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Applied Analysis of Trade Data for Policies and Negotiations

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Plan of talk

- **Introduction**

1. **Trade flows** and trade overlap: SITC
2. **Industry characteristics**: ISIC
3. **Country characteristics** in applied trade analysis
4. **Factor flows** and investment overlap
5. **Applied analysis** for trade negotiations
    1. A simple static PE model…
    2. …and a numerical illustration: 1996 EU beef protection

- **Wrap-up**

Aim and learning outcomes

- **Aim**: to characterise the data, sources, concepts and models used in applied analysis of trade policies
- **Learning outcomes**
  - describe the *data* commonly used in applied analysis of trade
  - know the currently available *sources* (websites) of such data
  - clarify the differences in major trade/industry *classifications*
  - define the key *concepts* employed in the study of trade/factor flows across national borders
  - present and illustrate a basic *model* which could be used for analysis of trade policies and negotiations

Internationally comparable data on trade flows: SITC

- Principal **source**: United Nations
  - UN International Computing Center (UNICC, http://www.unicc.org/)
  - UN Statistics Division (UNSD, http://www.un.org/Depts/unsd/)
- Member countries provide trade data to UN according to the Standard International Trade Classification (**SITC**) system
  - consists of *increasingly disaggregated* levels of *product* categories => revisions occur as new categories are added – BHV, T.A.1, p. 598
  - current version: *Revision 3* (http://pacific.commerce.ubc.ca/trade)
    - 10 1-digit *sections*: 0-4 comprise agricultural products and raw materials, 5-8 semi-finished and finished manufactured goods, 9 special transactions
    - 75 2-digit *divisions*
    - 265 3-digit *groups*
    - 1038 4-digit *subgroups*
    - 3126 5-digit *items*
  - SITC: *product*-based, not *industry*-based => each category involves some aggregation of products of different industries => empirical problems

Trade reporting systems

- **Two recording systems** used: the *difference* is in defining the *statistical* boundary => in excluding *entrepôt* trade (see below)
  1. *General* trade system (G): *national* frontier crossed
  2. *Special* trade system (S): *customs* boundary crossed
- ***Recorded* exports** consist of *national* exports (1. + 2. below) and *re*-exports (3. + 4. below)
  1. exports of national products (G and S)
  2. exports from customs-bonded **manufacturing plants** (G and S)
  3. nationalised exports (G and S)
  4. exports *from* customs-bonded **warehouses** and **free areas** (G but not S)
- ***Recorded* imports** include
  1. imports entering directly for home consumption or use (G and S)
  2. imports into customs-bonded **manufacturing plants** (G and S)
  3. imports *into* (G) / *withdrawn (inward) from* (S) customs-bonded **warehouses** and **free areas**

Trade data sources

- **Comprehensive** commodity trade data bases
  - UN *COMTRADE* data base (http://unstats.un.org/unsd/comtrade/) => extracts *published* in
    - *UN Yearbook of International Trade Statistics* (CD) and
    - *UN Commodity Trade, Series D* (microfiche): more detailed in terms of both commodity level and partner country
  - *Stat*istics *Can*ada (http://www.statcan.org): licensed to sell UN data (CD)
  - US National Science Foundation *Bowen-Feenstra-Lipsey Project* (CD and NBER WP: http://www.nber.org/papers/W5910) extends StatCan data (1980-1992) backwards (to 1970-1992)
- Commodity trade data bases for **member countries**
  - IMF (http://www.imf.org) *Direction of Trade* (CD): aggregate flows
  - OECD (http://www.oecd.org) *Import-Export Microtables* (microfiche): disaggregated data to the 5-digit SITC level
  - *Euro*pean *Stat*istical Agency (http://europa.eu.int/comm/eurostat) *COMEXT* data base (CD, *Monthly Bulletin*, *Statistical Yearbook*)

Key trade characteristics by country

- **Trade dependence:** $TD_i \equiv \frac{FT_i}{GDP_i} \equiv \frac{X_i+M_i}{GDP_i}$
- **Revealed** (vs theoretical) **comparative advantage:** $RCA_{ij} \equiv \frac{\frac{X_{ij}}{X_{wj}}}{\frac{X_i}{X_w}}$
- An empirical proxy for the theoretical concept of *intra-industry trade* from preceding lectures is **trade overlap** ≡ the value of *matching* export and import transactions of a country i in a given commodity j: $TO_{ij} \equiv (X_{ij} + M_{ij}) - |X_{ij} - M_{ij}| \equiv FT_{ij} - |NX_{ij}|$
- a summary measure of the *degree* of trade overlap is the **Grubel-Lloyd index**: b/n 0% (no) and 100% (complete) overlap:

$$GL_{ij} \equiv \frac{TO_{ij}}{X_{ij}+M_{ij}} \times 100 \equiv \frac{(X_{ij}+M_{ij})-|X_{ij}-M_{ij}|}{X_{ij}+M_{ij}} \times 100 \equiv \left(1 - \frac{|X_{ij}-M_{ij}|}{X_{ij}+M_{ij}}\right) \times 100$$

Internationally comparable data on industry characteristics: ISIC

- **Production** and **input-output** (I-O) *data* are published according to the International Standard Industry Classification (**ISIC**)
  - UN Industrial Development Organisation (**UNIDO,** http://www.unido.org): annual data on *production* and *expenditure on factor inputs* in its *International Yearbook of Industrial Statistics* (CD)
  - OECD (http://www.oecd.org)
    - *St*ructural *An*alysis (**STAN**) data base: *similar* data, 49 sectors
    - *Input-Output* (**I-O**) data base: 10 countries, 36 sectors
  - Global Trade Analysis Project (**GTAP)** network hosted at Purdue University (http://www.gtap.agecon.purdue.edu/): *I-O* tables by country for 37 sectors
- A **concordance** provides a *link* b/n systems of classification: UN provides such concordances b/n SITC and ISIC
  - 4-digit level of ISIC *roughly* matches 3-digit level of SITC => empirical studies routinely adopt SITC *groups* as equivalent to ISIC *industries*
  - however, the mapping is *not one-to-one*: a given SITC category may contain products by *several* ISIC industries – BHV, T.A.2, p. 602

Linked trade and production data: ISIC

- UNIDO (http://www.unido.org)

  Commodity Balance Statistics data base: contains
  - exports
  - imports
  - and *apparent* consumption (production + imports – exports)

  for commodities defined at the 6-digit level of ISIC
- OECD (http://www.oecd.org)

  Compatible Trade and Production (COMTAP) data base: links
  - exports
  - imports
  - and production flows

  at the 3-digit ISIC level for 1970-1986

Internationally comparable data on country characteristics

- UN *Yearbook of National Account Statistics*
- UN ILO *Yearbook of International Labour Statistics*
  - data classified according to the *International Standard Classification of Occupations* (ISCO) – BHV, T.A.3, p. 607
  - *wage differential* measures (of human capital): industry wage average relative to national wage average
  - *educational attainment* (of human capital): % of population per level of education via (10-yr) population censuses or (5-yr) labour force surveys
- UN FAO *Production Yearbook*: data on (the economic importance of) land
- WB *World Tables* (http://www.worldbank.org/trade/)
- IMF *International Financial Statistics*

Factor flows

- Trade **models** routinely assume that, unlike goods, factors of production are *internationally immobile*
- However, in **reality** this is *not necessarily* the case
  - **labour** flows: *migration* across national boundaries
  - **capital** flows: *private investment* across national boundaries
    - *direct* investment (FDI): profitability and ownership motives
    - *portfolio* investment: asset diversification and risk reduction motives
- **Investment overlap**, or *intra-industry FDI*
  - index b/n 0% (no) and 100% (complete) overlap for country i in industry g
  - O_{ig}: # of *foreign* subsidiaries of *home* parent firms, I_{ig}: *reverse*

$$IIFDI_{ig} \equiv \frac{(O_{ig}+I_{ig})-|O_{ig}-I_{ig}|}{O_{ig}+I_{ig}} \times 100 \equiv \left(1-\frac{|O_{ig}-I_{ig}|}{O_{ig}+I_{ig}}\right) \times 100$$

Applied analysis for trade negotiations: problems in GE trade policy modelling

- Any change to international trading regimes should ideally be analysed in a highly **disaggregated DGEMs**
  - **disaggregation** of sectors and commodities is essential since relevant trade policies differ vastly *from market to market*
  - a **dynamic** approach is important because shifts in resource use do *not* take place instantaneously or costlessly
  - a **general equilibrium** (GE) approach is warranted because resources are reallocated *across* sectors and industries
- However, this approach is **not tractable** => 2 sectors/industries: theoretical (C)GEMs are *of limited use* when considering major changes in trade regimes such as multilateral trade liberalisation
  - mostly because they exhibit high degree of aggregation
  - and incorporate ad-hoc specifications for functional relationships

Applied analysis for trade negotiations: trade policy modelling in static PE

- Hence, it is necessary and desirable to apply an *alternative* and *complementary* approach: **static PE –** GK, Fig. 2.1, p. 26
  - a market (i.e., a GEM *building block*) is viewed *in isolation*
  - paths of adjustment (i.e., *dynamics*) are *ignored*
  - *pre*- vs *post*-change equilibria are compared (i.e., *comparative statics*)
- For many economic questions, the **insights** gained from simple static PE analysis are *acceptable compromises*, insofar the loss of information that arises from ignoring

Applied analysis for trade negotiations: policy and price changes

- Informational requirements (i.e., needed data)
  - *initial* (physical) **quantities**: q_{s0}, q_{d0}, x_0, m_0
  - *initial* (physical) ***net*** **exports**: $nx_0 \equiv q_{s0} - q_{d0} \equiv x_0 - m_0$
  - *initial* **prices** and government **policy** (*trade*, *production* and *consumption*) measures: $P_{w0}, P_{d0}, P_{s0}, TM_0, CM_0, PM_0$
  - *initial* **demand prices**: $P_{d0} \equiv P_{w0} + TM_0 + CM_0$
  - *initial* **supply prices**: $P_{s0} \equiv P_{w0} + TM_0 + PM_0 \equiv P_{d0} - CM_0 + PM_0$
  - **policy** *changes*: $\Delta TM, \Delta CM, \Delta PM$
  - **price** *changes*: $\Delta P_d \equiv \Delta TM + \Delta CM \Rightarrow P_{d1} \equiv P_{d0} + \Delta P_d$
    $\Delta P_s \equiv \Delta TM + \Delta PM \Rightarrow P_{s1} \equiv P_{s0} + \Delta P_s$

Applied analysis for trade negotiations: quantity and government revenue changes

- *price* **elasticities**:

$$\varepsilon_d \equiv -\frac{\frac{\Delta q_d}{q_{d0}}}{\frac{\Delta P_d}{P_{d0}}} \qquad \varepsilon_s \equiv \frac{\frac{\Delta q_s}{q_{s0}}}{\frac{\Delta P_s}{P_{s0}}}$$

- **quantity** *changes*:

$$\Delta q_d \equiv -\varepsilon_d \times \frac{\Delta P_d}{P_{d0}} \times q_{d0} \Rightarrow q_{d1} \equiv q_{d0} + \Delta q_d$$

$$\Delta q_s \equiv \varepsilon_s \times \frac{\Delta P_s}{P_{s0}} \times q_{s0} \Rightarrow q_{s1} \equiv q_{s0} + \Delta q_s$$

$$\Delta nx \equiv \Delta q_s - \Delta q_d \Rightarrow nx_1 \equiv nx_0 + \Delta nx$$

- *change* in *net* ***government*** **revenue**:

$$GR_0 \equiv CM_0 \times q_{d0} + PM_0 \times q_{s0} + TM_0 \times nx_0$$

$$GR_1 \equiv CM_1 \times q_{d1} + PM_1 \times q_{s1} + TM_1 \times nx_1$$

$$\Delta GR \equiv GR_1 - GR_0$$

Applied analysis for trade negotiations: welfare changes (see GK, Fig. 2.1, p. 26)

- *change* in ***consumer*** **surplus**

Fig. 2.1(a), loss $\Delta CS \equiv \Delta P_d \times q_{d0} - \frac{1}{2}\Delta P_d \times \Delta q_d = \Delta P_d \times q_{d0} - \frac{1}{2}\Delta P_d \times \underbrace{\left(-\varepsilon_d \times \frac{\Delta P_d}{P_{d0}} \times q_{d0}\right)}_{\Delta q_d}$

$$\Delta CS \equiv \Delta P_d \times q_{d0}\left(1 + \frac{1}{2} \times \varepsilon_d \times \frac{\Delta P_d}{P_{d0}}\right)$$

- *change* in ***producer*** **surplus**

Fig. 2.1(b), gain $\Delta PS \equiv \Delta P_s \times q_{s0} + \frac{1}{2}\Delta P_s \times \Delta q_s = \Delta P_s \times q_{s0} + \frac{1}{2}\Delta P_s \times \underbrace{\varepsilon_s \times \frac{\Delta P_s}{P_{s0}} \times q_{s0}}_{\Delta q_s}$

$$\Delta PS \equiv \Delta P_s \times q_{s0}\left(1 + \frac{1}{2} \times \varepsilon_s \times \frac{\Delta P_s}{P_{s0}}\right)$$

- *change* in ***total*** **surplus** (i.e., in *social welfare*)

$$\Delta TS \equiv \Delta GR + \Delta CS + \Delta PS$$

Applied analysis for trade negotiations: 1996 EU beef protection numerical example

- EU intervention price: 4411 USD-equivalent per tonne
- OECD: 102% protection => 2184 USD “world” price (inferred)
- EU beef output: 7.950 mln tonnes; EU net exports: 0.708 mln => EU consumption: 7.242 mln
- assumed demand elasticity: -0.85 => removal of EU price support would have generated an increase of 10.35 mln tonnes in EU beef consumption
- assumed supply elasticities: 0.2 (SR) and 1.5 (LR) => EU output would have fallen to 7.147 and 1.929 mln tonnes, respectively
- EU would have switched to net imports of 3.203 and 8.42 mln tonnes in SR and LR, respectively
- EU consumer surplus would have been 19.589 bln USD p.a.
- EU producer surplus would have fallen by 16.811 bln USD in SR and by 11.001 in LR => loss of rents on inputs used intensively in beef production
- EU budgetary saving would have been 1.577 bln p.a.
- Efficiency gain (i.e., increase in total surplus) would have been 4.354 bln USD in the initial year (i.e., in SR) and would have eventually (i.e., in LR) approached 10.165 bln USD

Concluding wrap-up

- **What have we learnt?**
  - what the key *sources* of trade data are
  - what *classifications* of data for trade/industry analysis exist
  - how *intra-industry* trade and FDI are empirically measured
  - how *trade policies* could be *modelled*, and *quantified*, in a simple way when analysing reforms or trade negotiations
- **Where we go next**: to understanding the process of *globalisation* and related issues of WTO treatment of *labour standards* and *environmental protection*