Trade Flows and Trade Policy Analysis

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Analyzing trade flows

Content

a. Overview and learning objectives

b. Analyzing trade flows

c. Databases

a. Overview and learning objectives

- Main techniques used for trade data analysis
- Overview of trade indicators and of the databases needed to construct them
- Challenges in collecting and analyzing the data, such as measurement errors or aggregation bias

b. Analyzing trade flows

- Descriptive statistics in trade are typically needed to picture the trade performance of a country:
  i. How much does a country trade
  ii. What does it trade
  iii. With whom

1. “How much”

- This question is intimately related to the concept of "trade openness", which typically measures the economy’s ability to integrate in world trade circuits
- Another measure of the integration of a country into the world economy is the extent to which it is involved in global value chains

2. “What”

- Trade patterns are determined by a country’s endowment of productive factors and the technology used (comparative advantage in standard trade model)
- Other reasons for trade are love for variety w/ economies of scale, market structure w/ reciprocal dumping
- Some of the underlying factors that give rise to trade are exogenously given by nature (geography), others are the result of policies (e.g. physical and human capital)
- The question of "What" is also directly linked to the question of diversification of a country’s exports, a subject of concern for many governments

3. “With whom”

- The characteristics of a country's trading partners affect how much it will gain from trade
  - For instance, trade links with growing and technologically sophisticated markets can boost domestic productivity growth
- So it matters to know who the home country’s "natural trading partners" are
  - Typically, this depends on geography, infrastructure and other links, such as historical ties
  - A full discussion of the determinants of bilateral trade is the subject of gravity equations. In this discussion, we will limit ourselves to descriptive measures of the geographical composition of a country’s foreign trade and its complementarity with partners

Overall openness

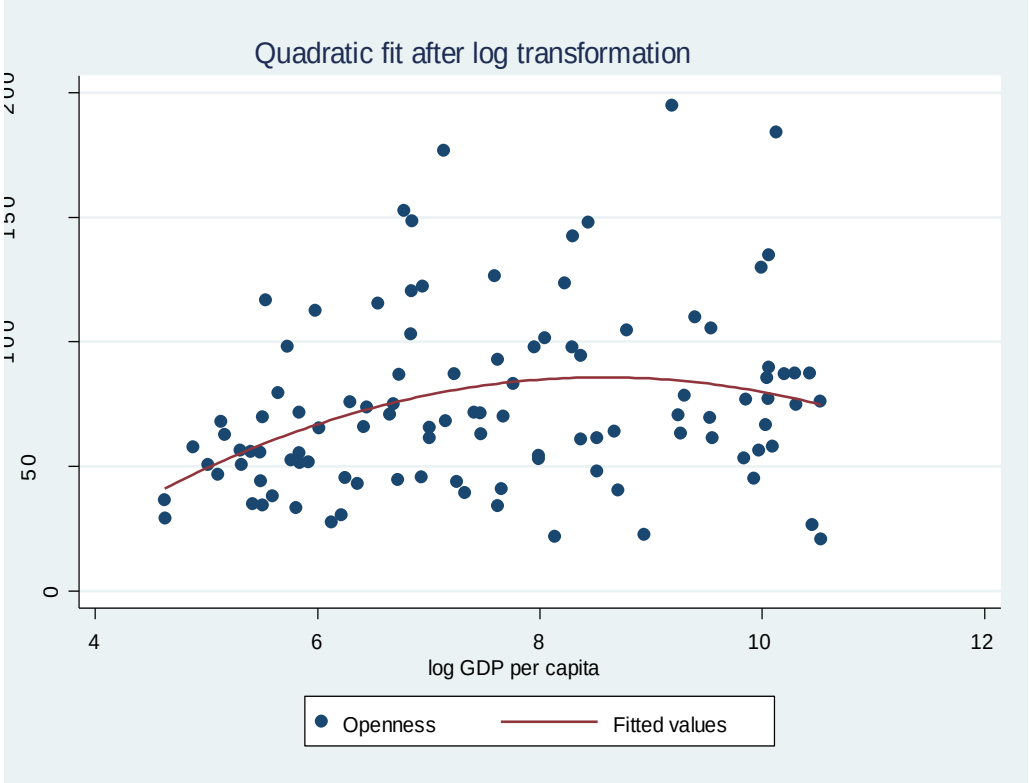
a. Trade over GDP measure

- Let X^i, M^i and Y^i be respectively country *i*'s total exports, total imports and GDP. Country *i*'s openness ratio is defined as

$$O_t^i = \frac{X_t^i + M_t^i}{Y_t^i}$$

- The higher O^i, the more open is the country. For small open economies like Singapore, it may even be substantially above one
- The Penn World Tables (PWT) include this measure of openness for a large number of years
- Can we use O^i as such for cross-country comparisons?
- No, because it is typically correlated with several country characteristics
- For instance, O^i varies systematically with levels of income

a. Trade over GDP measure (ct'd)



Source: Authors' calculations from WDI

a. Trade over GDP measure (ct'd)

- Does it matter that openness correlates with country characteristics such as the level of income?
- Yes, for two reasons:

1. Because "raw" openness embodies information about other country characteristics, it cannot be used for cross-country comparisons without adjustment

- For instance, Belgium has a higher ratio of trade to GDP than the United States…but this is mainly because the U.S. is a larger economy and therefore trades more with itself
- If we want to generate meaningful comparisons, we will have to control for influences, such as economic size, which we think are not interesting for the openness ratio. This can be done with regression analysis

a. Trade over GDP measure (ct'd)

2. Suppose that one wants to assess econometrically the influence of openness on growth

- The measure of openness used as an explanatory variable in the regression analysis will have to be cleaned from influences that may embody either *reverse causality* (from growth to openness) or *omitted variables* (such as the quality of the government or institutions, which can affect both openness and growth)
- In order to get rid of endogeneity bias in growth/openness regression, one must adopt an identification strategy consisting of using instrumental variables which correlate with openness but do not influence income except through openness
- For instance, Frankel and Romer (1999) used distance from trading partners and other so-called "gravity" variables as instrumental variables
- Using this strategy, they found that openness indeed has a positive influence on income levels
- Another route consists of using measures of openness based on policies rather than outcomes

b. Import content of exports and external orientation

- The import content of exports is a measure of the outward orientation of an exporting industry
- The imported input share of industry *k* can then be calculated as

$$IIS_{kt} = \frac{\sum_{j=1}^{J} \mu_{jt} z_{jk}}{y_{kt}}$$

- $\mu_{jt} = m_{jt}/c_{jt}$, is the import-penetration ratio of good *j* (m_{jt} is imports of good *j* and c_{jt} is domestic consumption)
- z_{jk} is industry *k*'s consumption of good *j* as an intermediate (from IO table)
- y_{kt} is industry *k*'s output

b. Import content of exports and external orientation (ct'd)

- The net external orientation of industry *k* is the difference between the traditional export ratio (or "openness to trade" index, x_{kt}/y_{kt}) and the imported input share

$$NEO_{kt} = \frac{x_{kt}}{y_{kt}} - IIS_{kt}$$

- In practice, these measures are rather difficult to calculate because of heavy data requirement (especially input-output tables and production data)

c. Trade in intermediate goods

- There are two measures proposed in the literature to measure offshoring, both based on input-output tables:

1. Offshoring measure suggested by Feenstra and Hanson (1996) is the ratio of imported intermediate inputs used by an industry to total (imported and domestic) inputs

2. Index of vertical specialization proposed by Hummels et al. (2001) is the value of imported intermediate inputs embodied in exported goods

Trade composition

a. Sectoral and geographical orientation of trade

- The sectoral composition of a country's trade matters
- It matters for growth if some sectors are drivers of technological improvement
- Moreover, constraints to growth may be more easily identified at the sectoral level

1. Sectoral orientation of trade

- Share of product *j* in total exports of country *i*
- Stata application from WITS trade indicators

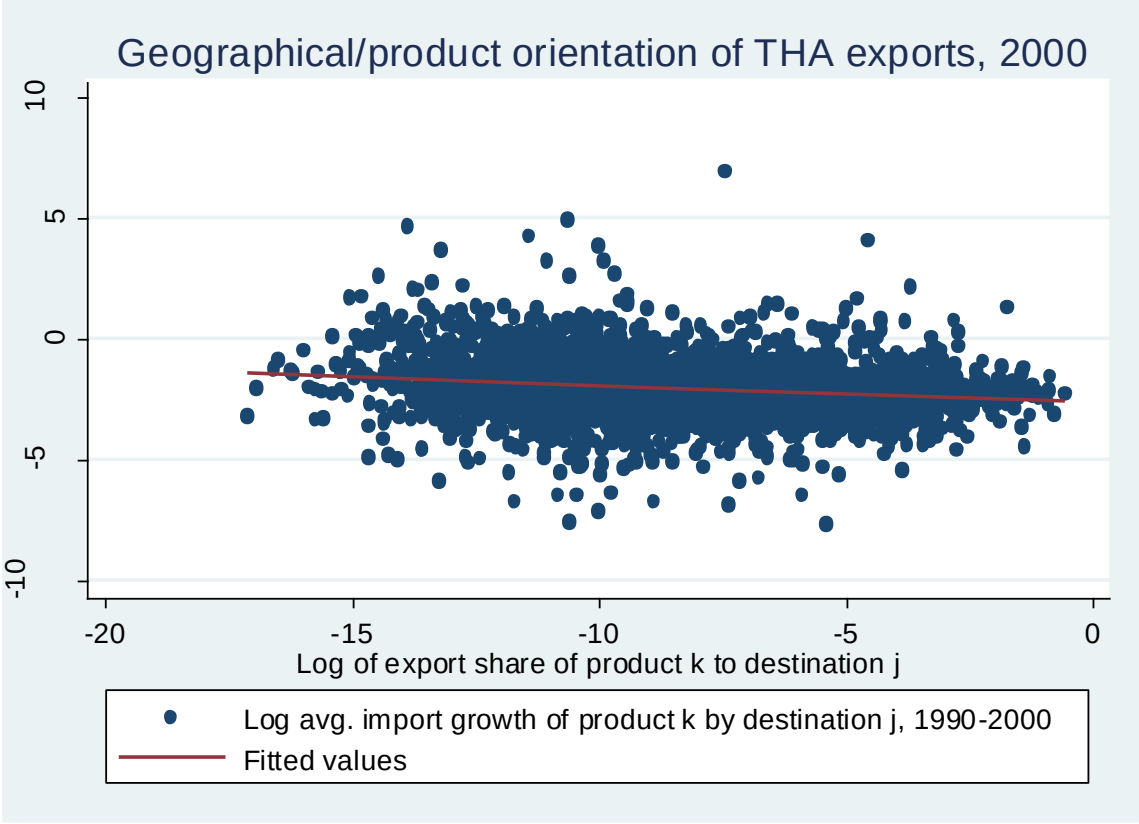
2. Geographical orientation of trade

- Share of exports sold in country *c* in total exports of country *i*
- Stata application from WITS trade indicators

a. Sectoral and geographical orientation of trade (ct'd)

- Using a dataset with sector-level bilateral trade data, we can construct indexes for the share of each sector/country in a country's total exports/imports

- One can go a step further and assess to what extent a country's export orientation is favorable, i.e. to what extent the country exports in sectors and toward partners that have experienced a faster import growth



Stata

b. Intra-industry trade

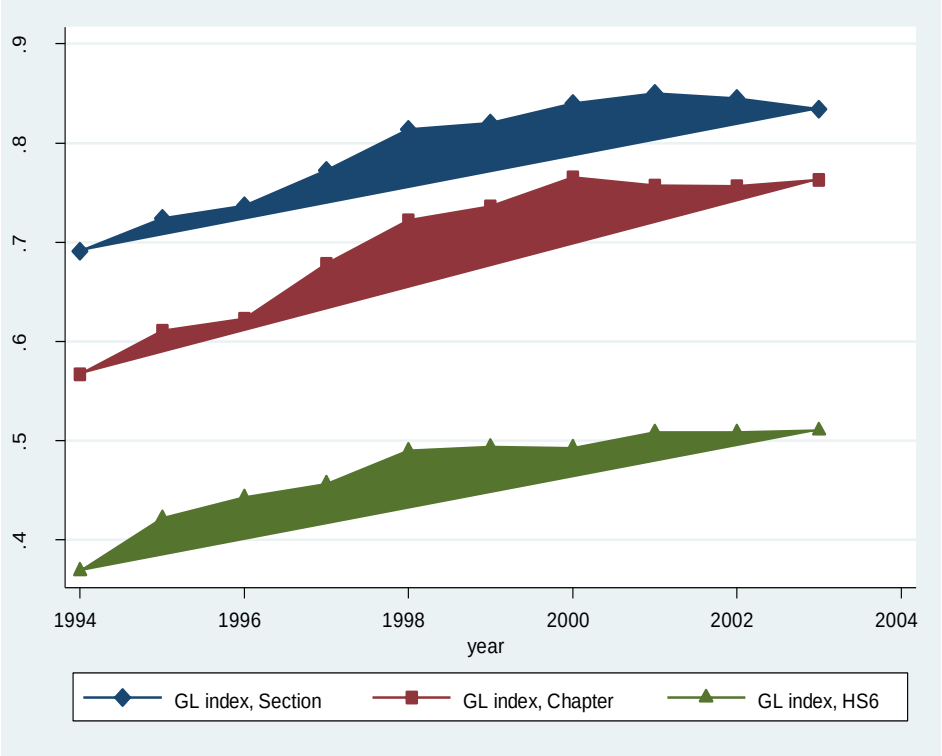
- For many countries, a large part of international trade takes place within the same industry, even at high levels of statistical disaggregation
- A widely used measure of the importance of intra-industry trade is the Grubel-Lloyd (GL) index

$$GL_{k}^{ij} = 1 - \frac{\left| X_{k}^{ij} - M_{k}^{ij} \right|}{X_{k}^{ij} + M_{k}^{ij}}$$

- The GL index ranges between zero and one
- If, in a sector, a country is either only an exporter or only an importer, the second term will be equal to unity and, hence, the index will be zero, indicating the absence of intra-industry trade
- If in this sector a country both exports and imports, the index will be closer to one the more similar in value imports and exports are
- High values of the GL index are consistent with the type of trade analyzed in, say, Krugman's monopolistic-competition model

b. Intra-industry trade (ct'd)

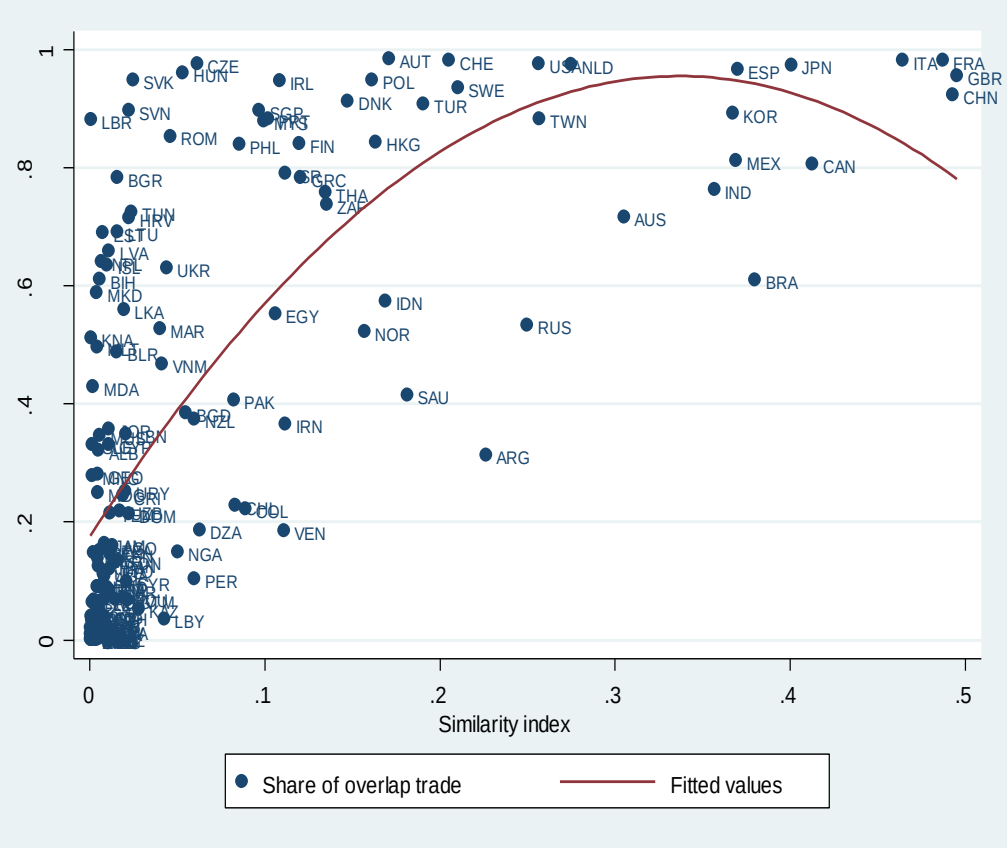
- GL indices should however be interpreted cautiously
- First, they are lower when calculated at more detailed levels of product aggregation, so comparisons require calculations at similar levels of aggregation



- Second, unless calculated at extremely fine degrees of disaggregation, GL indices can pick up "vertical trade", a phenomenon that can reflect comparative advantage rather than monopolistic competition

b. Intra-industry trade (ct'd)

- Typically, similar countries (in terms of economic size, i.e. GDP) share more intra-industry trade with each other



Note: The trade overlap index measures two-way intra-industry trade

c. Export diversification/concentration

- Export concentration in primary products has often been highlighted as a major drawback for development
- Prebisch (1959) argued that primary product dependence caused:
  - volatile terms of trade
  - slow productivity growth
  - relatively low value added
- Lederman and Maloney (2007) find that any negative impact of resource abundance (net natural resource exports per worker) on growth relates to the high export concentration that is typical of resource exporters

c. Export diversification/concentration (ct'd)

- Export diversification has the potential to reduce the dependence on fluctuating commodity prices and "export riskiness"
- Diversification into other technology-intensive sectors can trigger knowledge spillovers from the exposure to international markets, management and marketing practices, and production processes
- Diversification at the extensive margin (new products or exporters) reflects "export entrepreneurship" and, in that sense, is useful evidence on the business climate

c. Export diversification/concentration (ct'd)

- However, one should be careful in taking diversification as a policy objective per se
- For example, diversification has often been justified to avoid the so-called "natural resource curse" (a negative correlation between growth and the importance of natural resources in exports). However, whether the curse is real or a statistical illusion has recently become a matter of controversy
- Increasing levels of export diversification do not guarantee by themselves higher levels of growth

- See Cadot et al. (2011) and the literature cited therein

c. Export diversification/concentration (ct'd)

- The simplest measure of export concentration in the Herfindahl concentration index

$$h^i = \sum_k \left(s_k^i\right)^2$$

- Where s_k^i is the share of sector *k* in country *i*'s total exports or imports

- The Herfindahl index is sometimes normalized to range from zero to one, in which case it is referred to as Normalized Herfindahl index

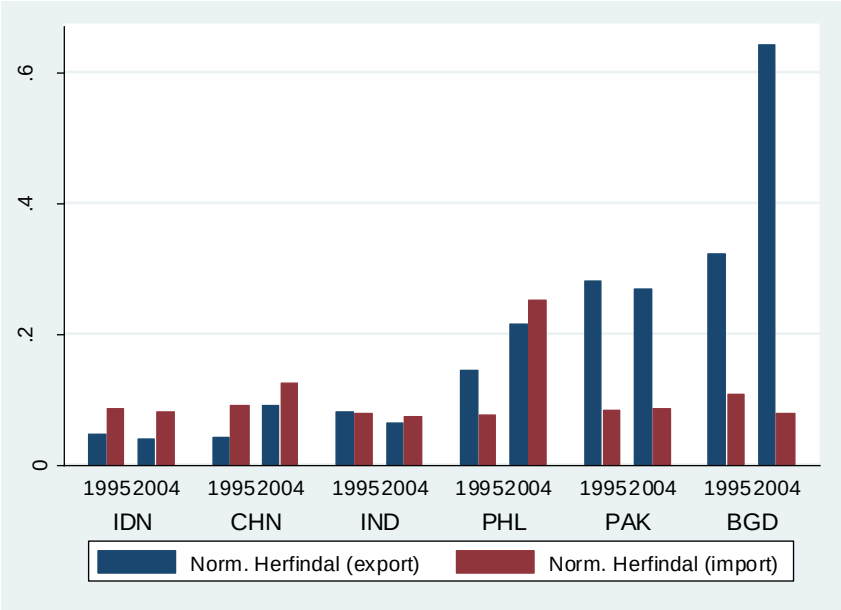
$$nh^i = \frac{h^i - 1/K}{1 - 1/K}$$

Where *K* is the number of producs exported or imported

- Alternative measures of concentration are the Gini index or the Theil index

c. Export diversification/concentration (ct'd)

- The higher the Herfindahl index, the more concentrated exports or imports are in a few sectors



- Observe that the indices are higher on the export side than on the import side for Pakistan and Bangladesh, whose export structures are rather concentrated on textile and apparel
- Notice that Herfindahl indexes are large for countries heavily depending on oil exports. For instance, the (normalized) index for Nigeria in 2003 was 0.63 (Comtrade data, Stata)

c. Export diversification/concentration (ct'd)

- The World Bank proposes an export diversification index

$$DX^{i} = \frac{\sum_{k} \left| X_{k}^{i} - X_{k} \right|}{2}$$

Where X_k^i is the share of sector k in country i's total exports and X^i is the share of good k in world exports

- Available at WITS
- Stata

c. Export diversification/concentration (ct'd)

- If concentration indices such the Herfindahl index are calculated over active export lines only, they measure concentration/diversification at the *intensive margin*
- Diversification at the *extensive margin* can be measured by counting the number of active export lines
- One drawback of measuring diversification by just counting active export lines is that whether a country diversifies by starting to export crude petroleum or mules, asses and hinnies is the same: one export line is added (at a given level of product disaggregation)
- Hummels and Klenow (2005) have proposed a variant where new export lines are weighted by their share in world trade
- Then, starting to export a million dollar worth of crude counts more than starting to export a million dollar worth of asses, because the former is more important in world trade (and therefore represents a stronger expansion potential)

c. Export diversification/concentration (ct'd)

- Intensive margin

$$IM^{i} = \frac{\sum_{\Omega^{i}} X_{k}^{i}}{\sum_{\Omega^{i}} X_{k}^{W}}$$

Where Ω^i is the set of products exported by country *i*, X_k^i the value of *i*'s exports of product *k* to the world, and X_k^W the value of world exports of product *k*

  - *IM* is *i*'s market share in products belonging to *i*'s export

- Extensive margin

$$EM^{i} = \frac{\sum_{\Omega^{i}} X_{k}^{W}}{\sum_{\Omega^{W}} X_{k}^{W}}$$

Where Ω^W is the set of all traded products

  - *EM* is the share of products belonging to *i*'s export portfolio in world trade

c. Export diversification/concentration (ct'd)

- Intensive and extensive margins can also be computed with geographical dimension
  - Products extensive margin: *i*'s market share in countries where *i* exports
  - Products intensive margin: share of world exports to countries where *i* exports in world trade

- Available at WITS
- See Exercise 1

d. Export market penetration

- Typically, a given developing countries will reach only a small fraction of importing countries
- Brenton and Newfarmer (2007) construct an index of export market penetration (IEMP) that measures the extent to which a country is actually exploiting the market opportunities from the existing set of export products

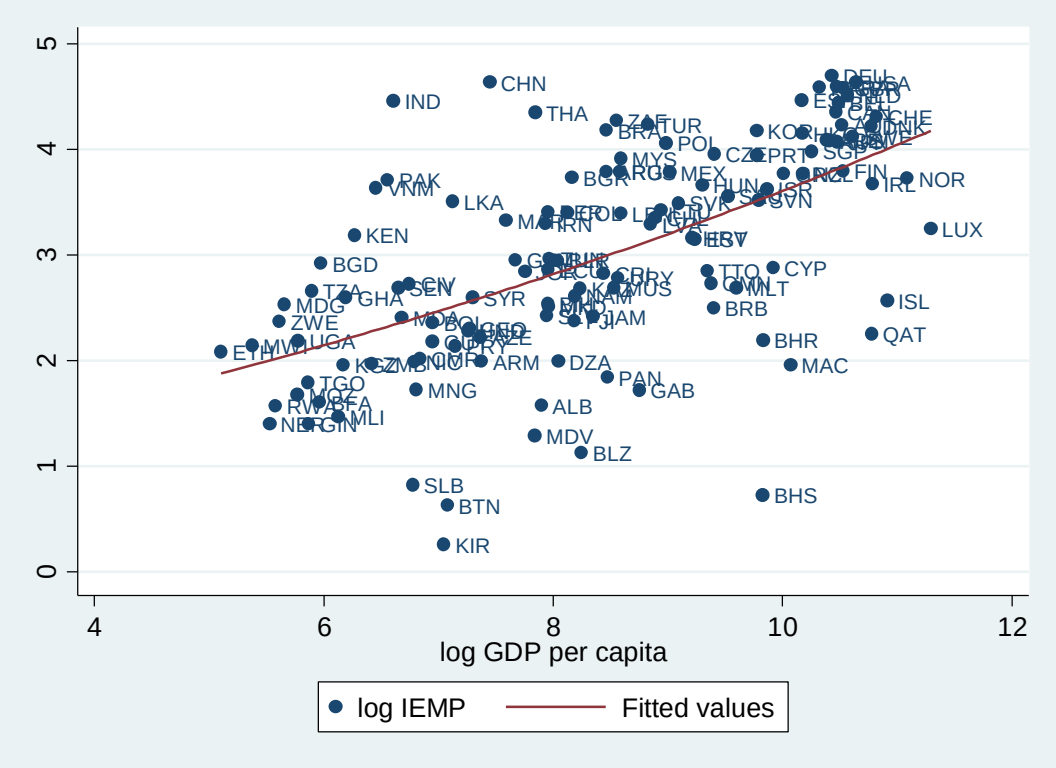
$$IEMP^{i} = \frac{\sum_{k \in \Omega_i} \sum_{j} Y_{kj}^{i}}{\sum_{k \in \Omega_i} \sum_{j} Z_{kj}}$$

Where Ω_i is the set of products exported by country *i*, *j* indexes importers, $Y = 1$ if *i* exports product *k* to *j*, $Z = 1$ if *j* imports good *k*

- For the given range of products that a country exports, then the *IEMP* will be higher for countries that reach a large proportion of the number of international markets that import that product
- Note: increasing geographical reach with existing exports is easier than discovering wholly new products for exports…

d. Export market penetration (ct'd)

- This index is positively correlated with GDP per capita
- Countries with relatively low per capita incomes tend to do less well in exploiting the available markets for the goods that they export
- Available on WITS (Stata) (Figure below for year 2005)



e. Export growth decomposition

- Export growth is a particularly important policy concern
- Export expansion, in terms of either products or destinations, can be at:
  - *Intensive margin* (growth in the value of existing exports to the same destination(s))
  - *Extensive margin* (new export items, new destinations)
  - *Sustainability margin* (survival of export spells)
- Brenton and Newfarmer (2007) propose this decomposition of export growth between time 0 and time 1:

$$\Delta X = \sum_{\Omega_0 \cap \Omega_1} \Delta X + \sum_{\Omega_1 / \Omega_0} X_k - \sum_{\Omega_0 / \Omega_1} X_k$$

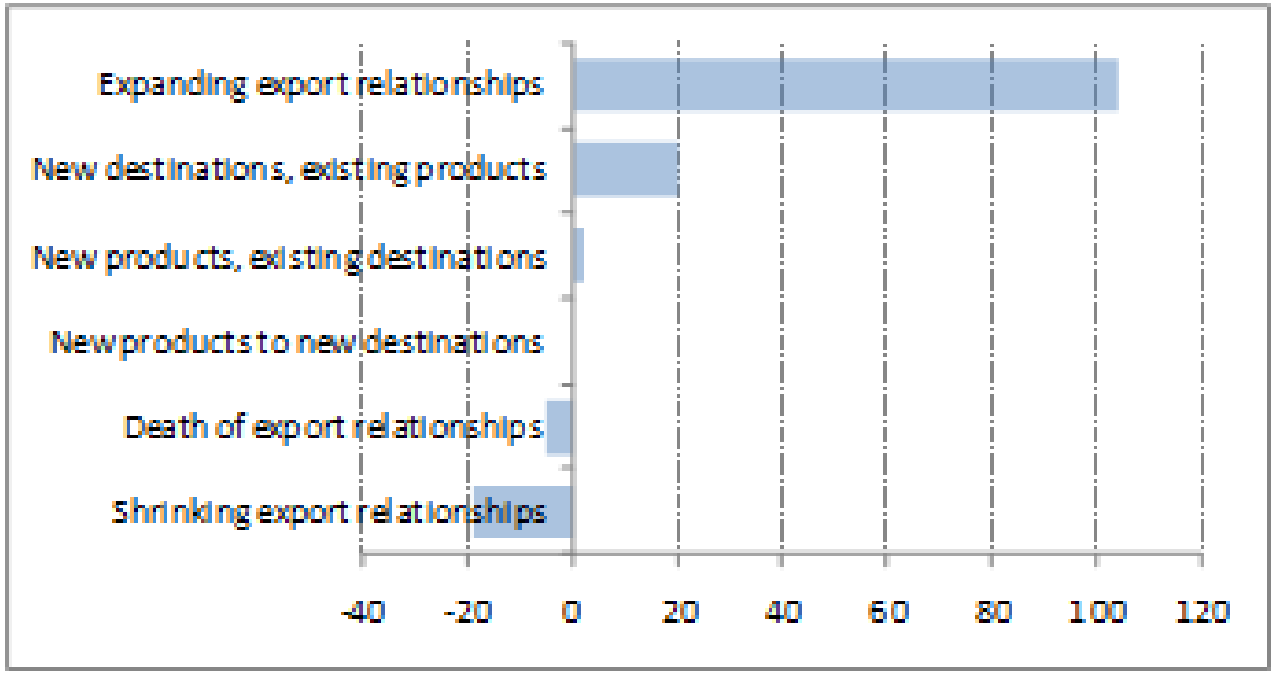
Where Ω_0 is the set of products exported by a country in a year taken as the base year, and Ω_1 is the set exported by a country in a terminal year

- 1st term: export variation at the intensive margin
- 2nd term: new-product margin
- 3rd term: product death margin

e. Export growth decomposition (ct'd)

- The contribution of the new-product margin to export growth is generally small in all countries (developed and developing alike)

Decomposition of the export growth of 99 developing countries, 1995-2004



- The same story holds for most Asia-Pacific countries

Reporter	Intensive margin contribution	New product margin contribution	Product death margin
BGD	0.88	0.13	0.01
CHN	0.99	0.01	0.00
IDN	0.92	0.09	0.01
IND	0.98	0.03	0.01
MYS	0.93	0.09	0.01
THA	0.93	0.08	0.01

- Stata

Comparative advantage

a. Revealed comparative advantage

- The current resurgence of interest for industrial policy sometimes confronts trade economists with demands to identify sectors of comparative advantage
- The traditional measure is the Revealed Comparative Advantage (RCA) index (Balassa, 1965)

$$RCA_k^i = \frac{X_k^i / X^i}{X_k / X}$$

- *RCA* is the ratio of product *k*'s share in country *i*'s exports to its share in world trade
- A value of the *RCA* above 1 in sector *k* means that *i* has a revealed comparative advantage in that sector

a. Revealed comparative advantage (ct'd)

- A disadvantage of the RCA index is that it is asymmetric, i.e. unbounded for those sectors with a revealed comparative advantage, but it has a zero lower bound for those sectors with a comparative disadvantage
- A solution is to rely on a simple normalization proposed by Laursen (2000). The normalized RCA index, NRCA becomes:

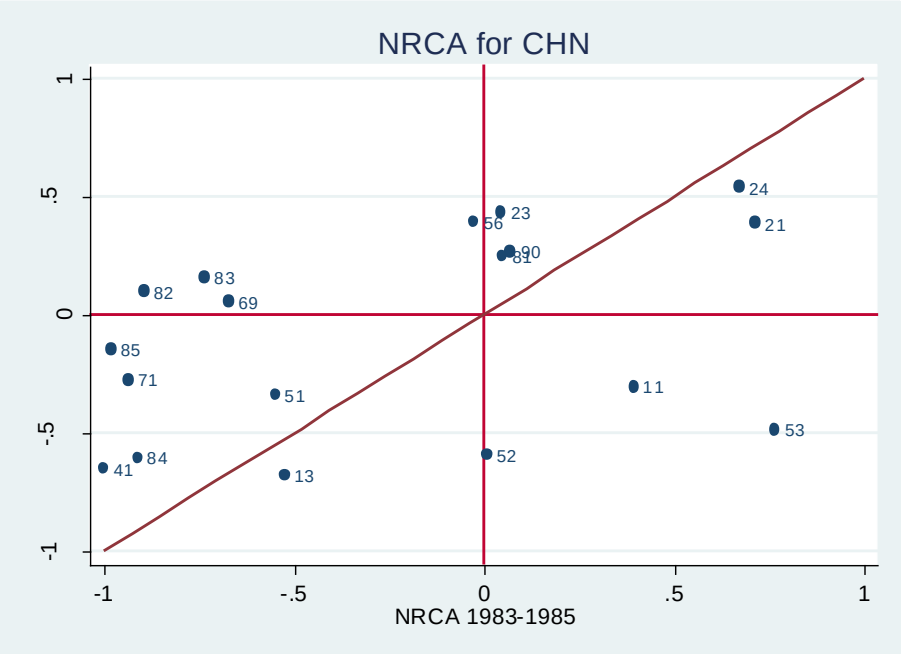
$$NRCA_{k}^{i} = \frac{RCA_{k}^{i} - 1}{RCA_{k}^{i} + 1}$$

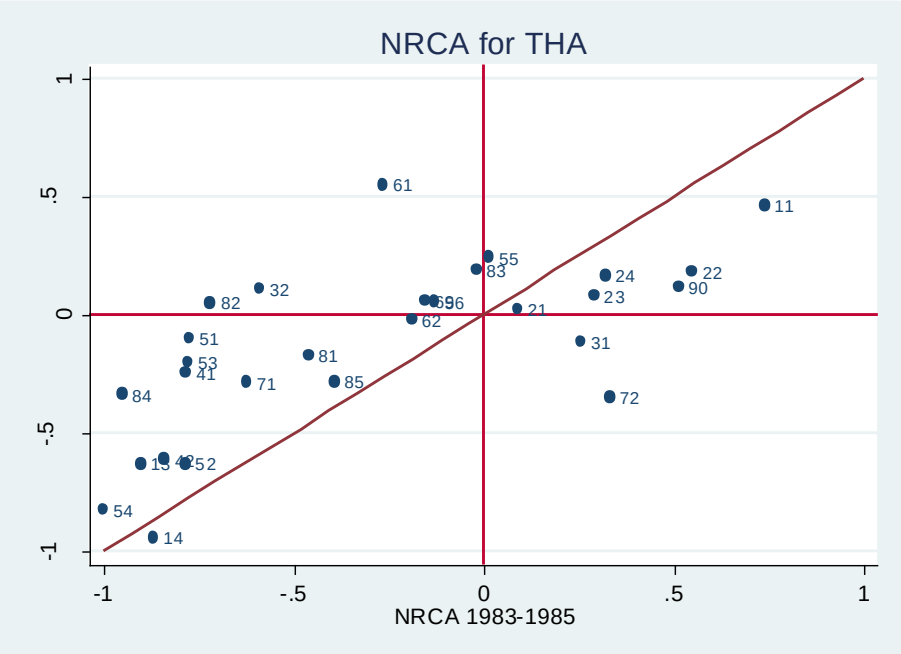
- By construction, NRCA is between -1 and 1

- RCA available at WITS
- In next slide, we present an illustration using the Trade, Production and Protection (TTP) database

a. Revealed comparative advantage (ct'd)

Change in NRCA between 1980s and 2000s, China and Thailand (Stata)





- Sectors above the main diagonal experienced an increase in NRCA
- Sectors above the main diagonal whose NRCA was < 0 in 1983-85 and > 0 in 2002-04 (second quadrant) moved from revealed comparative disadvantage to revealed comparative advantage

b. Export specialization index

- The export specialization index is a modified RCA index

$$ES_k^i = \frac{X_k^i / X^i}{M_k^j / M^j}$$

- The denominator is the share of imports of product *k* in country *j*'s total imports
- *ES* provides product information on revealed specialization in the export sector of a country not vis-à-vis the world, like RCA, but rather vis-à-vis specific markets or partners
- The value of the index less than unity indicates a comparative disadvantage and a value above unity represents specialization in this market
- Available at WITS
- Stata

c. Revealed technology content

- The PRODY index developed by Hausmann et al. (2007) ranks sectors in terms of their productivity/income content

$$PRODY_k = \sum_i \frac{RCA_k^i}{\sum_i RCA_k^i} Y^i$$

- The index is a weighted average of the GDP per capita of the countries that export in sector *k*, where the weights are a measure of the exporter's RCA indices in sector *k* (RCA are adjusted to sum up to one)

c. Revealed technology content (ct'd)

- By construction, sectors with high values of PRODY are those where high income countries play a major role in world exports
- Under the reasonable assumption that high income/high wage countries display a strong presence where comparative advantages are determined by factors other than labor cost (such as know-how, technological content, intrinsic quality, and so on), sectors with a high PRODY index are more sophisticated than sectors with a low value of the index

Largest and smallest PRODY values (2000 US$)

	Product (k)	HS6	Prody_k
1	Equine hides and skins,raw	410140	517.7
2	Sisal and Agave, raw	530410	766.81
3	Cloves (whole fruit, cloves and stems)	90700	892.15
4	Vanilla beans	90500	927.77
5	Natural uranium, its compounds, mixtures	284410	982.94
4955	Nuclear reactors	840110	31565.67
4956	Railway cars nes, open, with sides > 60 cm high	860692	31677.95
4957	Calcium-ammonium nitrate mix, double salts pack >10kg	310260	31783.25
4958	Vinyl chloride (chloroethylene)	290321	31826.73
4959	Leucite, nepheline and nepheline syenite	252930	32218.66

c. Revealed technology content (ct'd)

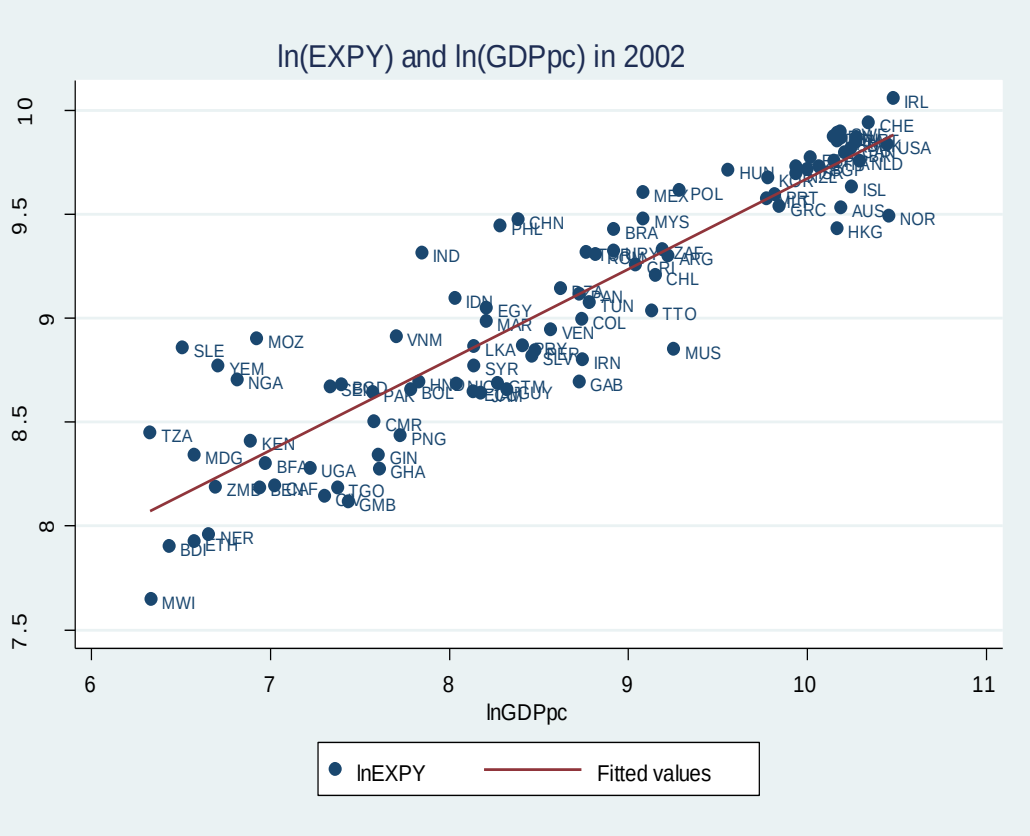
- Hausmann et al. (2007) also construct a quantitative measure of the sophistication of the overall specialization pattern of each country, EXPY

$$EXPY^{i} = \sum_{k} \frac{X^{i}_{k}}{X^{i}} PRODY_{k}$$

- EXPY is a weighted average of the PRODY for country *i*, using product *k*'s share in country *i*'s exports as weights
- EXPY is productivity content associated to the export vector of a country
- Products that are exported by rich countries get ranked more highly than commodities that are exported by poorer countries
- There is a positive relationship between EXPY and per capita GDP
- This is partly by construction, since a commodity's PRODY is determined by the per capita GDPs of the countries that are important exporters of that commodity…

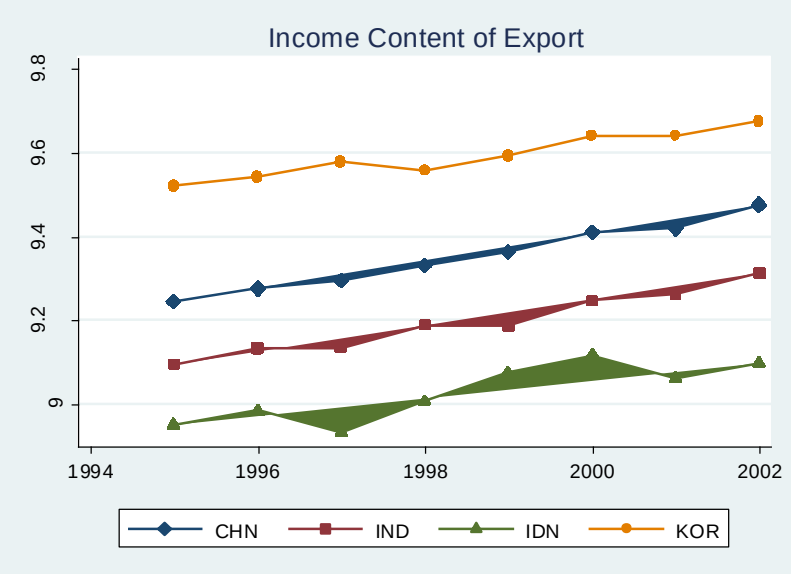
c. Revealed technology content (ct'd)

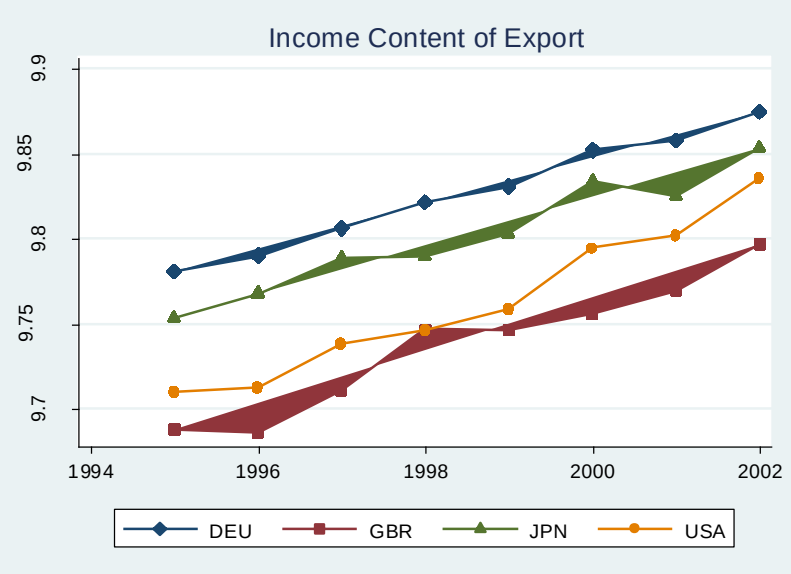
- Hausmann et al. (2007) show that this relationship is not just a mechanical one: excluding own exports from the calculation PRODY index (in this case the index becomes country specific) does not change the results much



c. Revealed technology content (ct'd)

- Hausmann et al. (2007) show that the index is correlated with GDP growth
- Countries that export goods associated with higher EXPY are those who also grow more rapidly, even after controlling for initial income per capita, human capital levels, and time-invariant country characteristics
- What an economy exports matters: rich (poor) countries export products that tend to be exported by other rich (poor) countries
- *Ceteris paribus*, producing and exporting goods that richer countries export represent an effective route to faster growth





d. Revealed factor intensity

- A recent database constructed by UNCTAD (Shirotori et al., 2010) estimates "revealed" factor intensities of traded products
- Good *k*'s revealed intensity in (physical) capital is

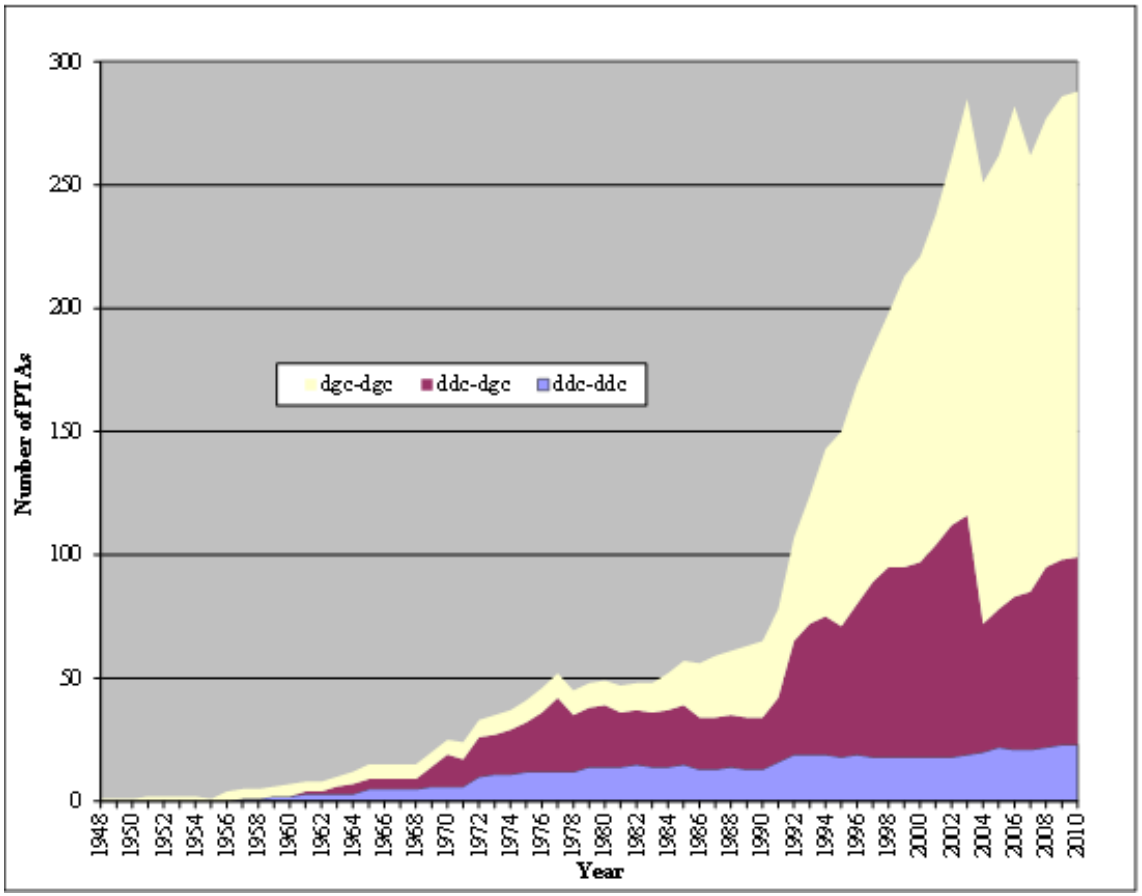
$$rki_k = \sum_{\Omega_k} \frac{RCA_k^i}{\sum_i RCA_k^i} k^i$$

Where $k^i = K^i/L^i$ is country *i*'s stock of capital per worker (national factor endowment)

- "Revealed" means that a product exported by a country that is richly endowed in physical capital, is supposed to be capital intensive
  - For instance, if good *k* is exported essentially by Germany and Japan, it is revealed to be capital-intensive. If it is exported essentially by Vietnam and Lesotho, it is revealed to be labor-intensive
- A similar expression is constructed for the revealed intensity in other factors, such as human capital
- Data available here

Regional trade

- Preferential Trade Agreements (PTAs) are very much in fashion

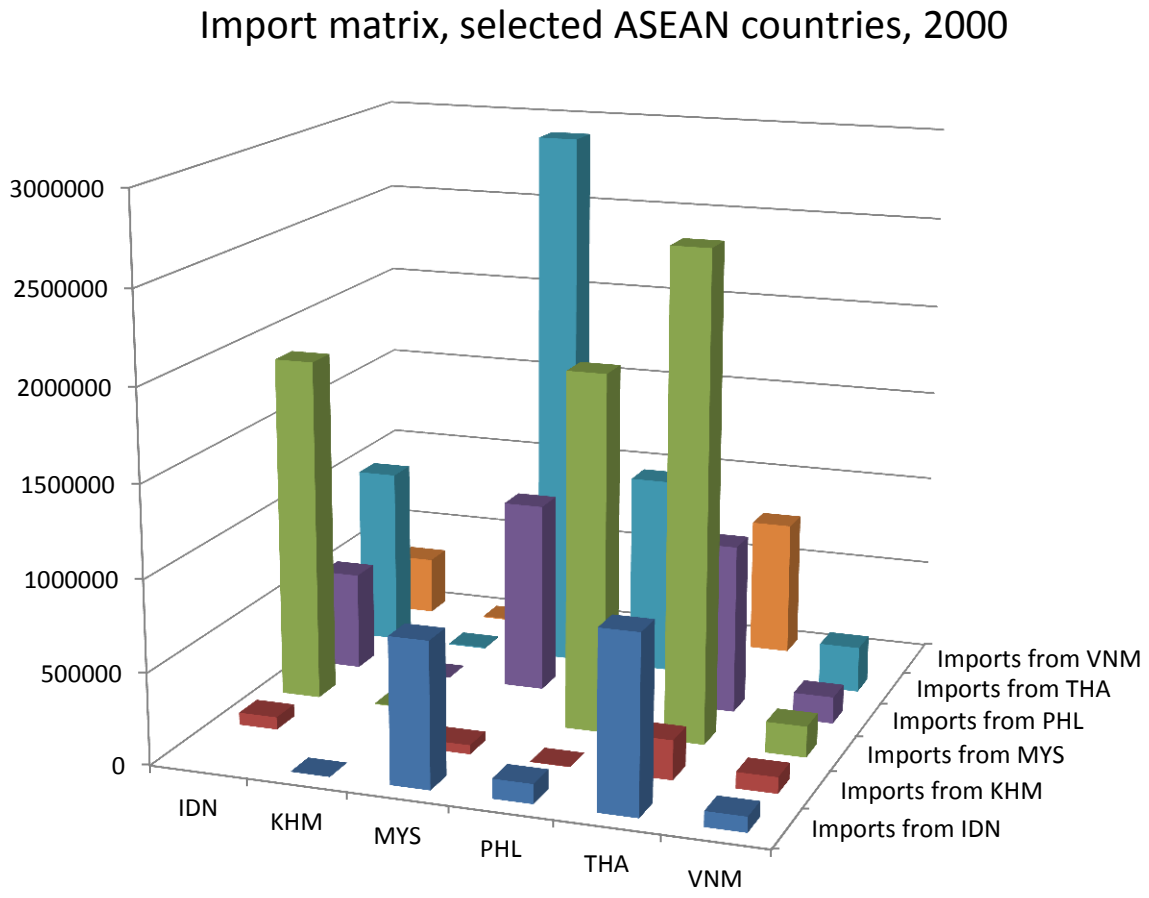


- The surge in PTAs has continued unabated since the early 1990s. Some 474 PTAs have been notified to the GATT/WTO up to July 2010
- Almost 300 preferential trade agreements (notified and not notified) were in force in 2010

Regional trade

- Here we discuss how to construct simple indicators of regional trade

a. Intra-regional import matrix



- Stata

b. Regional intensity of trade

- Regional Intensity of Trade (RIT) indices measure, on the basis of existing trade flows, to what extent countries trade with each other more intensely than with other countries

$$TI_{j}^{i} = \frac{X_{j}^{i} / X^{i}}{X_{j}^{w} / X^{w}}$$

Where X_j^i is *i*'s exports to *j*, X^i is *i*'s total exports, X_j^w is world exports to *j*, X^w is world exports

- TI is the ratio of the share of a country's exports going to a partner over the share of world exports going to the same partner
- An index of more (less) than one indicates a bilateral trade flow that is larger (smaller) than expected, given the partner country's importance in world trade
- TI provides information on the potential welfare effects of a regional integration agreement
- Available at WITS

- TI is large vis-à-vis regional partners:

Regional intensity of trade, Malaysia 2005, top 20 partners (Stata)

Ranking	Partner	Trade Intensity Index
1	Singapore	8.37
2	Solomon Islands	5.22
3	Maldives	4.40
4	Thailand	4.19
5	Sri Lanka	2.45
6	Australia	2.39
7	Bangladesh	2.30
8	Philippines	2.29
9	Indonesia	2.28
10	Cambodia	2.22
11	Vietnam	2.09
12	China	1.87
13	Pakistan	1.79
14	Yemen	1.78
15	Mauritius	1.75
16	Japan	1.74
17	New Zealand	1.55
18	Hong Kong, China	1.50
19	Korea, Rep.	1.41
20	Uganda	1.41

b. Trade complementarity

- Trade Complementarity Index (TCI) measures the extent to which two countries are "natural trading partners", in the sense that what a country exports overlaps with what the other country imports

$$TC_{j}^{i} = 100\left[1 - \left(\sum_{k}\left|m_{k}^{i} - x_{k}^{j}\right| \Big/ 2\right)\right]$$

Where m_k^i is sector k's share in i's total imports from the world and x_k^j is sector k's share in j's total exports to the world

- The index is zero when no goods are exported by one country or imported by the other and 100 when the export and import shares exactly match

- See Exercise 2

c. Databases

- Trade and production data
- Measurement issues

Trade data

- Aggregated trade data are available from the IMF Direction of Trade Statistics (DOTs)
- DOTs provide aggregate bilateral import (c.i.f. and f.o.b.) and import data

- For disaggregated trade data, there exist various nomenclatures to classify products. The most common are:

a. Harmonized system (HS)

b. Standard International Trade Classification (SITC)

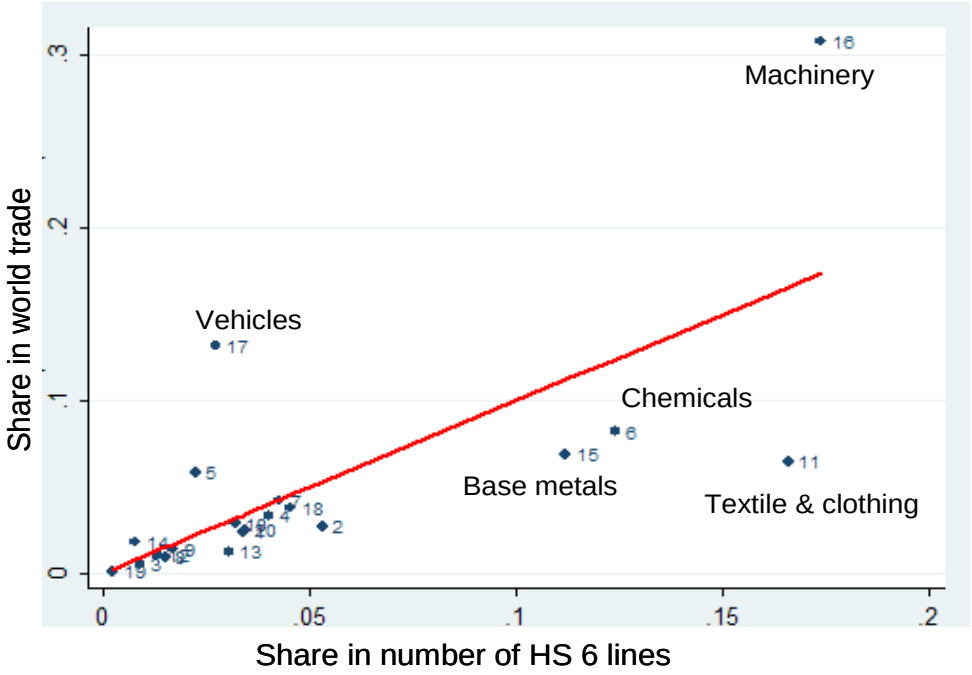
a. Harmonized System (HS)

- Last revised in 2012
- Four harmonized levels, by decreasing degree of aggregation:
  - Sections (21 lines)
  - Chapters (99 lines, also called "HS 2" because chapter codes have two digits)
  - Headings (HS 4, 1243 lines)
  - Subheadings (HS 6, more than 5000 lines including various special categories)
- Levels beyond HS 6 (HS 8 and 10) are not harmonized so the description of product categories and their number differs between countries

- HS2 and HS4 are the same in all revisions

a. Harmonized System (HS) (ct'd)

- Main drawback of the Harmonized System
- Originally designed to organize tariff collection rather than to organize economically meaningful trade statistics
- Traditional products like textile and clothing (Section XI) are over-represented in terms of number of subheadings compared to newer products in machinery, vehicles and instruments (Sections XVI, XVII and XVIII)



b. Standard International Trade Classification (SITC)

- SITC Revision 4 in 2006
- Five levels:
  - Sections (1 digit, 10 lines)
  - Divisions (2 digits, 67 lines)
  - Groups (3 digits, 262 lines)
  - Subgroups (4 digits, 1’023 lines)
  - Basic heading (5 digits, 2’970 lines)

- Concordance tables between HS 6 2007 subheadings and SITC Rev. 4 basic headings (in both directions) are available on the UN Statistics Division webpage

Production data and classification systems

- In some instances, trade data have to be combined with production data, for which there also exist various nomenclatures:

a. SIC, ISIC and CPC (managed by the United Nations)

b. NACE (EU) and NAICS (North American countries)

c. BEC (United Nations) and Rauch classification

b. NACE and NAICS

i. *Nomenclature des Activités économiques dans la Communauté Européenne* (NACE)

- NACE Rev. 2 approved in 2006 and phased in over 2008-9
- At the one and two-digit levels, NACE Rev. 2 categories are fully compatible with ISIC Rev. 4

ii. North American Industrial Classification System (NAICS)

- Last revised in 2007
- Common use by members of the North American Free Trade Agreement (NAFTA)

- Concordance tables between these nomenclatures can be found in various places. However none is perfect, meaning that one typically has to jump up one or several levels of aggregation in order to match trade with production data

c. Broad Economic Categories (BEC)

- Introduced by the United Nations in 1970
- Products classified in four categories by end use
  - Capital goods (01)
  - Intermediate goods (02)
  - Consumer goods (03)
  - Other (04, mainly car parts which can be re-classified "by hand" into categories 01-03)

- Finally, James Rauch designed a reclassification of SITC 4-digit categories by degree of product differentiation
  - Products traded on organized exchanges such as the London Metal Exchange
  - Products with reference prices (listed in widely available publications like the Knight-Ridder CRB Commodity Yearbook)
  - Differentiated products whose prices are determined by branding

Databases for disaggregated trade data

a. UN Comtrade

- Available through the World Bank's WITS portal
- Covers bilateral trade flows at up to the HS 6 level for almost all countries up to 1962
- All trade values are in thousands of current US dollars
- UN Comtrade also reports volumes (in physical units) so that unit values can, at least in principle, be calculated for each good

b. *Base Analytique du Commerce International* (BACI)

- Created by CEPII (*Centre d'Etude Prospectives et d'Informations Internationales*), a Paris-based institute, to reconcile discrepancies between UN Comtrade's import and export data
- BACI trails UN Comtrade with a two-year lag

Databases for disaggregated trade data (ct'd)

c. Trade, Production and Protection (TPP) database

- Developed by Nicita and Olarreaga (2006)
- Merges trade flows, production and trade protection data available from different sources into ISIC Rev. 2 data
- Data potentially cover 100 developing and developed countries over 1976-2004
- Input-output tables make it possible to trace vertical linkages
  - Unfortunately those linkages cannot be related to trade because the input-output tables do not distinguish between domestic and imported inputs

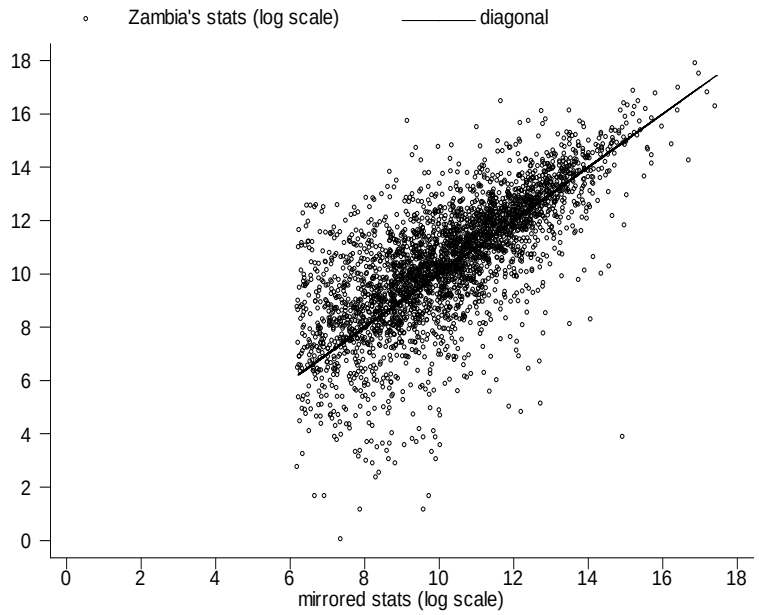
d. CEPII Trade, Production and Protection database

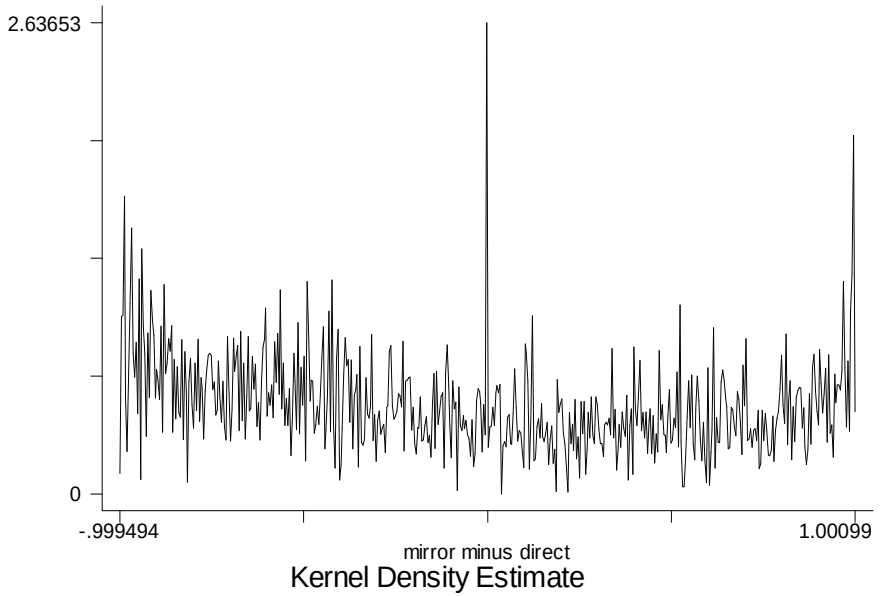
Measurement issues

a. Mirroring, and related problems

- Export data, which is typically not (or marginally) part of the tax base, is monitored less carefully by customs administrations than import data
- Even when the object of analysis is exports, one should in general prefer import data from partner countries, a technique called "mirroring“
- However, mirroring should be avoided if one suspects that the value of imports is deliberately underestimated by traders (tariff avoidance) or the product is declared under a product heading with a lower tariff (tariff misinvoicing)
- Import data is also subject to further reporting errors
- Under automated systems such as ASYCUDA, data is increasingly entered in computer systems directly by employees of transit companies, but progress on reducing input errors is slow in many developing countries

a. Mirroring, and related problems (ct'd)





- Left panel: Each point is an import value at the HS 6 level for Zambia in 2002. The horizontal axis measures values reported by Zambia's partners on the export side and the vertical axis measures values reported by Zambia on the import side. They roughly straddle the diagonal, suggesting no systematic bias, but rather a wide variation
- Right panel: Distribution of discrepancies. It which should normally have the shape of a Gaussian density. In contrast, it is spread out uniformly

b. Missing values and zero trade flows

- Missing values create particular problems

1. Very often lines with zero trade are omitted by national customs rather than reported with a zero value
2. It is generally difficult to tell true “zero trade” from unreported trade or entry errors

- Sometimes, the missing data can be complemented by mirroring (this is done by the IMF DOTs)
- Sometimes the nature of the data suggests entry errors rather than zero trade; for instance, when a regular trade flow is observed over several years with a zero in between. In that case (only), interpolation is valid
- Industry or country averages may not be very meaningful in the presence of many missing observations, because they will then correspond to different time periods, or contain different countries in different years
  - In this case, one should try to use a consistent sample

c. Trade volumes and “unit values”

- UN Comtrade provides not only trade values, but also volumes. They are seldom used because:
  - They cannot be aggregated
  - They are badly monitored by customs because most tariffs are *ad valorem*
- However, sometimes the researcher is interested in calculating prices (“unit values”): trade value divided by volume
- The result is however often tricky to interpret for two reasons:

1. “Composition problem”: what will be observed will not be the price of a good but an average price of several (unobserved) sub-goods
   - Wider categories worsen composition problems
2. Because measurement errors in volumes are in the denominator, they can have nonlinear effects. Suppose for example that a very small volume is mistakenly entered in the system. The unit value will become very large and thus seriously bias subsequent calculations
   - Narrow categories are likely to have small volumes and thus to be sensitive to this problem