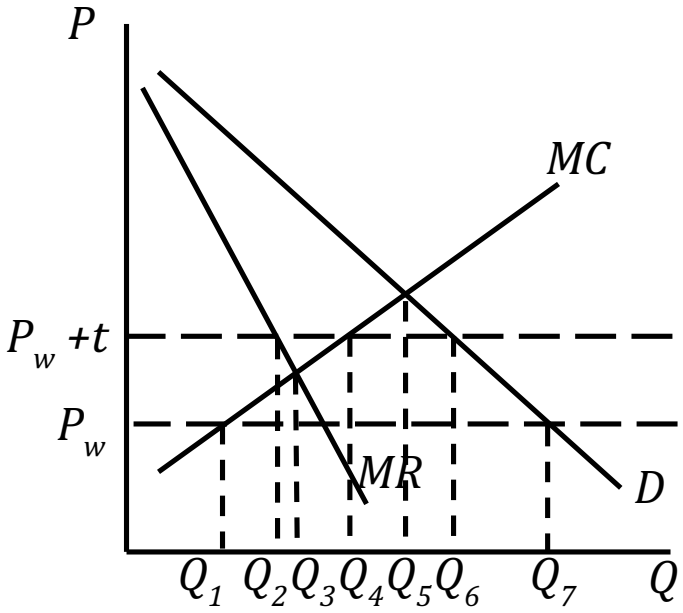
Problem Set #3 - *Answers*
Analysis of Trade Barriers

1. Suppose that a small domestic economy has only a single firm producing a good that can be imported, under free trade, for the fixed price P_w shown. The firm's marginal cost is the upward sloping line shown here. Domestic demand is the downward sloping line, D, the firm could earn the marginal revenue MR shown if there were no trade at all.



   a. Suppose first that there is free trade. What will be the quantities of the good produced by the firm, demanded by the domestic market, and imported?

   With free trade, the firm cannot charge a price higher than P_w, and its marginal revenue, in spite of being the only domestic firm, is therefore also P_w. So it operates as if it were a perfect competitor facing that price, producing where $MC=P_w$, at quantity Q_1. Demanders buy Q_7 at that price, and import $Q_7 - Q_1$.

   b. Now suppose the country levies the tariff, *t*, shown. What now will be the quantities produced, demanded, and imported?

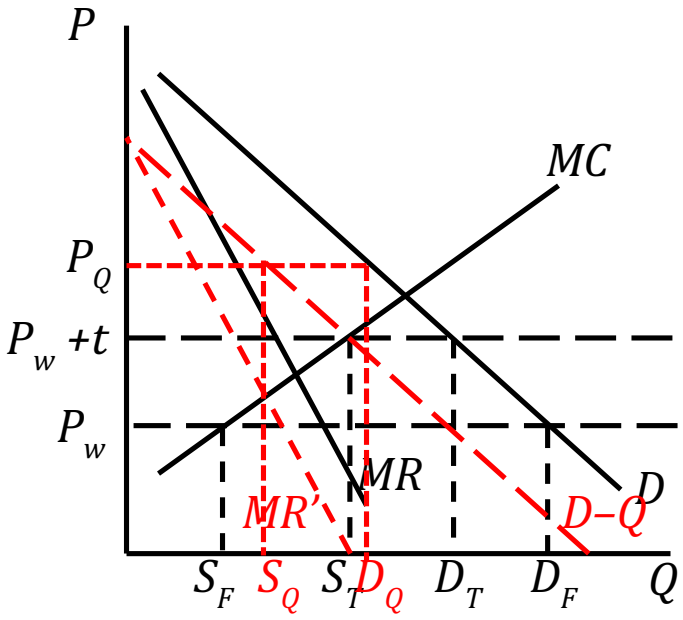
   The firm can now charge up to P_w+t. Since the most it would want to produce at that price (where $MC = P_w+t$) is less that is demanded at that price, that is its output: Q_4. The domestic price is P_w+t, demand is Q_6, and imports are $Q_6 - Q_4$.

   c. Suppose next that the government replaced the tariff with an import quota set equal to the quantity of imports that would have come in under the tariff. What now will be the quantities produced, demanded, and imported, and at what price? (For this part, unlike parts a and b, you will need to add lines and labels to the figure.)

   The domestic firm can now charge a higher price than P_w+t if it wishes, and at such prices, it will sell a quantity given by the demand curve minus the amount of the quota. Thus, for prices above P_w, the demand curve that it faces is a straight

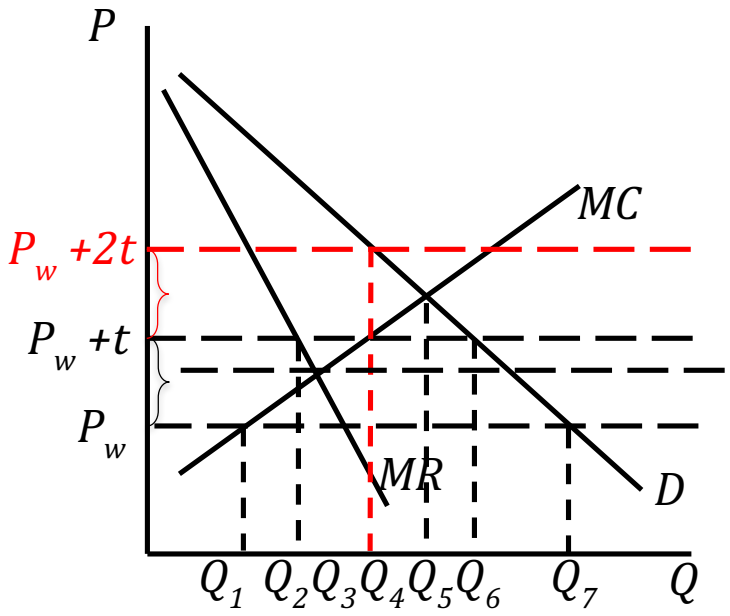
line parallel to D and to its left by the quantity of imports that came in under the tariff: $Q = D_T - S_T$ in the figure below.

To find how much it will produce, we need the corresponding marginal revenue curve, MR', which is a straight line half the distance between the vertical axis and the demand curve D – Q. The firm maximizes profit by producing where MR' = MC, at the quantity S_Q. It then sells this quantity for the price at which it is demanded, P_Q. That also become the domestic price of imports, generating a quota rent for the holds of import licenses equal in value to $(P_Q - P_w)Q$.

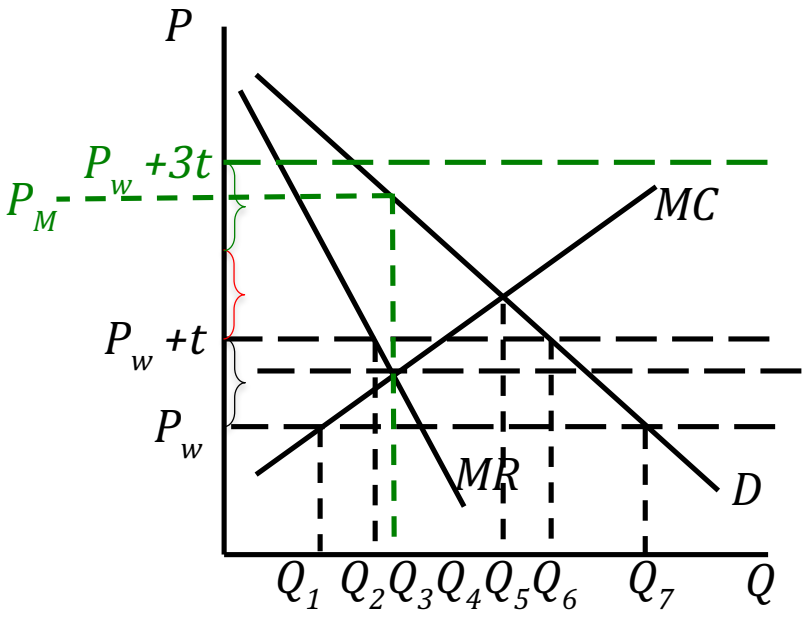


d. Finally, suppose we go back to a tariff, but double its size to 2*t*. What happens then? And what happens if we triple the size of the tariff to 3*t*?

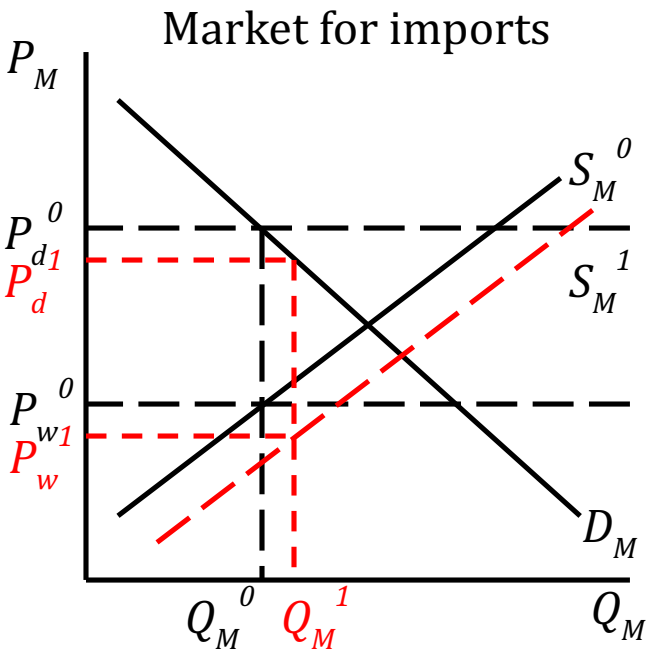
A small increase in the tariff will just cause the firm to move up its MC curve to a higher output. But once the tariff pushes price above the intersection of MC and D, the firm will not be able to sell a large output. Instead, it will be constrained by domestic demand. And as drawn here, doubling the tariff to 2t does have that effect. As shown, the firm charges the price $P_w + 2t$, but produces and sells only the quantity demanded, Q_4. (Coincidentally, this happens to be the same quantity that it sold with the tariff t, but that need not have been the case. Notice that the tariff has cut imports to zero, just as it would have under perfect competition.



Now if the tariff continues to increase, the firm's output will fall, as the rising price reduces demand. This does not go on forever, though, since eventually $P_w + t$ exceeds what the firm would have charges in a closed economy, its monopoly price found by setting output where MC = MR. As it happens, a tariff of 3t in this cases is high enough to do that, so with that tariff, the price is P_M, not $P_w + 3t$. And quantity is Q_3.



2. Suppose that we are a large country importing a good subject to a tariff or NTB, and that foreign producers of imports then become more efficient, so that their costs fall. How will the effects of this change – on the price and quantity of imports – differ depending on whether we are restricting imports with
   a. a tariff,
   b. a quota,
   c. a voluntary export restraint,
   d. a variable levy, or
   e. a government procurement regulation?



The figure shows the market for imports, with downward sloping demand for imports (equals domestic demand for the good minus supply) and upward sloping supply (because we are a large country). In the initial equilibrium we import Q_M^0. The domestic price, P_d^0, is above the world price, P_w^0, due to the a

trade barrier.

Now the foreign suppliers' costs fall, shifting the supply curve down to S_M^1.

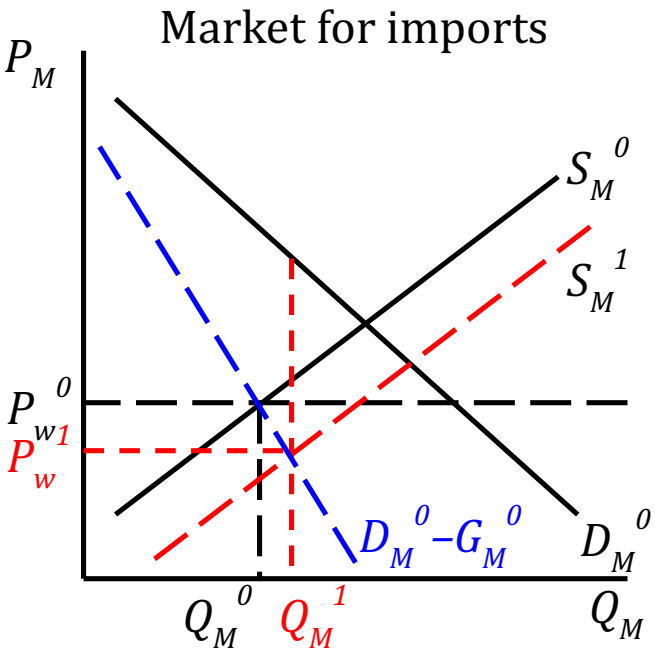
If this were a tariff, both the domestic and the world price would fall, remaining apart by the size of the tariff, and quantity of imports would rise as shown to Q_M^1.

If it were a quota, then imports would be constrained to the level Q_M^0, and domestic price could not change, since otherwise quantity demanded would rise. The world price therefore falls to P_w^2. Quoata rents, incidentally, would increase.

If this were a voluntary export restraint, quantity again could not rise, and the result would be the same as under the quota.

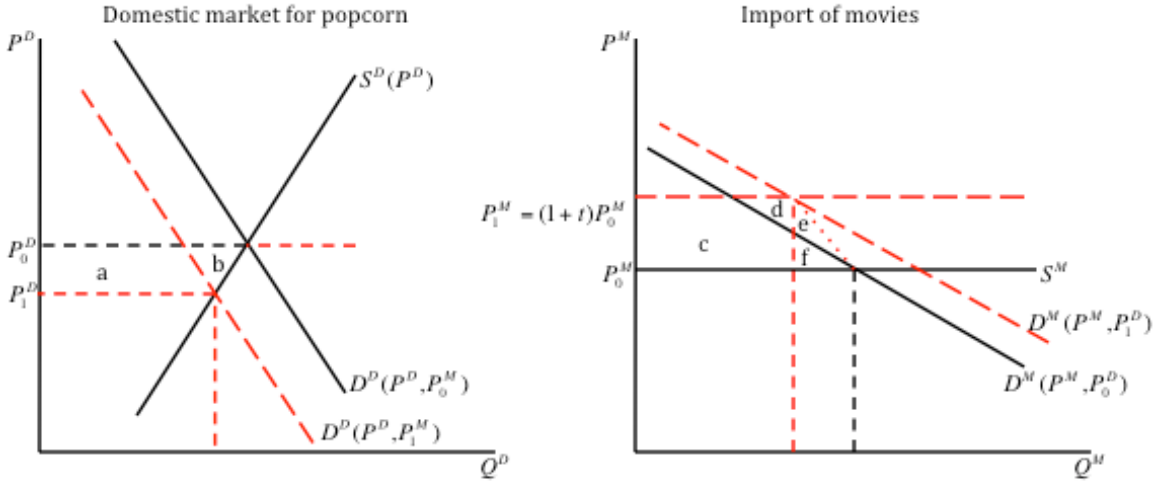
If this were a variable levy, the size of the levy would have to rise in order to keep the domestic price as P_d^0, and this would mean, again, that the quantity of imports would not rise. The picture would be the same as under the quota, but the price difference would be due to the increased levy, yielding higher tariff revenue for the domestic government.

If the NTB were a government procurement regulation, then the picture is different, since our intitial imports of Q_M^0 would be due to a portion of demand (by the government) being reduced. Thus the demand curve for imports has been shifted by the regulation from position D_M^0 to $D_M^0 - G_M^0$. When the cost of imports now falls, demand expands along this demand curve and the world price falls, much as in the case of the tariff.



3. Analyze the effects of a tariff on a good imported into a small country under the assumption that the good is not produced inside the country at all, but that another good for which the import is a complement, is produced inside the country and is not traded. A slightly contrived example might be a tariff on imports of movies into a country that has no movie industry, together with the market for popcorn to be eaten at the movie theater. A rise in the price of movies will reduce the demand for popcorn.

   This is very much like the case of a tariff on a differentiated product that we saw in class and in the paper on multi-market analysis, except that now the domestic good is a complement for the import rather than a substitute. The graphical analysis is as follows:



Welfare Effects of Tariff:	
Dom sup's	−(a+b)
Dom dem's	+a
	& −(c+f)
Dom gov't	+(c+d)
Dom cty	−(b+f−d)

Note that while the effect of price in one market on demand in the other is now negative, rather than positive, and this causes the demand curve for popcorn to shift left instead of right, the induced shift of the movie demand curve is still to the right. This is because two things have reversed: the price change in popcorn and its effect on movie demand.