Modeling Tariffs and Other Interventions

Short Course on CGE Modeling, University of the South Pacific

John Gilbert

Professor
Department of Economics and Finance
Jon M. Huntsman School of Business
Utah State University
jgilbert@usu.edu

July 23-27, 2012

UtahStateUniversity
JON M. HUNTSMAN
SCHOOL OF BUSINESS

Introduction

- So far we have considered economies that are free from policy-induced distortions to the economic system.
- In this session we will consider how trade taxes, subsidies, and other interventions can be incorporated into the models of the small and large economy.
- This will allow us to examine the production, consumption, trade, income distribution, and economic welfare implications of interventions.
- Since almost all real world trade patterns are riddled with distortions of various kinds, introducing these types of distortions is also a crucial step in building the components we need for a CGE model applied to an actual economic system.

Session Outline

1. Tariffs for the small country
2. Symmetry
3. Other price interventions
4. Quotas
5. Tariffs for the large country

Small Economy Tariffs

- For a small economy, in the absence of distortions, optimal policy is free trade. In other words the MRS and MRT both equal the world relative price.

- A trade tax/subsidy has the effect of driving a wedge between domestic and world prices. We can define the wedge in percentage terms as $t_i = (p_i - p_i^*)/p_i^*$, $i = 1, 2$, with the price of foreign exchange normalized to unity.

- For an importable good (i.e., $x_i < 0$) a positive value of t_i represents a tariff.

- A tariff pushes the domestic price up relative to a world price.

- Tariffs can drive the relative domestic price no further away from the relative world price than the relative autarky price. Beyond that point they are said to contain 'water'.

Formal Problem

- Given world prices, the domestic prices are determined by the tax wedge.
- Solving the production problem reveals that firms will produce on the production possibilities where the MRT is equal to the domestic price ratio.
- Solving the consumer's problem reveals that households will consume where the MRS is equal to the domestic price ratio, and will spend all of their income.
- Finally, we determine income as the sum of the value of output at domestic prices, plus the tariff revenue. This completes the model.
- Note that although the consumption choice affects tariff revenue, this should not form part the consumer decision (why?)
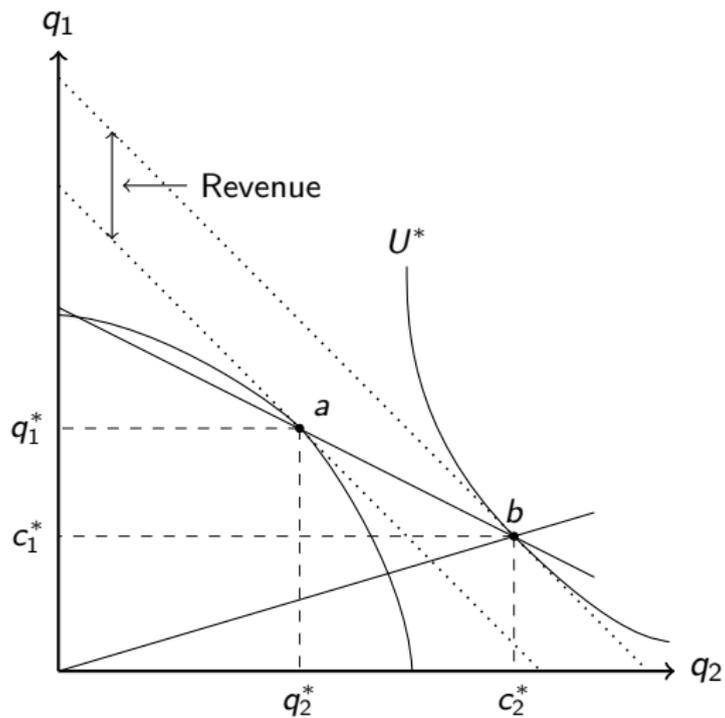
Other Price Interventions

- For an importable good (i.e., $x_i < 0$) a negative value of t_i represents an import subsidy.
- For an exportable good ($x_i > 0$) a positive t_i represents an export subsidy while a negative value represents an export tax.
- Hence, all price based interventions can be dealt with in the same manner as a tariff.
- Both a tariff and an export subsidy push the domestic price up relative to a world price, while an import subsidy or export tax pushes the domestic price down relative to the world price.
- Like tariffs, export taxes can drive the relative domestic price no further away from the relative world price than the relative autarky price.
- In the two good case, an export tax and an import tariff are the same intervention, a result known as the Lerner symmetry theorem.

GAMS Implementation

- First we need to introduce the tax wedge, either by creating a new equation or by substitution.
- The first order conditions for firms need to be adjusted to reflect decision making at domestic prices.
- The first order conditions for households need to be adjusted similarly.
- Income needs to be adjusted to include tariff revenue.

Quota Equivalence

- Under competitive conditions a tariff and a quota are equivalent in effect if the revenue is distributed in the same manner.
- We can use our GAMS model to demonstrate.
- Rather than introducing tariffs as a parameter, we can introduce them as a variable. We can then fix the value of the variable, causing as a parameter.
- To model a quota, we just need to exogenize imports, and endogenize the corresponding tariff.

- For a large economy, a tariff will affect world prices.
- Free trade is not optimal policy for such an economy.
- The mechanics are the same as the small country case. The foreign offer should continue to be defined in terms of world prices.
- By endogenizing the tariff, we can determine the optimal intervention.
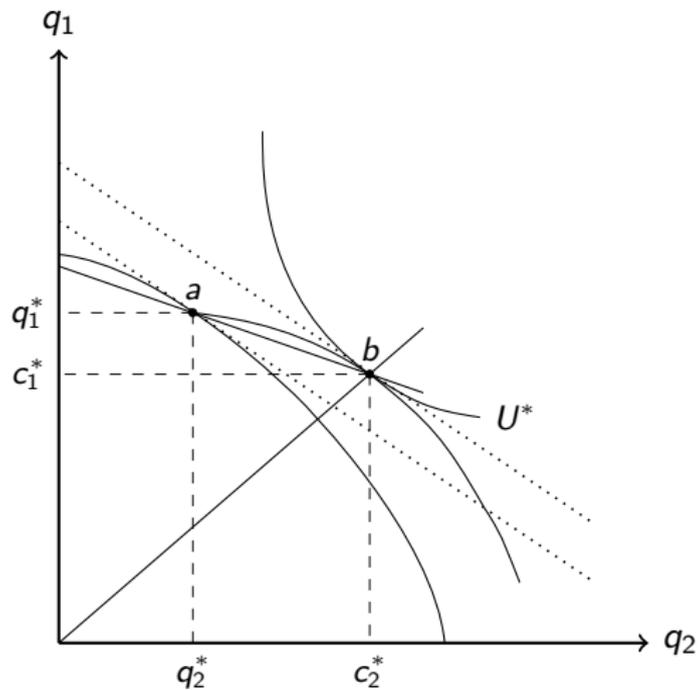
- Using the small country model, implement a series of small incremental increases in the tariff. As the tariff increases, what happens to the index of utility?

- Using the small country model, implement a tariff of 10 percent. Now remove the tariff and implement an export tax of 9.09 percent. Compare the results.

- Using the small country model, implement a tariff of 10 percent and simultaneously an export subsidy of 10 percent. What happens? Explain.

- If the underlying production model is specific factors, which factors of production would you expect to be in favor of a tariff? How about an export subsidy? How would your answer change if the production structure was HOS?

Exercises

- With the tariff in place, simulate growth of the importable sector by changing the capital endowment. Now consider the same growth scenario without introducing the tariff first.
- How would the results change if the growth were to occur through capital accumulation, and the increment to capital was assumed to be owned by foreign interests who repatriate the earnings?
- Simulate a binding quota and a fall in the world price of the importable. How do the results compare to the same price fall in the presence of the tariff that is equivalent to the initial quota?
- Using the large country model, try changing the values of the trade elasticities and simulating the optimal tariff.
- What happens in the large country model if the economy imposes an export subsidy?
- How would you find the revenue maximizing tariff?

Further Reading

- The literature on tariffs and other trade interventions is vast, Bhagwati *et al.* (1998) is a good place to start.
- For discussion of the symmetry between import tariffs and export taxes see the classic paper by Lerner (1936).
- On the equivalence of tariffs and quotas under certain circumstances see Bhagwati (1965).
- The classic treatment of the relationship between domestic and international prices in the presence of tariffs is Metzler (1949).
- On the structure of optimal tariffs you might want to read Graaff (1949).
- Johnson (1967) and Brecher and Diaz-Alejandro (1977) consider growth in the presence of tariffs.