Notes on Trade, Macro, and IO

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Chapter A

International Trade

A.1 Multinational Production

In this section, I summarize the multinational production literature that explicitly model the role of platform by multinational firms.These flows are important because

1. A large share of foreign affiliates' production is exported to other countries, beyond exports back to their parent countries (Tintelnot, 2017).
2. They also lead to interesting implications for commercial policy and for the welfare gains from trade and multinational production.

The main challenge for modeling export platforms is the ugly corner solutions for production, consumption, and trade. However, it is not surprising that, the same solution that EK (2002) provided for extending the Ricardian trade model to multiple countries is also helpful for the extension of the multinational production models to multiple countries: **A probabilistic structure based on the Frechet distribution.**

$$\Pr(Z_i(j) \leq z) = F_i(z) = \exp\Big(-T_i z^{-\theta}\Big) \tag{A.1.1}$$

where

- $T_i > 0$ governs the **location** of $F_i(z)$. Higher T_i implies higher productivity draw is more likely for any good j. "Absolute advantage."
- $\theta > 1$ determines the dispersion of productivity, where a higher θ means there is less dispersion (common across countries). "Comparative advantage."

A.1.1 "Trade, Multinational Production, and the Gains from Openness" (Ramondo and Rodríguez-Clare, 2013)

Motivation The existing literature on the gains from inter-country interactions studies **trade in goods**, and **MP/FDI** in isolation. The omission of combining these two interactions in analysis is important because trade agreements often combine tariff reductions and removal of barriers to MP.

Table A.1.1: Notations in (Ramondo and Rodríguez-Clare, 2013)

Notation	Meaning
$i = \{1, 2, 3, \cdots, I\}$	country of headquarter (parent)
$l = \{1, 2, 3, \cdots, I\}$	country of production
$n = \{1, 2, 3, \cdots, I\}$	country of destination
$d_{nl} \geq 1$	trade costs
$h^g_{li} \geq 1$	MP costs
$v \in [0, 1]$	tradable intermediate goods
$u \in [0, 1]$	non-tradable final goods

NOTES: $h^g_{li} \geq 1$ implies that home production is more efficient that those of foreign affiliates.

Some Notations

A.1.1.1 Model

MP Cost Unit cost of the MP input bundle for MP by i in l:

$$c_{li} = \left[(1-a)(c_l h_{li})^{1-\xi} + (a)(c_i d_{li})^{1-\xi} \right]^{\frac{1}{1-\xi}} \tag{A.1.2}$$

Productivity Distributions For a home country, she faces a vector $\mathbf{z}^s_i = (z_{1i}, z_{2i}, \cdots z_{Ii}), s = g, f$ that is drawn independently across goods and countries from a Multivariate Frechet distribution:

$$F_i\left(\mathbf{z}^s_i; T_i\right) = \exp\left[-T_i \left(\sum_{l=1}^{I} (z^s_{li})^{\frac{-\theta}{1-\rho}} \right)^{1-\rho} \right] \tag{A.1.3}$$

where ρ governs the correlation of productivity across production locations.

Equilibrium Analysis Final goods are non-tradable, so i must produce them in destination country n to obtain positive market share. Therefore, the price of final good u in n is

$$p^f_n(u) = \min_i \frac{c^f_{ni}}{z^f_{ni}}$$

As $z^f_{ni} \sim F(z)$, the share of expenditure by country n on final goods produced in country n with country i technologies is

$$\pi^f_{ni} = \frac{T_i (c^f_{ni})^{-\theta}}{\sum_j T_j (c^f_{nj})^{-\theta}} \tag{A.1.4}$$

Compared to non-tradable final goods, intermediate goods are tradable and can be imported from production countries that might differ from the home countries and destination countries ($i \neq l \neq n$).

The price of intermediate good v in n is

$$p_n^g(v) = \min_{i,l} \frac{c_{ni}^g d_{nl}}{z_{li}^g}, \quad d_{nl} \geq 1$$

where z_{li}^g is home-production technology. As $z_{li}^g \sim F(z)$, the share of expenditures by country n on intermediate goods produced in country l with country i technology is:

$$\pi_{nli}^g = \frac{T_i \left(\tilde{c}_{ni}^g\right)^{-\theta}}{\sum_j T_j \left(\tilde{c}_{nj}^g\right)^{-\theta}} \frac{\left(c_{li}^g d_{nl}\right)^{-\theta/(1-\rho)}}{\sum_k \left(c_{ki}^g d_{nk}\right)^{-\theta/(1-\rho)}} \tag{A.1.5}$$

where $\tilde{c}_{ni}^g = \left(\sum_k \left(c_{ki}^g d_{nk}\right)^{-\theta/(1-\rho)}\right)^{-(1-\rho)/\theta}$ This expression has a natural interpretation: The first term on the right-hand side is the share of expenditures that country n allocates to intermediate goods produced with country i's technologies independently of the location where they are produced, while the second term on the right-hand side is the share of these goods that are produced in country l.

A.1.2 Calibration

Chapter B

Econometrics

B.1 Shfit-Share Designs

B.1.1 "A Practical Guide to Shift-Share Instruments" (Borusyak, Hull, and Jaravel, 2024)

A recent econometric literature shows two distinct paths for identification with shift-share instruments, leveraging either many exogenous shifts (Borusyak, Hull, and Jaravel, 2022; Adão, Arkolakis, and Esposito, 2019) or exogenous shares (Goldsmith-Pinkham, Sorkin, and Swift, 2020).

This paper presents the core logic of both paths and practical takeaways.

B.1.2 ADH (2003)'s SSIV

The influential China shock paper by ADH constructs an instrumental variable with a shift-share structure:

$$\mathrm{SSIV}_i = \sum_k \text{emp share}_{i,k} \times \text{avg. of growth in Chinese import among non-US countries}_k \tag{B.1.1}$$

where k denotes industry and j denotes commuting zone.

B.1.3 Definition of SSIV

A shift-share structure follows

$$z_i = \sum_{k=1}^{K} \underbrace{s_{ik}}_{\text{Share}} \underbrace{g_k}_{\text{Shift}} \tag{B.1.2}$$

Remarks

- Shifts vary at a different level (e.g. industries) than the unit of analysis (e.g. local labor markets).

- Shares vary across units but are usually predetermined (e.g., employment shares are measured in a pre-period).
- To argue convincingly that SSIV are exogenous, one must explain what properties of the shifts and shares make z_i uncorrelated with ϵ_i (rather than simply stating $\text{Cov}[z_i, \epsilon_i] = 0$).
- $\sum_{k=1}^{K} s_{ik}$ is generally one. For incomplete share see Section B.1.4.

One strategy to ensure that the shift-share instrument z_i is exogenous is to have exogenous shift g_k. The key threat to identification in the exogenous shifts approach is the violation of the following condition: g_k **should be uncorrelated with an average of** ϵ_i **taken across units with weights** s_{ik}**.**

B.1.4 Incomplete Shift Share

In shift-share designs where the exposure shares $s_{i,k}$ do not add up to one, a special control must by included: the sum of shares, $S_i = \sum_k s_{i,k}$. This control remedies the bias arising from the correlation between S_i and the error.

B.1.5 A Checklist for the Shift-Based Approach

1. Thinking about what endogeneity bias is being addressed.
2. Bridge the gap between the observed and ideal shifts. Control for $\sum_k s_{ik} q_k$: shift-share aggregates of the industry-level confounders
3. Include the "incomplete share" control.
4. Lag shares to the beginning of the natural experiment.
5. Report descriptive statistics for shifts, such as mean and std. of z_i and g_k.
6. Implement balance tests for shifts in addition to the instrument.
7. Use correct standard errors.

Chapter C

Computational Economics

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