

Graduate Trade (II): ECON 8433

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Plan

WEEK	TOPIC
Week 1	Introduction to Structural Gravity Equation
Week 2	Calibration and Estimation
Week 3	Mapping Models to the Data
Week 4	Designing Counterfactual Experiments in General Equilibrium
Week 5	Presentations (I) and Catch-up
Week 6	Heterogeneous Firms (I)
Week 7	Heterogeneous Firms (II)
Week 8	Ricardian Models
Week 9	Multi-Sector Models
Week 10	Global Value Chains
Week 11	Presentations (II) and Catch-up
Week 12	Extensions: Demand Side
Week 13	Extensions: Supply Side
Week 14	Extensions: Migration and Geography
Week 15	Presentations (III) and Catch-up

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Hat Algebra and Armington

Given a shock $\hat{\tau}_{ij}$, we can calculate counterfactual outcomes by solving:

$$\begin{aligned}Y'_j &= Y_j \hat{w}_j \\ \hat{P}_j^{1-\sigma} &= \sum_{i \in S} \pi_{ij} (\hat{\tau}_{ij} \hat{w}_i)^{1-\sigma} \\ \pi'_{ij} &= \pi_{ij} (\hat{\tau}_{ij} \hat{w}_i)^{1-\sigma} \hat{P}_j^{\sigma-1} \\ \hat{w}_i &= \sum_{j \in S} \pi'_{ij} Y_j \hat{w}_j / Y_i\end{aligned}$$

Hat Algebra and Interpretation of the Data

Let us rewrite the system as follows:

$$\begin{aligned}Y_j' &= Y_j \hat{w}_j \\ \hat{P}_j^{1-\sigma} &= \sum_{i \in S} \pi_{ij} (\hat{\tau}_{ij} \hat{w}_i)^{1-\sigma} \\ \pi'_{ij} &= \pi_{ij} (\hat{\tau}_{ij} \hat{w}_i)^{1-\sigma} \hat{P}_j^{\sigma-1} \\ X'_{ij} &= \pi'_{ij} Y_j' \\ \hat{w}_i &= \sum_{j \in S} \pi'_{ij} Y_j \hat{w}_j / Y_i.\end{aligned}$$

Note that the interpretation of the data on Y_j and π_{ij} is not unique!

Let us rewrite the system as follows:

$$\begin{aligned}Y_j' &= Y_j \widehat{w}_j \\ \widehat{P}_j^{1-\sigma} &= \sum_{i \in S} \pi_{ij} (\widehat{\tau}_{ij} \widehat{w}_i)^{1-\sigma} \\ \pi_{ij}' &= \pi_{ij} (\widehat{\tau}_{ij} \widehat{w}_i)^{1-\sigma} \widehat{P}_j^{\sigma-1} \\ X_{ij}' &= \pi_{ij}' Y_j' \\ \widehat{w}_i &= \sum_{j \in S} \pi_{ij}' Y_j \widehat{w}_j / Y_i.\end{aligned}$$

Note that the interpretation of the data on Y_j and π_{ij} is not unique!

Hat Algebra and Import Tariffs

To see that the interpretation of the data is not unique, consider import tariff t_{ij} :

- ▶ Country i can charge imports from country j with tariff t_{ji}
- ▶ Let us reformulate total bilateral trade barriers as $\tau_{ij} = (1 + t_{ij})\kappa_{ij}$ where κ_{ij} capture natural trade barriers
- ▶ Further, let $Y_i = L_i w_i + T_i$ where T_i are tariff revenues
- ▶ Tariff Revenues can be calculated as: $T_i = \sum_j \frac{t_{ji}}{1 + t_{ji}} X_{ji}$
- ▶ The goods market clearing is: $L_i w_i = \sum_j \frac{1}{1 + t_{ij}} X_{ij}$

Hat Algebra and Import Tariffs

Using equations for tariff revenues and goods market clearing, we can specify the following:

$$L_i w_i = \sum_j \frac{1}{1 + t_{ij}} \pi_{ij} \frac{L_j w_j}{1 - s_j},$$

wher s_j is implicitly defined from:

$$Y_j = L_j w_j + \sum_i \frac{t_{ij}}{1 + t_{ij}} \pi_{ij} Y_j,$$

which implies that:

$$(1 - s_j) = \frac{L_j w_j}{Y_j}$$

What is the interpretation of s_j ?

Hat Algebra and Import Tariffs

Consider a policy change in import tariffs t_{ij} to t'_{ij} and let $E_i = L_i w_i$ in the benchmark, the hat algebra system can be rewritten as:

$$\begin{aligned}E'_j &= E_j \hat{w}_j \\ \hat{P}_j^{1-\sigma} &= \sum_{i \in S} \pi_{ij} (\hat{\tau}_{ij} \hat{w}_i)^{1-\sigma} \\ \pi'_{ij} &= \pi_{ij} (\hat{\tau}_{ij} \hat{w}_i)^{1-\sigma} \hat{P}_j^{\sigma-1} \\ \hat{w}_i E_i &= \sum_{j \in S} \frac{1}{1 + t'_{ij}} \pi'_{ij} \frac{E'_j}{1 - s'_j} \\ s'_j &= \sum_i \frac{t'_{ij}}{1 + t'_{ij}} \pi'_{ij}\end{aligned}$$

Given initial E_i and π_{ij} as well as exogenous shock to tariffs t'_{ij} , we can solve for \hat{w}_i .

Hat Algebra and Armington

- ▶ Use WIOD data for 2009 (total trade)
- ▶ Calculate how trade and welfare would change in response to a trade war between the US and China