

Trade Policy with Interacting Markets

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The purpose of this note is to show how to extend the simple, small-country analysis of a trade policy, such as a tariff, involving a single market to various situations in which two markets interact.

To recall, Figure 1 shows that familiar simple case.

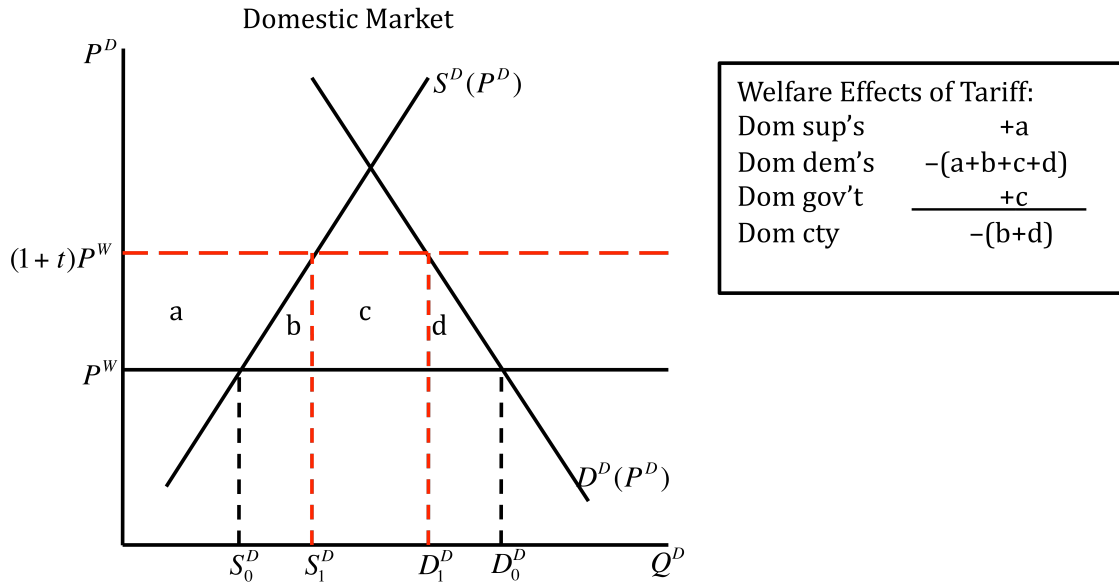


Figure 1
Tariff in a Small Country on a Homogeneous Good

The solution is also simple:

$$\begin{aligned}\% \Delta P^D &= t \\ \% \Delta S^D &= \varepsilon^D t \\ \% \Delta D^D &= \eta^D t\end{aligned}$$

where ε^D, η^D are the elasticities of supply and demand in the domestic market, the latter defined to be negative. $\Delta P^D, \Delta S^D, \Delta D^D$ can be used together with $P_0^D = P^W, S_0^D, D_0^D$ to calculate the effects on welfare of suppliers, demanders, government, and the country as a whole by using the geometry of the areas shown in the box in Figure 1.

Large Country Tariff

The most familiar and important case of interacting markets is the case of a large country, homogeneous good. Here the equilibrium must equate excess demand from the domestic market with excess supply from the foreign (rest-of-world) market. Figure 2 shows these two markets, without and then with a tariff on imports by the home (“domestic”) country.

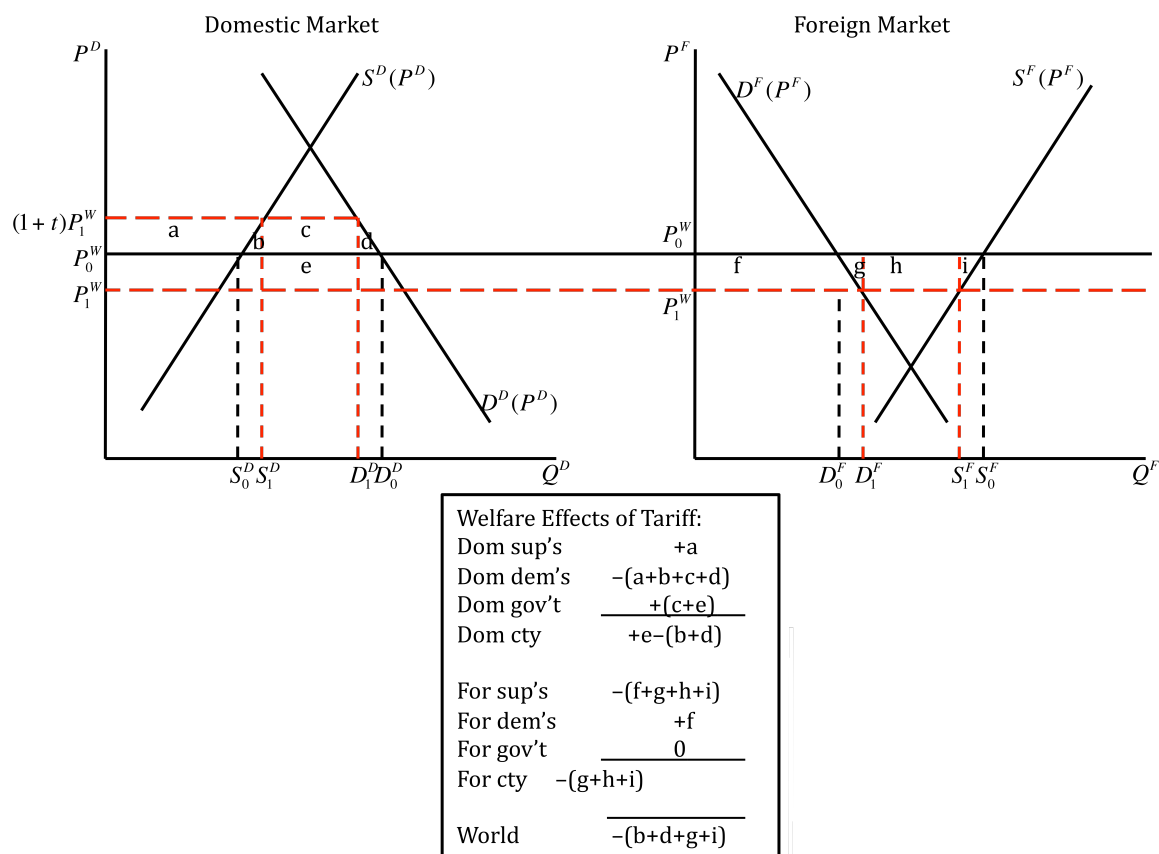


Figure 2
Tariff in a Large Country (“Domestic”) on a
Homogeneous Good

Note that areas c and h are equal, so that they cancel out in the World welfare calculation. Note also that areas with the same label in Figures 1 and 2 are not the same.

A simpler, but less informative, way of handling this situation is in terms of the excess demand and supply curves of the home and foreign countries, respectively. These are the home country’s demand for imports and the foreign country’s (world) supply of the home country’s import, and can be represented as the market for imports. This is shown in Figure 3.

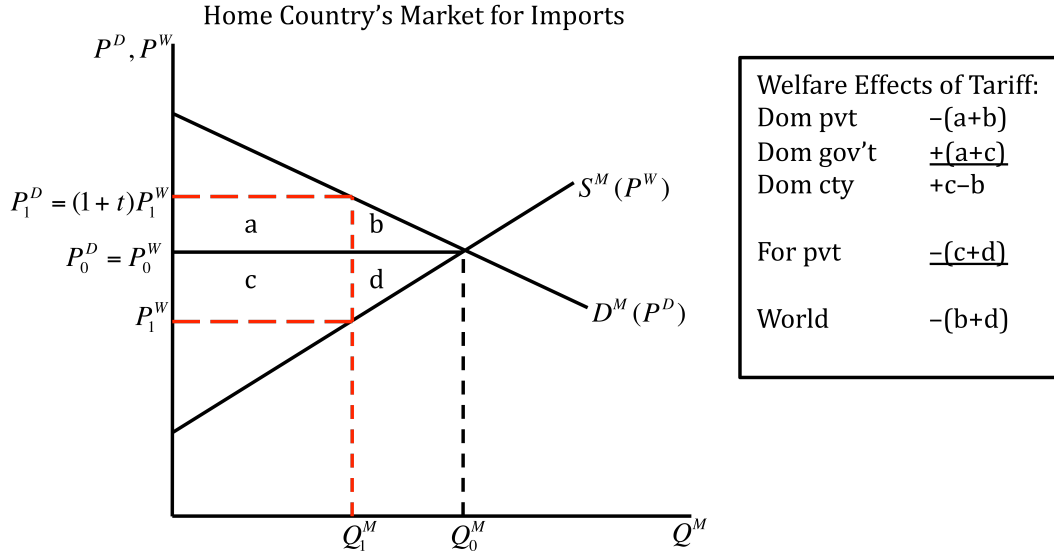


Figure 3
Tariff on Imports by a Large Country

Since supplies and demands in the two countries no longer appear separately, welfare can only be indicated for them in combination, what is listed here as the private sector (pvt).

To solve this model quantitatively, let ε^M, η^M be the (foreign) elasticity of supply of home-country imports and the home-country elasticity of demand for imports respectively. The equilibrium requires that

$$\begin{aligned} \% \Delta P^D - \% \Delta P^W &= t \\ \% \Delta S^M &= \varepsilon^M \% \Delta P^W = \eta^M \% \Delta P^D = \% \Delta D^M \end{aligned}$$

Together these yield

$$\varepsilon^M \% \Delta P^W = \eta^M (\% \Delta P^W + t)$$

and thus, letting $\alpha = -\eta^M / (\varepsilon^M - \eta^M)$ (which is between zero and one, since $\eta^M < 0$),

$$\begin{aligned} \% \Delta P^W &= -\alpha t \\ \% \Delta P^D &= (1 - \alpha)t \\ \% \Delta Q^M &= -\varepsilon^M \alpha t \quad (= \eta^M (1 - \alpha)t) \end{aligned}$$

Again, these expressions can be used together with Q_0^M or Q_1^M to calculate the various welfare changes.

Note that, while Figure 3 can be thought of as showing the excess demand and supply from Figure 2, one can also interpret it as representing the demand for imports of a differentiated good for which no perfect substitute is produced domestically. However, in that case, the use of partial equilibrium is justified only if the tariff on imports does not cause other domestic prices to change. Since tariffs are usually used to protect domestic producers of competing goods, even when those are not perfect substitutes for imports, that is not a very satisfactory assumption. We will therefore look next at a pair of markets for two related differentiated products, one domestic and the other imported.

Differentiated-Product Import, Small Country

The easiest case to examine is that of a small country, so that the world price of the import can be taken as given. This is shown in Figure 4.

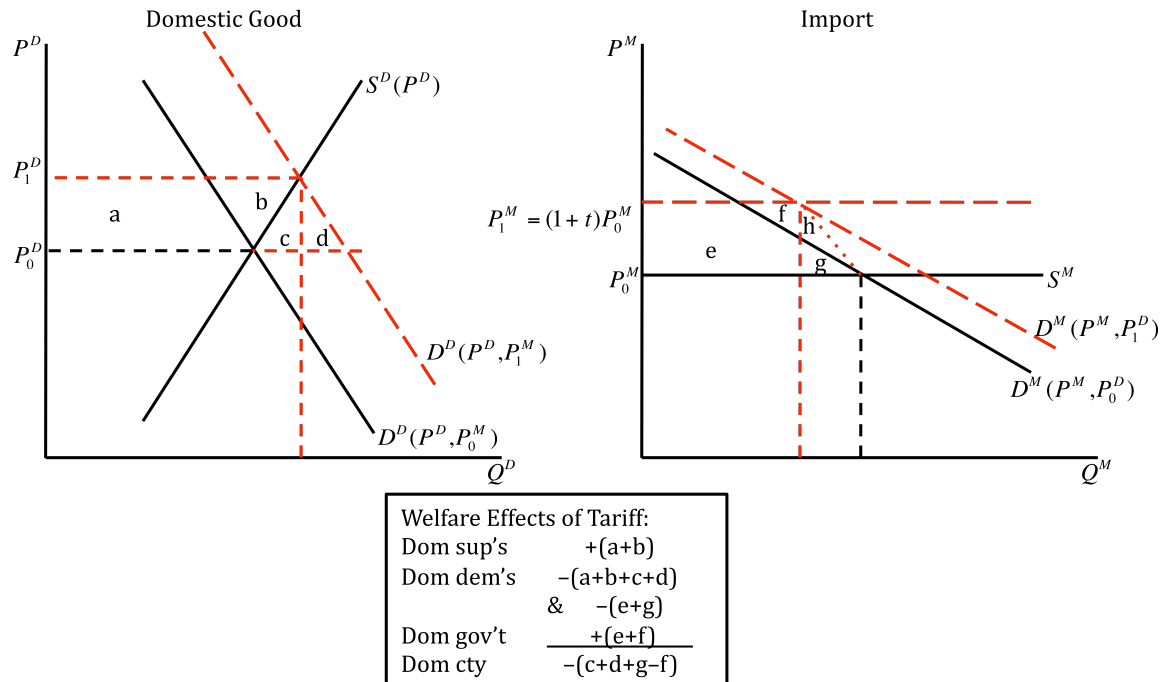


Figure 4
Tariff on Imported Imperfect Substitute for Domestic Good

The key is that both of the demands – for the domestic good and for the imported good – depend on both prices. Therefore each demand as a function of its own price is drawn for a given value of the price of the other good. The small country assumption means that we know, both without and with the tariff, what the price of the imported good will be, P_0^M and $P_1^M = (1+t)P_0^M$. We can therefore draw demand for the domestic good conditional on that price, use its intersection with domestic supply to determine the domestic price P_0^D , and finally draw the demand for the import conditional on that price.

The tariff raises the price of the import by the amount of the tariff, causing in the import market the familiar loss of consumer surplus, area (e+g). But that's not the end of the story. The rise in the import price shifts the demand curve for the domestic good to the right, as demanders substitute toward it. This in turn causes the price of the domestic good to rise, causing additional welfare effects: positive area +(a+b) for producers and negative -(a+b+c+d) for demanders. Meanwhile, the government collects tariff revenue of area +(e+f). All of this is recorded in the box above, leading to a net (dead weight) loss for the country: -(c+d+g-f).¹

Much of this can be quantified fairly easily, but only with the aid of a parameter to measure the cross effect of one price on the other demand. Let

$$\chi^{DM} = \frac{\% \Delta D^D}{\% \Delta P^M}$$

be the cross elasticity of demand for the domestic good with respect to the price of the import (which measures how much the D^D curve shifts to the right. Then equilibrium in the market for the domestic good implies that $\% \Delta S^D = \% \Delta D^D$, and thus

$$\epsilon^D \% \Delta P^D = \eta^D \% \Delta P^D + \chi^{DM} \% \Delta P^M$$

which solves to

$$\% \Delta P^D = \frac{\chi^{DM}}{\epsilon^D - \eta^D} t$$

Again, this can be used to calculate various other changes.²

Import of Final Good and Input to Its Production, Small Country

Suppose now that the imported good in a small country is not produced at home, but that it is used as an input to production of a nontraded final good in the domestic market. Figure 5 shows the situation.

¹ It is actually possible to get much of this from the import market alone. As drawn, the D^M curve assumes that the price of the domestic good is fixed. Alternatively, we could draw instead the demand curve that allows for changes in P^D as P^M changes along it. That curve would pass through both the initial and final equilibria in the import market above, such as the dotted line, and thus be steeper than the one drawn. The deadweight loss for the tariff with that demand curve, area (g+h), incorporates the net losses in the market for the domestic good.

² With the exception of the change in quantity of imports, which also includes the cross effect back from the domestic price to the demand for imports. We'll ignore that here

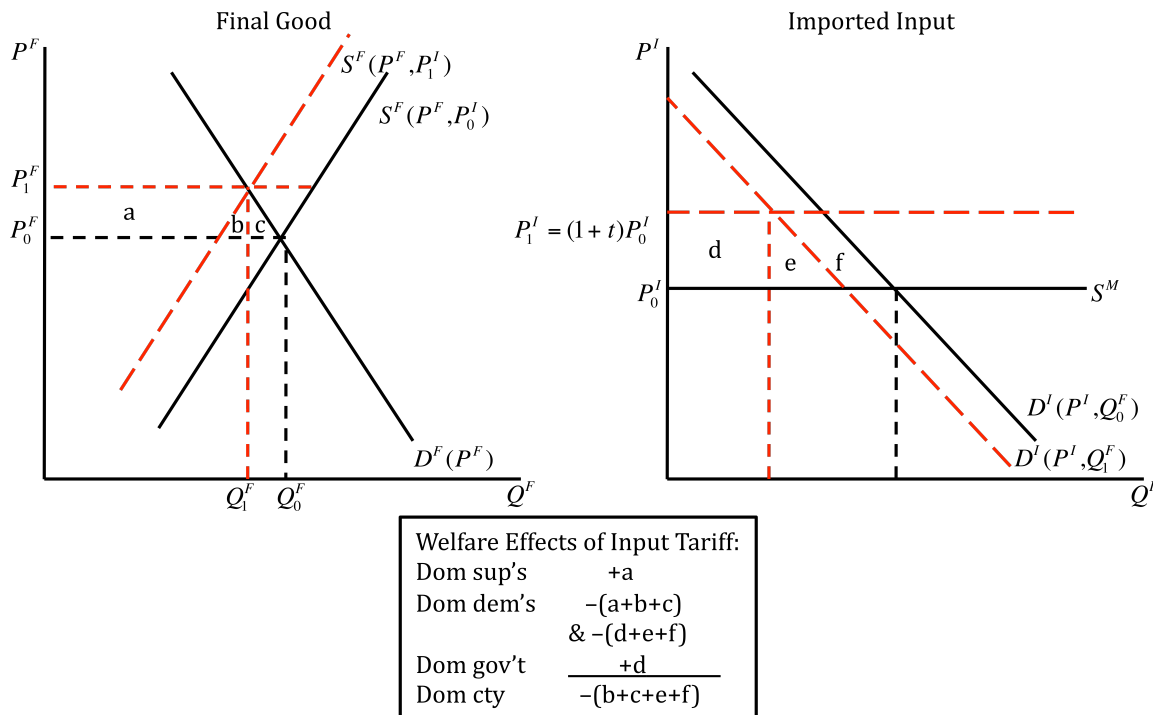


Figure 5
Tariff on Imported Input to Nontraded Final Good
Production

The tariff on the imported input raises its price, which in turn raises the cost of producing the domestic final good. This shifts its supply curve upward, leading to a rise in its price and a fall in its output. The latter in turn causes less of the imported input to be demanded, shifting its demand curve to the left.

I have to say that I am not entirely comfortable with the welfare effects that I list above, in particular the loss in the import market of $-(d+e+f)$. Don't take that one to the bank.

Tariff on Imports from One Country but Not Another

Finally, consider the case of a discriminatory tariff, levied on imports of a good from one country but not from another. This is quite common. In a free trade area, a country has a zero tariff on its FTA partners and positive tariff on all other countries. Similarly, when an anti-dumping duty or a countervailing duty is applied, they are levied only on imports from the offending country, and not on others.

If goods are homogeneous, then goods from different countries that are traded will have to have the same price, since otherwise nobody would buy the higher priced good. (This is ignoring transport costs, which may be different over different routes.) In that case, if an importing country levies a tariff on one but not another, it

will simply cease buying from the country subject to the tariff. We will look at an example of this later in the course when we deal more with FTAs.

Because of this, analysis of this problem is likely to be most meaningful if goods from different countries are differentiated, as we will now assume. Suppose that the home country (A) imports a good from both country B and country C, and that the prices of these two goods need not be the same, since they are differentiated, but that each does matter for the demand for the other. The situation is shown in Figure 6.

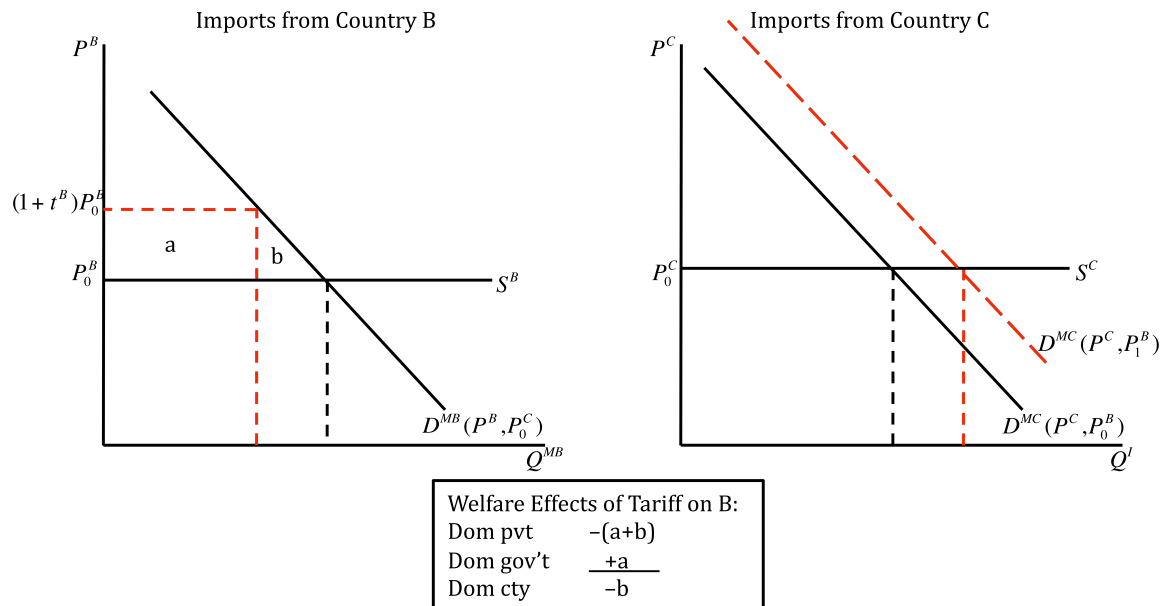


Figure 6
Tariff on Imports from Country B but not from
Country C

Here, the two markets are related, in that the tariff on imports from country B causes an increase in imports from country C. However, because we have assumed that imports are differentiated and supplied perfectly elastically by both countries (i.e., country A is small compared to both), the welfare effects are the same that we would have found had we ignored country C.

In general, this will not be the case. Supplies from both countries are likely to be less than perfectly elastic, so that the tariff on B will cause a rise in the price of imports from C. It would not be hard to modify the above analysis to allow for either of those supply curves to slope upward and their price to feed back into the demand from the other country, much as we did in Figures 4 and 5. However, to allow both supplies to slope upward would put us in a situation where the two prices must be determined simultaneously, and graphical analysis become less useful.