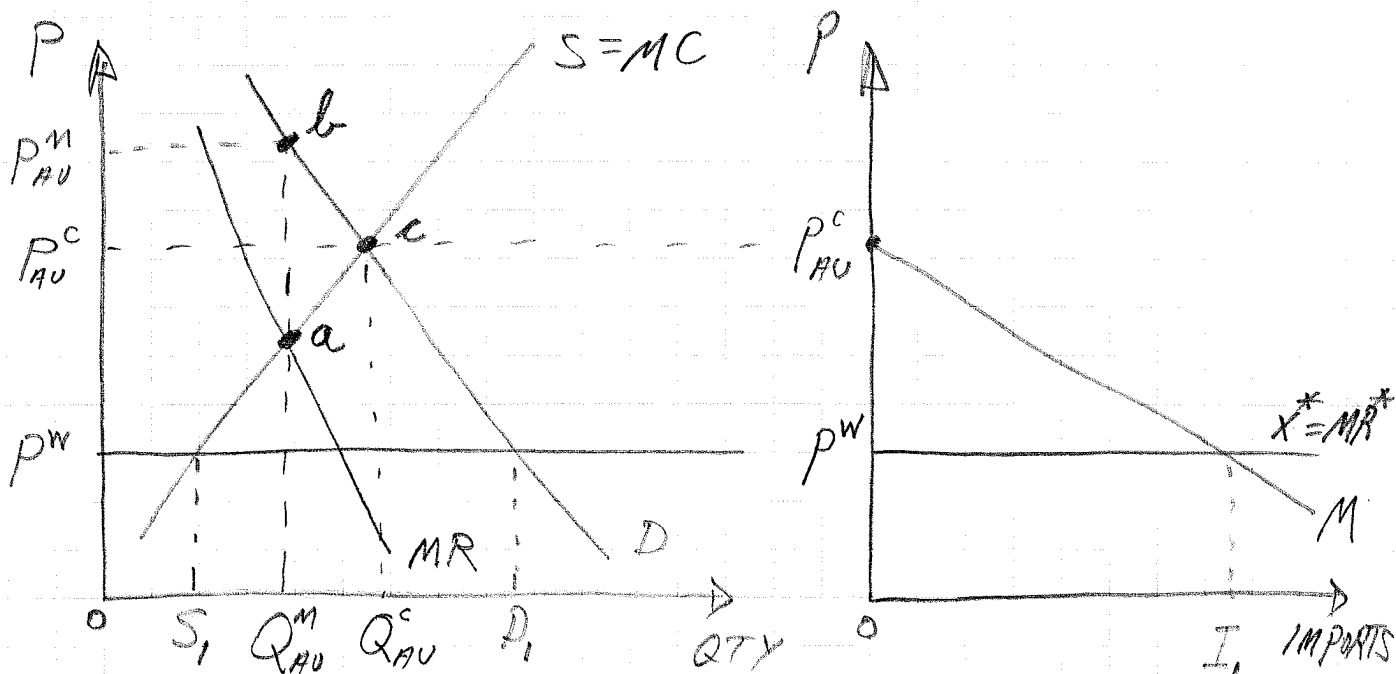


1) We consider the case of one industry with supply  $S$  and demand  $D$ .

a)



$MR \equiv$  marginal revenue curve corresponding to demand  $D$ .

$P^W \equiv$  world price of the good assumed fixed (small country assumption).

$(P_{AU}^C, Q_{AU}^C) \equiv$  autarky price and qty under perfect competition.

We assume that the  $MC$  curve is the same whether we have a monopoly or perfect comp. Thus  $S=MC$ .

$(P_{AU}^M, Q_{AU}^M) \equiv$  autarky price and qty with a monopoly.

We therefore note that the Home monopoly in autarky causes a deadweight loss given by triangle  $abc$ .

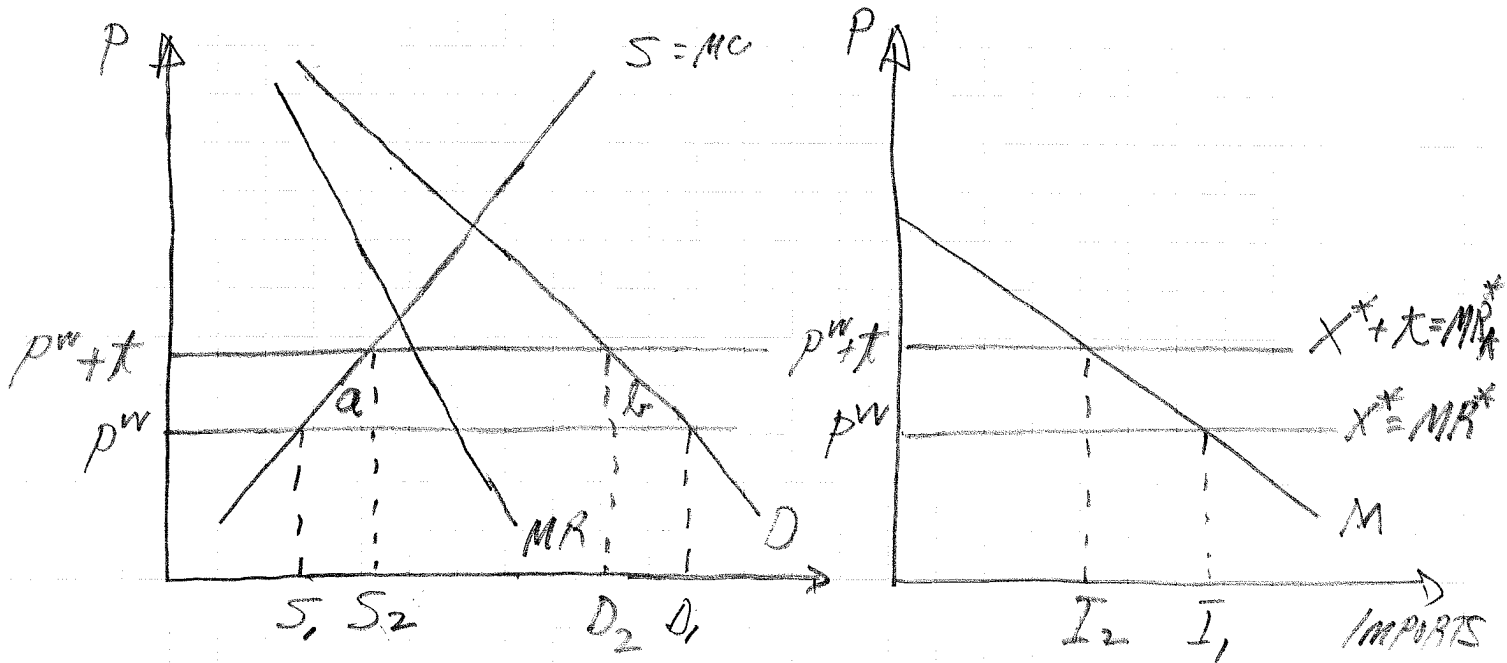
$X^*$  and  $M$  are export supply and import demand curves.

Under trade, the price drops to  $P^w$  whether we have a monopoly or perfect comp. at Home. Home supply is  $S_1$  and consumer demand is  $D_1$ , the difference being imported  $I_1$ .

Note that with constant price  $P^w$ ,  $MR^* = P^w$ , i.e. the marginal revenue curve for the monopoly becomes equal to  $P^w$ .

The trade equilibrium is therefore the same whether we have a Home monopoly or perfect comp. Hence, trade welfare levels are the same for both. The gain from trade is consequently higher when there is a Home monopoly since we started out with a deadweight loss under autarky compared to perfect comp.

b) Tariff with Home monopoly:



As noted in part a), the free-trade equilibrium is the same whether we have a Home monopoly or perfect comp.

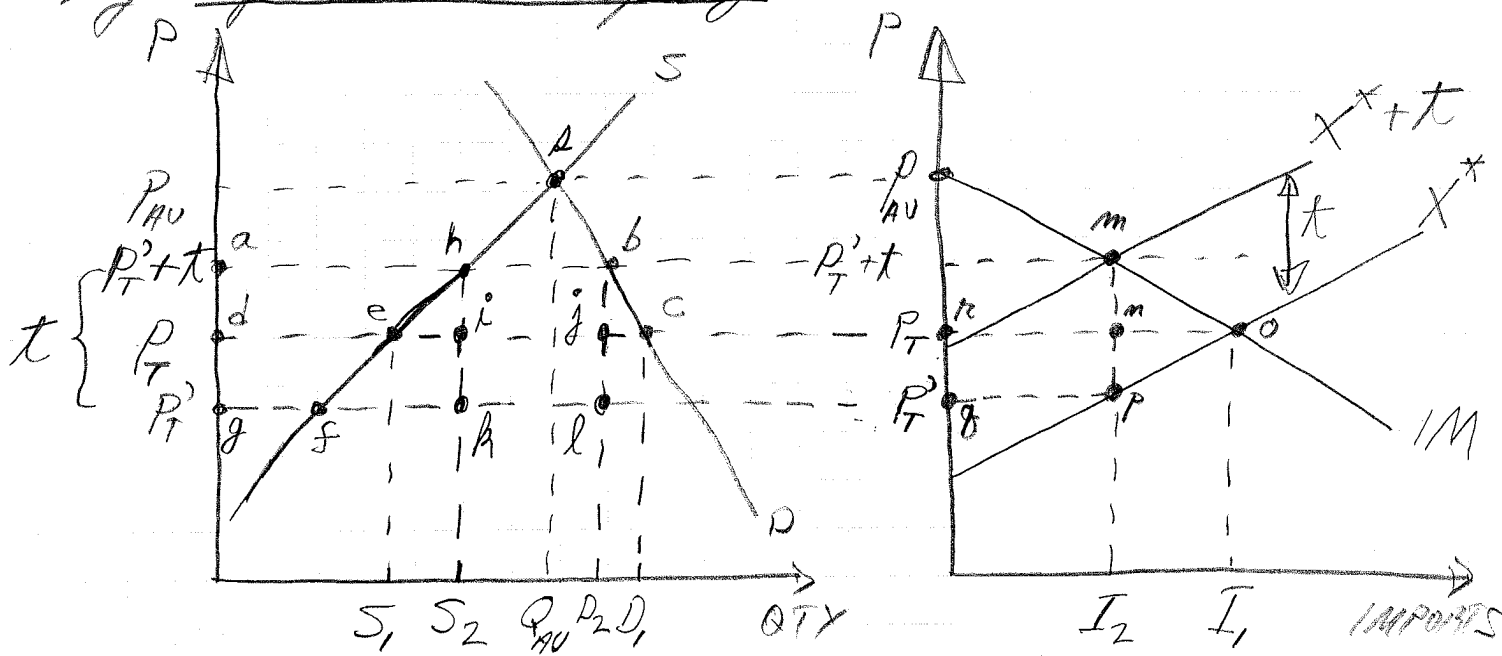
Imposing a tariff raises the price to  $P^w+t$  but it remains constant and equal to  $MR^*$ . Hence, there is still no difference between the monopoly and the perfect comp. cases. In both cases, the equilibrium supply, demand and imports are equal to  $S_2$ ,  $D_2$  and  $I_2$ , which leads to a deadweight loss of areas  $a+b$  in both cases, where

$a \equiv$  loss due to higher production with

$b \equiv$  loss due to higher consumer prices.

2) Import tariff: The large country case.

a) The large country case implies that the supply of Foreign exports increases with the Home price, as represented by upward sloping curve  $X^*$ .



S and D are Home supply and demand for a given industry.

We assume perfect comp. at Home.

$P_T$ , S, and D, are the free trade price, Home supply and Home demand. This leads to an imported quantity  $I_1$ .

The imposition of an import tax  $t$  shifts the Foreign export supply curve to the left at  $X^*+t$  on the right-hand side graph. This causes imports to decrease to  $I_2$ , the Home price to increase to  $P_T+t$  and the world price of the good to decrease to  $P_T$ .

With a higher domestic price  $P_T + t$ ,  
 Home supply increases to  $S_2$  and  
 Home demand drops to  $D_2$ , with  
 $D_2 - S_2 = I_2$ .

The welfare effects of the tariff are  
 given by the following surfaces:

- ①  $ehi$  = lower production efficiency
- ②  $jbc$  = lower consumer surplus
- ③  $kijl$  = gain from higher government tax income.

Other relevant comments:

i) The above welfare effects are net  
 effects. The full welfare changes  
 are as follows:

$$\Delta CS = -abcd$$

$$\Delta PS = +ahed$$

$$\Delta R_G = +khbl = t \cdot (D_2 - S_2)$$

This leads to the net effects in  
 ①, ② and ③.

ii) Using the right-hand side graph, the  
 net welfare effect is given by

$$kmpq - mm'o.$$

b) The analysis in part a) suggests that the net welfare effects of a tariff would be positive if

$$k_{ij}l > e_{hi} + j_{bc} \quad [*]$$

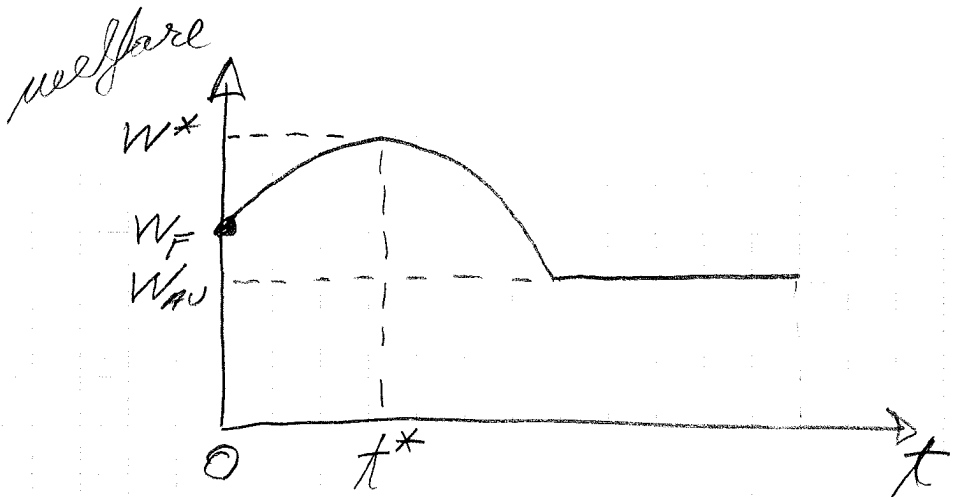
Now one notes that area  $k_{ij}l$  is larger than zero only when the world price decreases with the tariff, i.e. only when the Foreign export supply curve is upward sloping.

In the small-country case, the world price is insensitive to the Home demand (the Foreign export supply curve is flat). Hence, area  $k_{ij}l = 0$ .

Since the production and consumption losses given by areas  $e_{hi}$  and  $j_{bc}$  are always non-zero, a welfare-increasing tariff can only exist in the large country case.

REMARKS: Additional relevant comments:

- ① One may also add that from a mathematical point of view, it can be shown that in the large country case, one can always find a low enough tariff such that inequality  $[*]$  is respected.
- ② In the large country case, the welfare effects of a tariff can be represented by the following graph:



- $W_F \equiv$  welfare under free trade
- $W_{AU} =$  " " with no trade
- $W^* =$  " " with optimal tariff

③ The above analysis assumes no retaliation from trading partners.

④ The large-country gain from a tariff is due to a terms-of-trade effect, i.e. a drop in world prices.

⑤ The optimal tariff is given by

$$t^* = \frac{1}{\epsilon_E^*}$$

where  $\epsilon_E^*$  is Foreign export supply elasticity. In the small-country case  $\epsilon_E^* = +\infty$  and thus  $t^* = 0$ .

c) When the tariff is high enough, imports will be completely choked off. The equilibrium is thus equivalent to the autarky case, with price and quantity  $P_{AV}$  and  $Q_{AV}$  in the graph of part d). Since free trade increases welfare by triangle area  $e_s k$ , a very high tariff will eventually be worse than free trade.



### 3) Free trade and externalities

The comparative advantage (C.A.) principle says that a country should export a good for which it has a lower opportunity cost of production than the world price. Since the opportunity cost (O.C.) of a good is typically assumed to be reflected by its price, this implies that a country should export goods that have a lower autarky price.

If the production of a good entails negative externalities, it will tend to be underpriced since producers do not fully incur the total social opportunity cost of its production. This will happen, for instance, when a natural resource is exploited under free access, or when there is pollution.

Consequently, a country may export a good for which it appears to have a C.A. because of its lower autarky market price while in reality, the O.C. of its production is higher than the world price.