Non-Tariff Measures in CGE Models
Session III: Introducing NTMs to a CGE Model

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Introduction

- In this session we will consider various ways in which information on NTMs can be incorporated into CGE models.
- We will demonstrate the ideas and techniques using the CGE model of Viet Nam hat we developed in the previous session.
- By the conclusion of the session you should have a good idea of the mechanics of incorporating NTMs, the consequences of various choices, and their limitations.

Economic Effects of NTMs

- NTMs clearly have a trade restricting (cost raising) effect, that we call the protection effect, potentially on either the import or export side.
- NTMs may also have other effects, since generally they are intended to regulate various aspects of the domestic economy.
- Supply shifting effects are associated with policies intended to deal with externalities associated with supply. For example, health regulations limiting sales, or SPS measures. These polices may require use of certain techniques, or certain content requirements.
- Demand shifting effects may occur when policies are used to handle certain externality problems associated with demand. For example, compulsory labeling.
- CGE models are primarily useful for assessing the protection effect of NTMs.

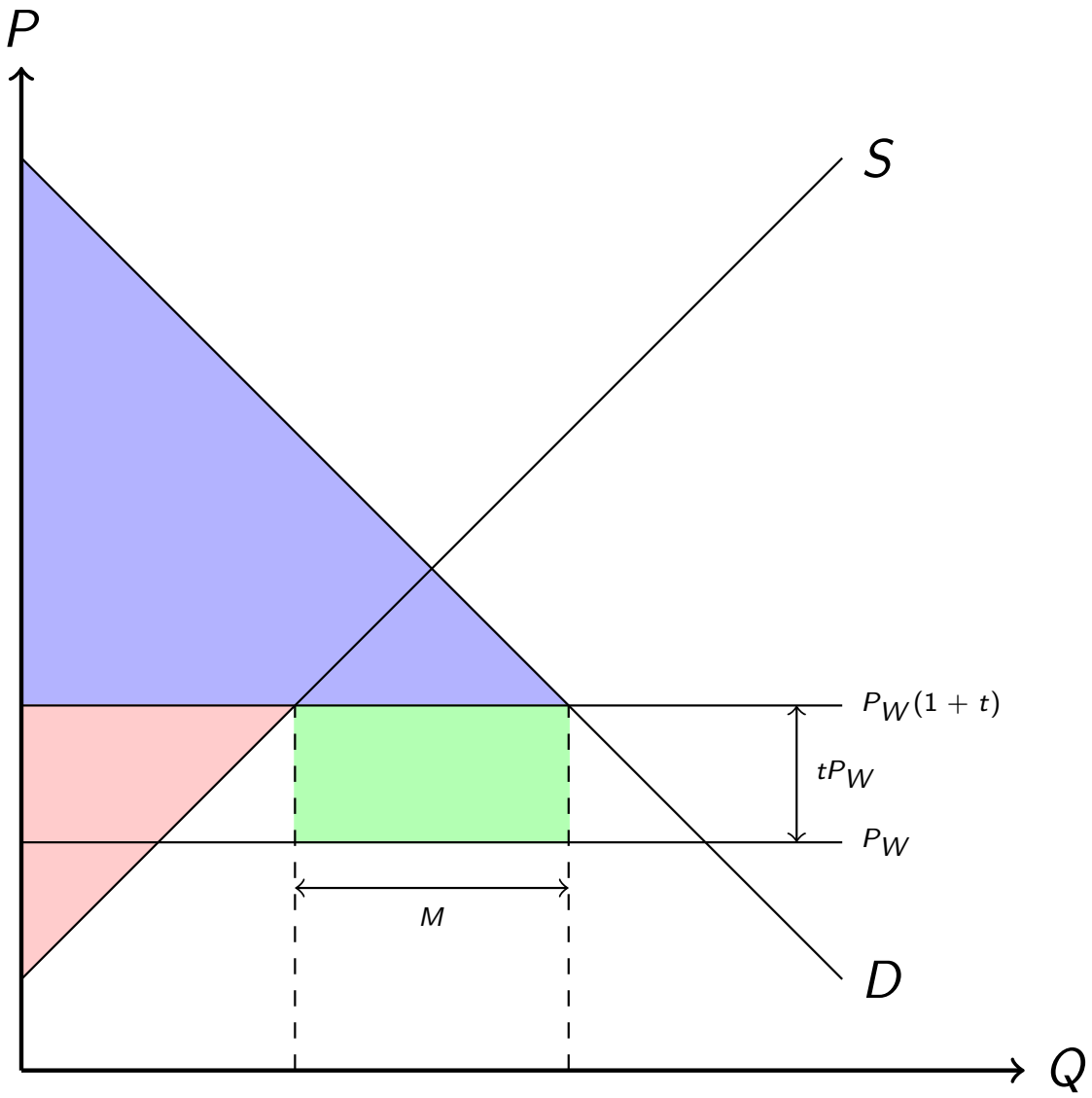
Incorporating NTMs into CGE Simulations

- As you have seen in earlier sessions, the most common way of measuring the border effect of NTMs is by estimating AVEs – the part of the difference between world and domestic prices not explained by tariff measures.
- Given estimates of the AVEs, the NTM measures can be introduced to CGE models in two basic ways.
- The first is by introducing the NTMs as tariff equivalents (or export tax equivalents if on the export side).
- The second is by introducing non-revenue generating price wedges (iceberg costs).

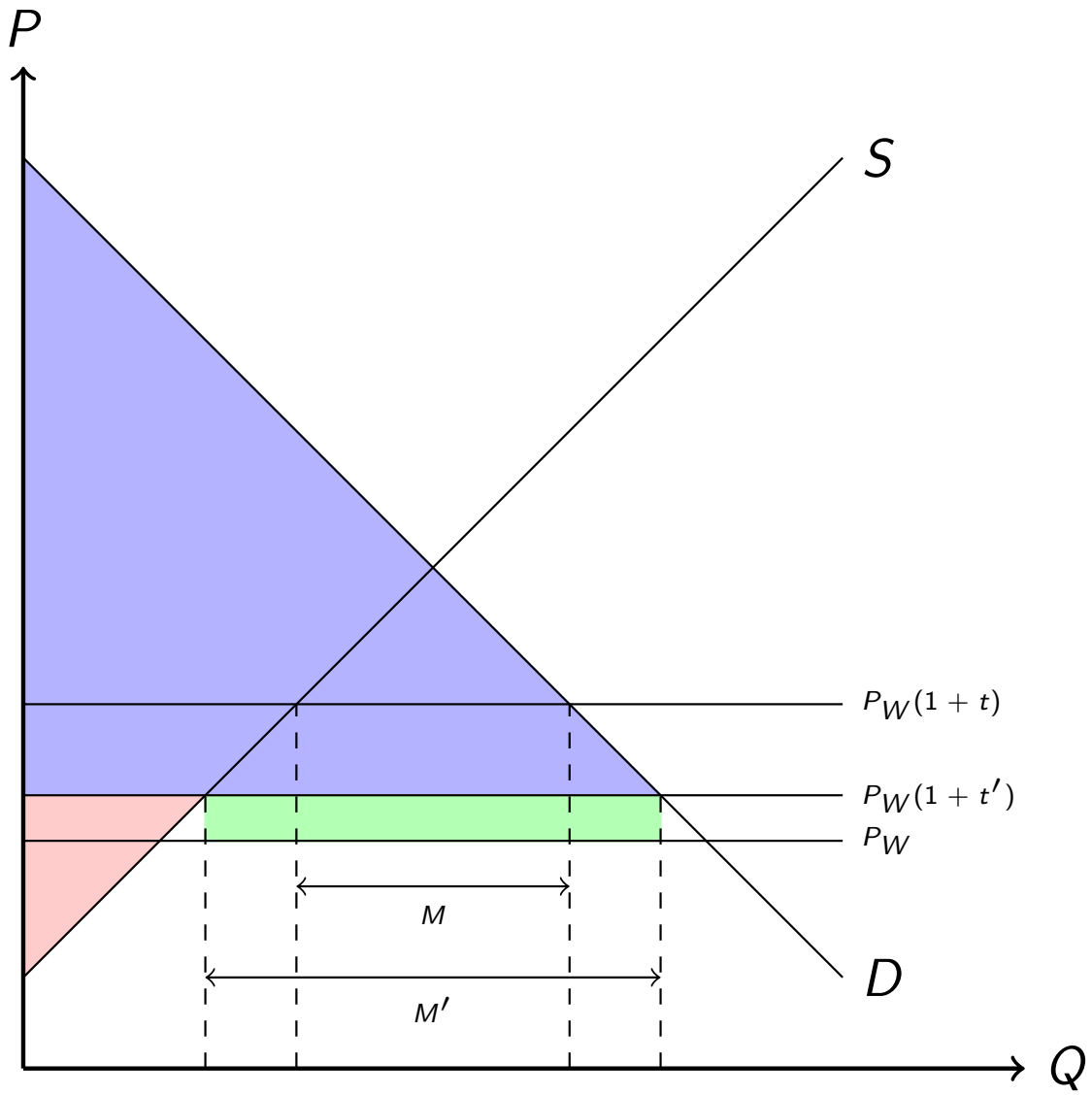
NTMs as Tariff Equivalents

- A tariff is a tax on imports. It drives a wedge directly between the world price and the domestic price, and generates revenue which is collected by the government and then disbursed in some manner.
- Given an AVE, we can adjust tariff rates in a model to capture the full price effect of import barriers.
- This may be appropriate in cases where the NTM is 'tariff like' in the sense that it generates a rent that accrues to an agent in the economy.

Effect of a Tariff (or Equivalent)



Effect of Lowering a Tariff (or Equivalent)



Practicalities

- To model reductions in NTMs as tariff equivalents, the tariff measures in the model must be adjusted to incorporate the estimated NTMs.
- Because tariffs are revenue generating, the associated revenue must also be changed, and the allocation of the flows of revenue must be accounted for in some way.
- In other words, the equilibrium data of the model must be adjusted – this sounds simple but is generally a non-trivial thing to do!

Simple Counterfactual Simulation

- The easiest way to adjust the data of a general equilibrium model is via a counterfactual simulation.
- In this technique we use a shock to the model to simulate a new equilibrium with the NTMs included. We can then run further simulations, including partial or full removal of the NTMs from this base.
- A disadvantage of this approach is that the simulation distorts the equilibrium following the assumed theory – we are no longer simulating relative to observed data.

Exercises

- The tariffs recorded in the Viet Nam CGE model are 3.9 percent in agriculture, 10.9 percent in food products, 10.9 percent in textiles, and 5.1 percent in other manufactures. There is no recorded tariff in services (typical in GTAP).
- Suppose the AVE of NTMs on manufactures is estimated to be 20 percent.
- To build this into the tariff we need to shock the tariff rate to 26.1 percent. Why?
- Exercise 1: Estimate the economic efficiency effect of halving the manufacturing NTMs, leaving the tariffs in place.
- Exercise 2: Estimate the economic impact of halving the tariffs and NTMs in manufacturing.
- Exercise 3: Estimate the economic impact of halving the tariffs in manufacturing, leaving the NTMs in place. How do the results compare to the tariff scenario without NTMs? Why are they different?

Other More Advanced Options

- An alternative approach is to run counterfactual simulations using a closure/parameter specification designed to minimize the changes in the data in a certain way.
- In particular, CGE model results are highly dependent on the shares of various activities (e.g., consumption shares, value-added shares, and so on).
- By simulating the introduction of NTMs with the core elasticities adjusted, we can adjust the equilibrium while maintaining shares. The old parameters can then be restored for further simulations.
- Using this technique correctly requires rewriting the new SAM and recalibrating.

Other More Advanced Options

- A final option is to adjust the flows in the SAM directly.
- This approach gives the most control, since it is possible to directly manipulate the tariff revenues, specify how the NTMs affect consumption of the various agents, and specify the distribution of the revenue.
- If entirely new entries are made in the a cell of the SAM, new theory must generally be introduced to explain the flow.
- Care must be taken to ensure the SAM balances. This will generally require the use of SAM balancing techniques such as RAS after the manipulations have been made (since an alteration anywhere will put the SAM out of balance).

For GTAP Users

- In GTAP the variable that should be shocked to introduce an NTM as a tariff equivalent is `tms(i,r,s)`.
- This is the power of the tariff by source and commodity.
- Adding via simulation is a matter of introducing shocks to generate the new `tms` levels, then running a simulation from the updated dataset.
- The procedure for modifying tax rates while keeping shares constant in GTAP is called `ALTERTAX`.
- Directly modifying the SAM in GTAP is technically possible, but too difficult for most users.

Issues

- The key concern with this approach is the adjustment of the tariff revenue and accounting for where it goes.
- If we only adjust the tariff rates, then we are implicitly assuming that any rents associated with the NTM in question are captured by the government and disbursed in the same way as other tax revenues.
- This might be valid under some circumstances (e.g., auctioned quota rights), but is likely to be violated under others (e.g., if the rent accrues to other agents, or if there are rent-seeking costs that dissipate all or part of the rent).
- Correct attribution of the rents requires detailed knowledge of how the NTMs function in practice.
- This is especially important in models with multiple households.

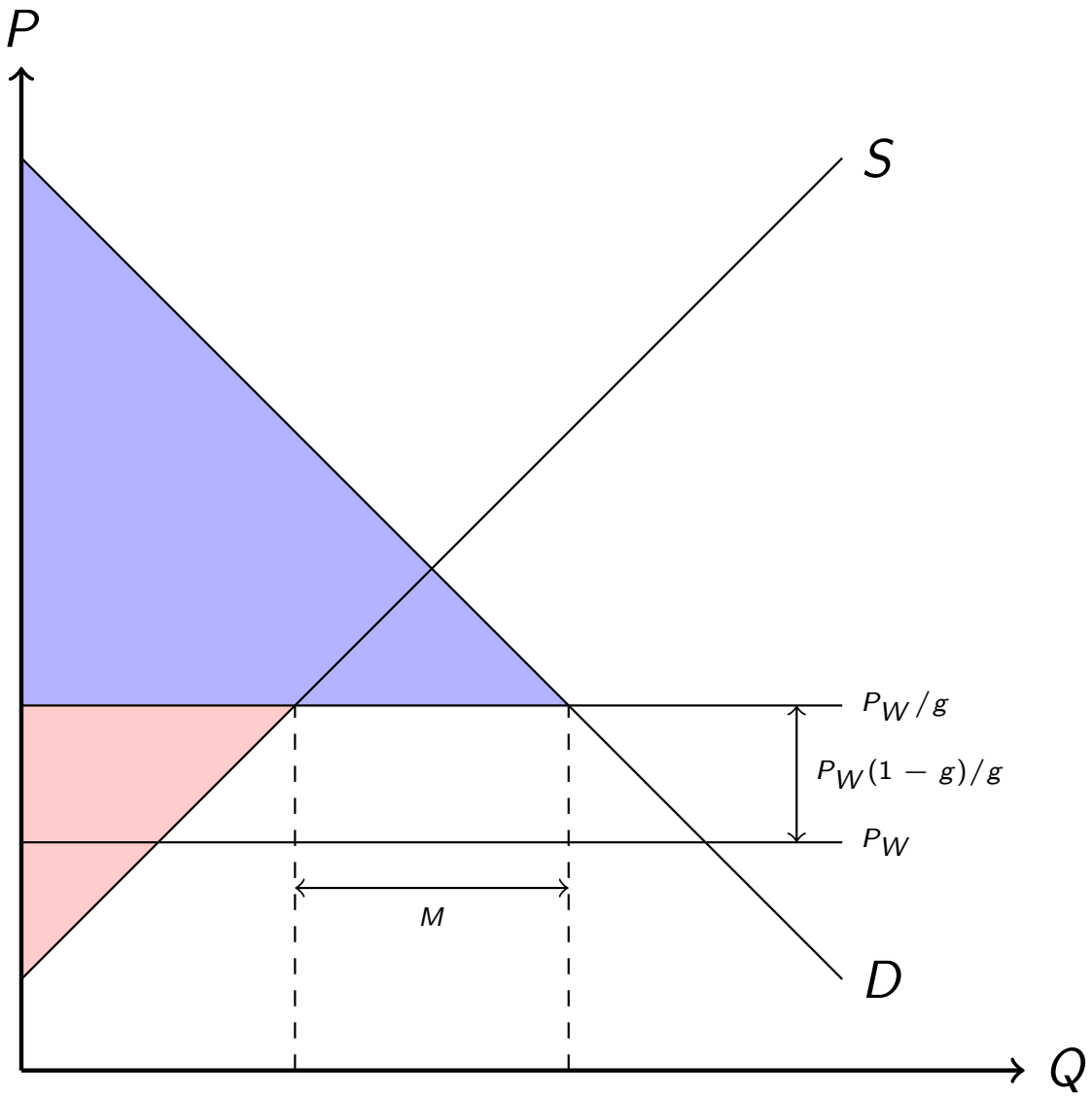
NTMs as Iceberg Costs

- Iceberg trade costs are a simple way of modeling the NTMs in terms of lost imports. The idea is that some of the product is lost between the the buyer and the seller (think a melting iceberg).
- This process is modeled using an iceberg parameter. This parameter, g, which lies between 0 and 1, represents the proportion of goods shipped that actually make it to import consumption.
- Hence, if M units are shipped, only gM units arrive. If M are consumed, then M/g units were shipped.
- We can think of NTMs as iceberg cost as representing 'sand in the wheels' of trade.
- This might be appropriate when modeling the impact of standards harmonization, trade facilitation and so on.

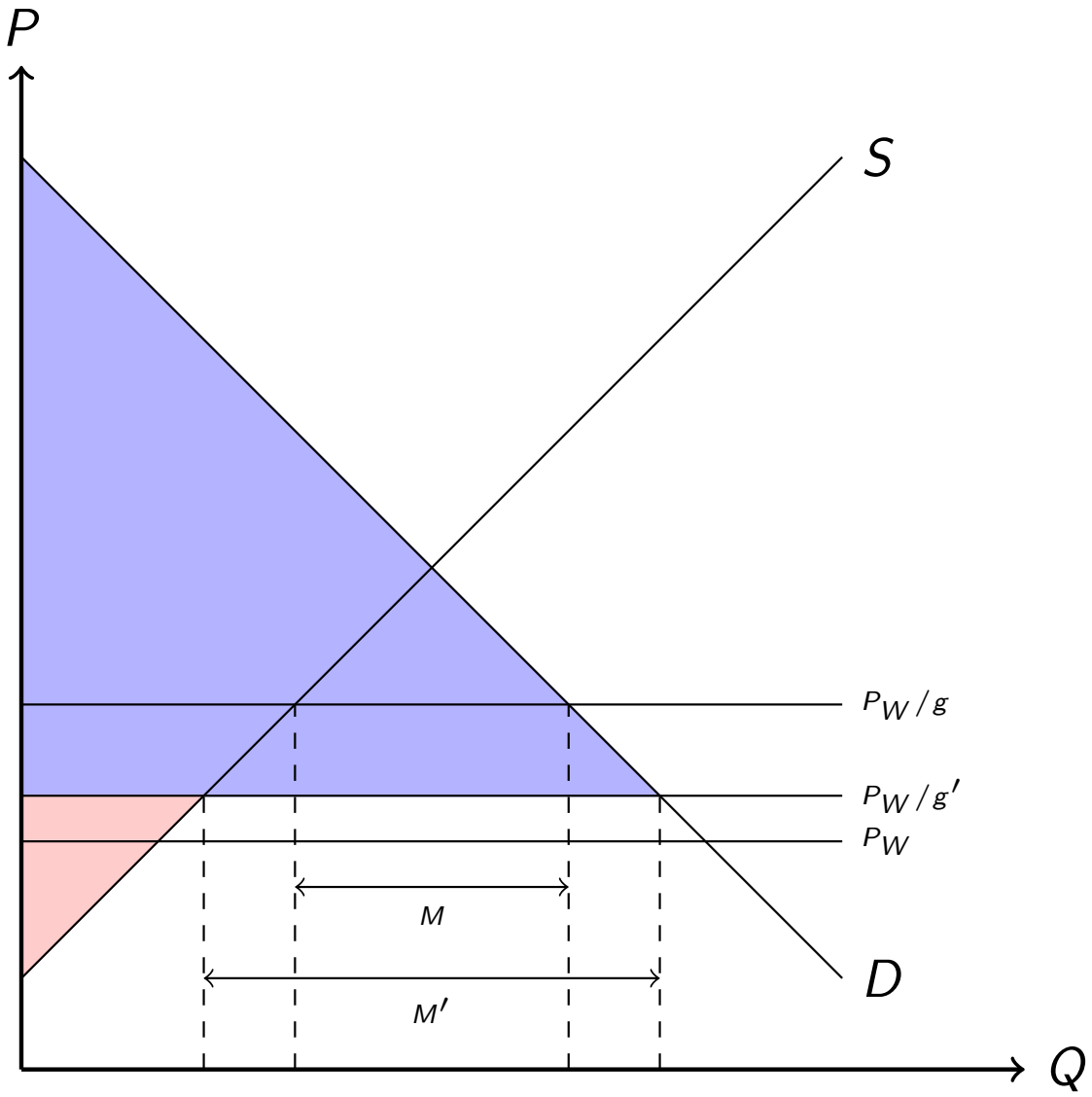
NTMs as Iceberg Costs

- Iceberg trade costs drive a wedge between world and landed prices much like a tariff, although they do not generate any revenue.
- A reduction in iceberg trade costs is sometimes called import augmenting technical change.
- It means that for a given payment to suppliers, a greater quantity becomes available for import consumption.
- Alternatively, for a given quantity of import consumption, the price that must be paid falls.

Iceberg Trade Costs



Reductions in Iceberg Trade Costs



Implications

- We can see that, in general, for a given AVE, modeling a reduction in NTMs as a reduction in iceberg trade costs will tend to lead to larger impacts on measures of economic welfare than modeling as a reduction in a tariff equivalent.
- The reason is that the price differential implied by the AVE is assumed to be entirely explained by efficiency losses due to NTMs.

Practicalities

- The fact that their are no revenues involved with iceberg trade costs lends a major advantage technical – no adjustments need to be made to the underlying equilibrium data.
- The assumed iceberg parameter can be adjusted directly, and then shocked as needed.

Exercises

- Let's compare a given AVE under tariff equivalence with icebergs.
- Suppose the AVE of NTMs on manufactures is estimated to be 20 percent. This implies a g value of 0.83. Why?
- In the Viet Nam model, the parameter is called `ICE`. We can set the value to 0.83 in the calibration section.
- Notice how this does not alter the equilibrium values at all.
- Exercise 4: Estimate the economic efficiency effect of halving the manufacturing NTMs, leaving the tariffs in place.
- Exercise 5: Estimate the economic impact of halving the tariffs and NTMs in manufacturing.
- Exercise 6: Estimate the economic impact of halving the tariffs in manufacturing, leaving the NTMs in place.
- How do the results compare to the tariff equivalent approach?

For GTAP Users

- In GTAP the variable that should be shocked to introduce an NTM as a change in iceberg costs is `ams(i,r,s)`.
- The value can be shocked directly using a percentage change.

Issues

- This approach is very popular because of its simplicity.
- It will tend to generate much larger efficiency impacts for a given AVE than tariff equivalents – possibly unreasonably large since it is unlikely that many NTMs have pure efficiency impacts.
- One possibility is to treat the efficiency effects of removing tariff equivalents and iceberg costs as lower and upper bounds, respectively, on the protective effect of a given AVE.
- It is possible to mix, if you have a basis for attributing the AVE to revenue generating and non-revenue generating.

Quota Regimes

- In some cases information about an NTM may be available in quantity form rather than price form.
- A quota regime can be implemented in simple way by altering the closure – the volume of imports can be exogenous, while the tariff wedge can represent the quota rent.
- The implicit assumption is that the rent is captured by the government – so the same cautions we outlined above with respect to rent-seeking apply.
- Once the closure is altered, we can simulate expansions or contractions of the quota, or changes in other economic variables in the presence of a quota.

Exercises

- Suppose that the food products sector in Viet Nam is in fact protected by a quota.
- The version of the model called `VietnamCGE_Q` has the required closure switch.
- Notice how a closure switch like this does not alter the underlying data.
- Exercise 7: What is the effect of an expansion of the quota by 5 percent?
- Exercise 8: What happens if there is an expansion of the capital stock? How are the results different from what you would see if an AVE was used instead of the quota?

For GTAP Users

- In GTAP a simple quota regime can be implemented by switching the required element of `tms(i,r,s)` with the corresponding trade flow, an element of `qxs(i,r,s)` in the closure.
- The exogenous trade flow can then be shocked as usual, and the change in the tariff equivalent will be reported in the results.

Voluntary Export Restraints

- In some cases it may be appropriate to consider AVEs on the export side.
- Once such case is a voluntary export restriction, assuming that the revenue is captured domestically.
- A version of the model that allows for export taxes is `VietnamCGE_TX`. The model allows a price wedge on the export side, and accounts for the revenue.
- Exercise 9: What is the effect of a 5 percent export tax on textiles?

For GTAP Users

- In GTAP a export taxes are represented by `txs`.
- This is the power of the export tax, which can be shocked like any other variable.
- Powers less than one indicate export subsidies.

Outstanding Issues

- While CGE models tend to focus on the protective effect of NTMs, the demand/supply shift issues are also important from a policy perspective. Ideally we would like to consider optimal policy balance, but this is highly situation specific.
- Some rudimentary attempts have been made by shifting Armington elasticities (e.g., adopting common standards may make domestic and foreign goods more interchangeable). Data is limited.
- In some cases NTMs may have direct impacts on firm fixed cost, either of production or entry into export markets. This creates another channel through which NTMs can work/be modeled, but increases complexity (since economies of scale are generally associated with imperfect competition).

Further Resources

- Deardorff and Stern (1997) is a good reference on the types of NTMs and some measurement issues.
- One of the best introductions to NTMs in CGE models is Fugazza (2008).
- In the next session we will look at results from a few recent studies.