

Partial Equilibrium Analysis Part II

Differentiation by Source

Capacity Building Workshop
"Enhancing Capacity on Trade Policies and Negotiations in Laos"
May 8-10, 2017
Vientienne, Lao PDR

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Introduction

- The model we developed in the previous session is useful for understanding changes in overall imports.
- It is thus useful for evaluating the overall impact of a general tariff reform from the perspective of the importing country.
- It may also be useful for exporting countries, when the objective is to determine how much overall trade might increase in an export partner when they liberalize their trade.
- The model does not identify separate sources of imports, and does not allow for tariff variation by source, both of which are important in evaluating preferential trade agreements.
- In this session we will look at modifications required to allow the model to handle these cases – allowing for differentiation of imports by source.

The Armington Assumption

- Imports of the same good from different countries are not generally consistent with the idea that those goods are perfectly substitutable.
- If imports from different countries were in fact perfectly substitutable, we would expect to see any one good imported from only one country.
- The fact that we do not observe this suggests product differentiation.
- The [Armington assumption](#) is that products are differentiated by their source of origin.
- In this approach, the overall import demand function describes overall demand for imports by product category. A second stage optimization then generates demand from each possible source.

Extended Theory

- Suppose that the economy under study imports from a set of partner countries indexed by p . We let the supply of each of these countries be described by an export supply function of the same form as before:

$$X_p = \alpha_{Xp} P X_p^{\eta_p}$$

- The equilibrium conditions also have to be adjusted, since there is now a market with each partner:

$$X_p = M_p$$

- The price margin is adjusted in the same way:

$$PM_p = P X_p (1 + T_p/100)$$

- Notice that the tariff can vary by source (as it generally would with a preferential trade agreement in place).

- The overall import demand remains the same.
- To split the overall demand we add what is called the Armington aggregator:

$$M = A \left[\sum_p \delta_p M_p^\rho \right]^{\frac{1}{\rho}}$$

- Here A is a shift parameter, δ_p represents the share of each country in the import aggregate, and ρ is a parameter reflecting the degree of substitutability between imports from different sources.
- The latter is related to the elasticity of substitution σ (also called the Armington elasticity) by $\rho = -1/\sigma + 1$.
- A high degree of substitutability is reflected in a value of ρ close to 1, while a low degree is represented by a strongly negative parameter value.

- Finally, we can derive demands for imports from each country as:

$$PM_p = PM \times A \left[\sum_r \delta_r M_r^\rho \right]^{\frac{1}{\rho}-1} \times \delta_p \times M_p^{\rho-1}$$

- The interpretation of the expression is that at equilibrium, the importing country has to be just indifferent between sources of the marginal unit.

- Just like our first model, this version needs to be calibrated to data.
- In this case we need the following information:
 - The original import values by source (as cif values), normalizing prices to one.
 - The original tariffs by source.
 - Estimate of the overall import demand elasticity.
 - Estimates of the export supply elasticities by source.
 - An estimate of the Armington elasticity.
- With this information, the remaining parameter values can be determined.

Application Example

- Let's reconsider the application we used in the previous session.
- In that example we looked only at Thailand's total imports in HS category 8702. In fact, according to COMTRADE, in 2014 Thailand imported in that category from 14 different economies.
- We can use TRAINS to obtain data on the effectively applied tariffs, which take into account preferential trading agreements already in place.
- **Exploring the Code:** Open the files 10_PE.gms (the code). We will simulate removing the tariff on Japan.

Table: Thailand's Imports and Applied Tariffs in HS8702 for 2014

	Applied Tariff (%)	Import Value (\$000)
China	0.0	24239.3
France	40.0	1283.4
Germany	40.0	23325.9
India	40.0	3050.5
Indonesia	0.0	41792.6
Italy	40.0	48.5
Japan	7.5	48106.7
Korea, Rep.	40.0	32321.8
Malaysia	0.0	5232.7
Portugal	40.0	4256.8
Singapore	0.0	25.0
Spain	40.0	3660.2
Turkey	40.0	1909.1
United States	40.0	192.6

Source: TRAINS

Results

Table: Effect on Thailand of Removing Thailand's Tariff on Japan

	Initial	Post Tariff Cut
Total Imports	189445.1	203087.9
Tariff Revenue	23353.5	18996.9
Change in Tariff Revenue		-4356.1
Change in Gains from Importing		3380.8

- The results indicate a substantial rise in imports from Japan (over 43 percent).
- There are small falls in the imports from other regions, as importing from Japan becomes more attractive relative to the other options, although total imports do rise.
- Tariff revenue collected by Thailand falls by just over \$4 million, and the benefits of exchange to Thailand rise by just over \$3 million.

Partner Effects

Table: Effect on Trade Partners of Removing Thailand's Tariff on Japan

	Δ in Exports	Δ in Surplus
China	-1174.6	-58.7
France	-62.2	-2.2
Germany	-1130.3	-40.3
India	-147.8	-5.3
Indonesia	-2025.2	-101.1
Italy	-2.4	-0.1
Japan	20947.0	984.0
Korea, Rep.	-1566.2	-55.9
Malaysia	-253.6	-12.7
Portugal	-206.3	-7.4
Singapore	-1.2	-0.1
Spain	-177.4	-6.3
Turkey	-92.5	-3.3
United States	-9.3	-0.3

Changes in Perspective

- Note that while we have viewed the simulation primarily from Thailand's perspective, this sort of simulation can be useful for all of the economies.
- Hence, the simulation can be used to evaluate not only changes in domestic import markets, but also partner export markets, or even non-partner markets (e.g. the effect of an agreement on third parties).

- See how the results change for different changes in the tariff rate.
- For given changes in the tariff rate, see how the results change as the Armington elasticity parameter is varied.
- See if you can calibrate the model to data from another sector/country to simulate the effects of tariff reforms. Try a case of own tariff reform, and a case of tariff reform in a trading partner.