ECON 357

Lecture 1: Introduction

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Housekeeping issues

- No office hours (send me an email to meet).
- No TA, no problem sets, no exams.
- Classroom will be C24 (BOOTH, lower level, north side of the building), except on Oct 12 (TBA).
- Only mild usage of Chalk.

Introduction

- This class introduces recent models of international trade.
- We will study in details key theoretical and empirical papers.
- It is essential that you master techniques from these papers.

Grading

- Class participation (20%)
- Weekly reports on papers covered in class (40%)
- Oral presentations (40%)

What we *will* do in this class

1. Introduction: gravity equations, basic models of trade
2. Heterogeneous firms and trade
3. The size distribution of firms
4. Trade and labor
5. Outsourcing, FDI and off-shoring

What we *won't* do in this class

1. Trade policy (e.g. Bagwell in Stanford)
2. Open economy macro and international finance (e.g. Obstfeld in Berkeley)
3. More fun stuff (e.g. Nunn in Harvard)

Road map for this class

- Gravity equations: first pass at empirics
- Gravity equations: theory guided empirics

Gravity equations

- First documented by Tinbergen (1962).
- Trade between country A and B,

$$X_{AB}^t = \lambda_t \frac{\left(GDP_A^t\right)^\alpha \times \left(GDP_B^t\right)^\beta}{dist_{AB}^\gamma}$$

$$\ln X_{AB}^t = \ln \lambda_t + \alpha \ln GDP_A^t + \beta \ln GDP_B^t + \gamma \ln dist_{AB}$$

- Typical empirical estimates give $\alpha, \beta, \gamma \approx 1$.
- Typical $R^2 \approx 80\%$.

Border effect

- McCallum (AER 1995)
- Trade between US States and Canadian provinces

$$\ln X_{ij} = \ln \lambda + \alpha \ln GDP_i + \beta \ln GDP_j + \gamma \ln dist_{ij} + \delta \text{DUMMY}_{ij} + \varepsilon_{ij}$$

  with $\text{DUMMY}_{ij} = 1$ if i and j in Canada.
- Incredible finding: $e^{\delta} \approx 22$

Gravity with Gravitas

- Anderson and van Wincoop (AER 2003)
- Theory grounded estimation of gravity.
- Tariff equivalent of US-Canada border about 50% (large but not implausible).

Simple theoretical model:

- goods differentiated by country of origin (Armington assumption)
- endowmend economy (may be relaxed).
- identical homothetic preferences, approximated by CES.
- multiplicative trade costs (Samuelson's iceberg costs)
- perfect competition

- Optimal consumption given by:

$$\max_{c_{ij}} \left(\sum_i q_{ij}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$
$$\text{s.t. } \sum_i p_{ij} q_{ij} = Y_j$$

with σ the elasticity of substitution across goods.

Gravity with Gravitas

- Perfect competition $\Rightarrow p_{ij} = \tau_{ij} p_i$
- Bilateral exports: $X_{ij} = p_{ij} q_{ij}$
- Market clearing: $Y_i = \sum_j X_{ij}$

Gravity with Gravitas

- Isoelastic demand:

$$X_{ij} = \left(\frac{\tau_{ij} p_i}{P_j} \right)^{1-\sigma} Y_j$$

$$\text{with } P_j = \left(\sum_i (\tau_{ij} p_i)^{1-\sigma} \right)^{\frac{1}{1-\sigma}}$$

Gravity with Gravitas

Proposition

If trade costs are symmetric $(\tau_{ij} = \tau_{ji})$ *then,*

$$X_{ij} = \frac{Y_i Y_j}{Y^W} \left(\frac{\tau_{ij}}{P_i P_j} \right)^{1-\sigma}$$

with the price indices solution to,

$$P_j^{1-\sigma} = \sum_i s_i \left(\frac{\tau_{ij}}{P_i} \right)^{1-\sigma}, \ \forall j.$$

Notes:

1. X_{ij}, Y_i, Y_j, Y_W observable
2. $(\tau_{ij})^{1-\sigma}$ can be estimated through OLS with fixed effects
3. Then P_i's can be recovered

Main predictions

Proposition

$$X_{ij} = \frac{Y_i Y_j}{Y^W} \left(\frac{\tau_{ij}}{P_i P_j} \right)^{1-\sigma}$$

- Size matters: larger (richer) countries import more and export more.
- Trade barriers matter: bilateral trade barriers (τ_{ij} large) reduce trade.
- Novel prediction: for given bilateral trade barriers, more "remote" countries import (and export) less.
- Key ingredient: price indices depend on relative sizes and relative trade barriers.

Border effect

Proposition

i and j are in the same country, k in another: $\tau_{ij} = b \times \delta_{ij}$, $\tau_{ik} = \delta_{ik}$

$$\frac{X_{ij}}{X_{ik}} = \frac{\frac{Y_i Y_j}{Y^W}\left(\frac{\tau_{ij}}{P_i P_j}\right)^{1-\sigma}}{\frac{Y_i Y_k}{Y^W}\left(\frac{\tau_{ik}}{P_i P_k}\right)^{1-\sigma}} = \frac{Y_j}{Y_k}\left(\frac{\delta_{ij}}{\delta_{ik}}\right)^{1-\sigma} b^{\sigma-1}\left(\frac{P_j}{P_k}\right)^{\sigma-1}$$

- Canada is a small country that buys mostly (expensive) foreign goods.
- The US is a large country that buys mostly (cheap) local goods.

$$P_{Ca} > P_{US}$$

- Canada trades more with itself than the US does,

$$\frac{X_{Ca',Ca}/X_{Ca',US}}{X_{US',US}/X_{US',Ca}} = \left(\frac{P_{Ca}}{P_{US}}\right)^{2(\sigma-1)} > 1$$

Estimation strategy

Proposition

$$X_{ij} = \frac{Y_i Y_j}{Y^W} \left(\frac{\tau_{ij}}{P_i P_j} \right)^{1-\sigma}$$

- Assume only distance and border matter for trade costs,

$$\tau_{ij} = b_{ij}^{(1-\text{DUMMY}_{ij})} \times dist_{ij}^{\rho}$$

- Estimate the following equation,

$$\ln \frac{X_{ij}}{Y_i Y_j} = k + (1-\sigma)\rho \ln dist_{ij} + (1-\sigma) \ln b_{ij} \left(1 - \text{DUMMY}_{ij}\right) - \ln P_i^{1-\sigma} - \ln P_j^{1-\sigma} + \varepsilon_{ij}$$

$$\text{s.t. } P_j^{1-\sigma} = \sum_i s_i \times dist_{ij}^{\rho(1-\sigma)} b_{ij}^{(1-\sigma)(1-\text{DUMMY}_{ij})} \times P_i^{\sigma-1}, \ \forall j$$

Note: alternative strategy

Proposition

$$X_{ij} = \frac{Y_i Y_j}{Y^W} \left(\frac{\tau_{ij}}{P_i P_j} \right)^{1-\sigma}$$

- Estimate $\widehat{\tau_{ij}^{1-\sigma}} = \widehat{\varepsilon_{ij}}$ from,

$$\ln \frac{X_{ij}}{Y_i Y_j} = \alpha + \alpha_i + \alpha_j + \varepsilon_{ij}$$

- Solve for the $P_i \left(\widehat{\tau} \right)$'s solution to,

$$P_j^{1-\sigma} = \sum_i s_i \times \widehat{\tau_{ij}^{1-\sigma}} \times P_i^{\sigma-1}, \ \forall j$$

- Note: with $\widehat{P_i} = \widehat{\alpha}_i$, possible to test:

$$P_i \left(\widehat{\tau} \right) = \widehat{P_i}$$

Results

- $(1-\sigma)\,\rho \approx .8$, instead of 1.5 in McCallum.
- Border effect:

$$b_{US-Can} - 1 = \begin{cases} 50\% \text{ for } \sigma = 5 \\ 10\% \text{ for } \sigma = 10 \end{cases}$$

- Canada trades 10.7 times with itself than with the US (McCallum: 22 times)
- US trades 2.24 times more with itself than with Canada.

Gravity beyond trade

- Gravity holds for trade in assets, bonds or equity (Portes and Rey 2005)

$$Inv_{ij} = \lambda \frac{MktCap_i \times MktCap_j}{Dist_{ij}}$$

- Gravity holds within countries (Combes, Lafourcade and Mayer 2005)
- Gravity holds for FDI (Ramondo 2008)

Gravity beyond distance

Other determinants of bilateral trade flows:

- Common currency
- Trade agreement
- Common language, religion, legal system
- Common border
- Colonial ties
- Social networks
- Business networks
- ...etc