
Application of Gravity and Related Methods in Trade Facilitation Research

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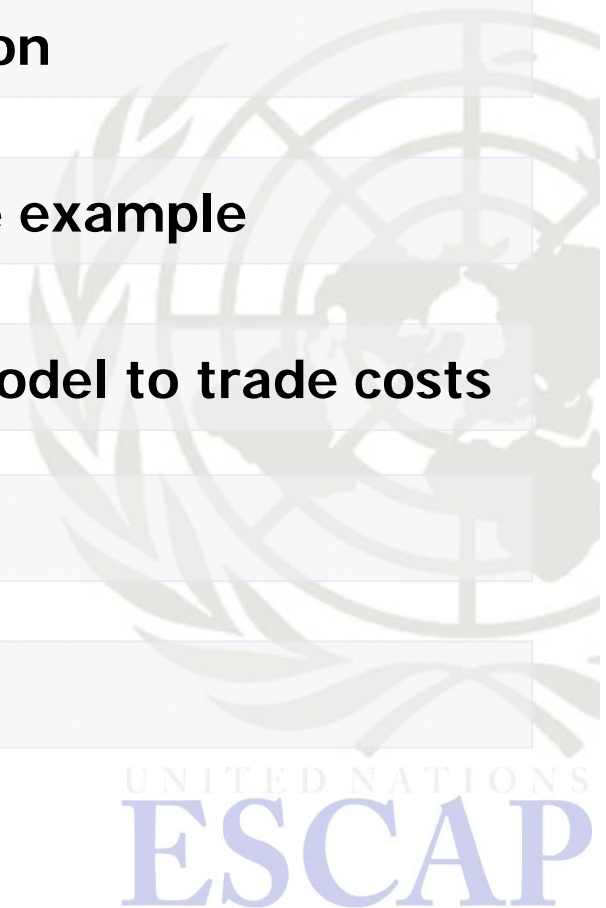
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What is Trade Facilitation (TF)? - Definition



- “the simplification and harmonization of international trade procedures”
- “measures that aims to increase the cost effectiveness of international trade transactions”



What is Trade Facilitation? – Overview of TF

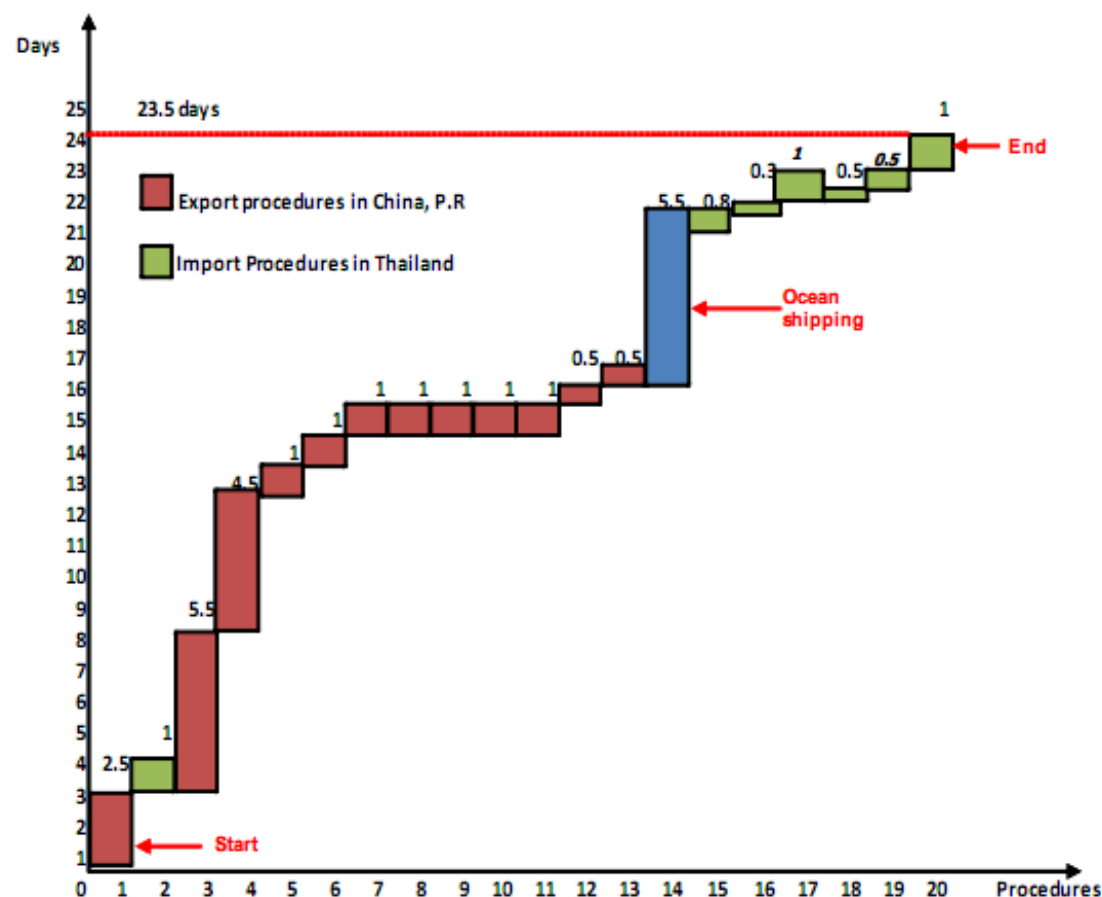
- Significant progress made in reducing time of import/export since 2005, but developed economies also improved during that period
- On average, it still takes 30 days to move goods from factory to deck-of-ship at the nearest seaport
 - South Asia: 30 days
 - South-East Asia: 20 days
 - Developed economies: 10 days
- Improvements in TF could bring \$250 billion in additional trade for Asia and the Pacific



What is Trade Facilitation? – Overview of TF

Sr. No	Process	Days
1	Buy	2.50
2	Obtain permission for raw materials release	1.00
3	Obtain export permit	5.50
4	Arrange transport	4.50
5	Arrange inspection	1.00
6	Prepare customs declaration	1.00
7	Collect empty containers from yard	1.00
8	Stuff a container	1.00
9	Transfer to port of departure	1.00
10	Clear goods through customs	1.00
11	Handle containers and stow on vessel	1.00
12	Obtain cargo insurance	0.50
13	Prepare documents for payment	0.50
14	Ocean shipping	5.50
15	Request for vessel berthing	0.75
16	Unload goods from vessel	0.25
17	Declare goods to Customs	1.00
18	Arrange goods for inspection	0.50
19	Inspect and release goods	0.50
20	Pay	1.00
	Total	23.50

Figure 4. Time Procedure Chart: Trade in electronic devices from China to Thailand



Source: ARTNeT Working Papers 88 and 103.

What is Trade Facilitation? – Overview of TF



INVOLVES

Commercial Procedures

- Establish Contract
- Order Goods
- Advice on Delivery
- Request Payment
- Packing
- Certification
- Accreditation
- Warehousing

Transport Procedures

- Establish Transport Contract
- Collect, Transport and Deliver Goods
- Provide Waybills, Goods Receipts Status Reports, etc.

Regulatory Procedures

- Obtain Import/Export Licenses, etc.
- Provide Customs Declaration
- Provide Cargo Declaration
- Apply Trade Security Procedures
- Clear Goods for Export/Import

Financial Procedures

- Provide Credit Rating
- Provide Insurance
- Provide Finance
- Execute Payment
- Issue Statements

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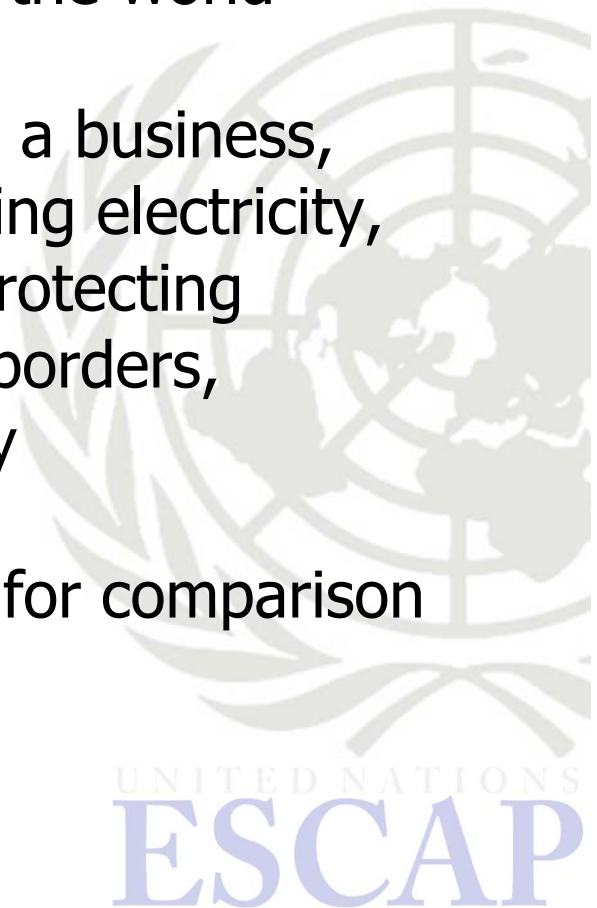
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Potential variables for TF? – Doing Business

- Doing Business ranks the business regulation and environment in 185 economies around the world
- Ranking is based on 10 topics: starting a business, dealing with construction permits, getting electricity, registering properties, getting credit, protecting investors paying taxes, trading across borders, enforcing contract, resolving insolvency
- Distance to frontier provides the score for comparison across years
- source: <http://www.doingbusiness.org>



Potential variables for TF? – Doing Business

 International Finance Corporation
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DOING BUSINESS

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Economy Rankings

Economies are ranked on their ease of doing business, from 1 – 185. A high ranking on the ease of doing business index means the regulatory environment is more conducive to the starting and operation of a local firm. This index averages the country's percentile rankings on 10 topics, made up of a variety of indicators, giving equal weight to each topic. The rankings for all economies are benchmarked to June 2012.

[EXPLORE ECONOMY DATA](#)

Ranking Methodology

Explanation of how the [Ease of Doing Business Index](#) (PDF) its sub-indices and the distance to frontier measures are calculated.

SUBNATIONAL = Subnational *Doing Business* ranking data available.

• Rankings by region:

Select region

or

• Rankings by income:

Select income

or

• Rankings by population:

Select grouping

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Economy	Ease of Doing Business Rank ▲	Starting a Business	Dealing with Construction Permits	Getting Electricity	Registering Property	Getting Credit	Protecting Investors	Paying Taxes	Trading Across Borders	Enforcing Contracts	Resolving Insolvency
Singapore	1	4	2	5	36	12	2	5	1	12	2
Hong Kong SAR, China	2	6	1	4	60	4	3	4	2	10	17

Potential variables for TF? – Doing Business

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Distance to Frontier

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This measure shows the distance of each economy to the "frontier," which represents the highest performance observed on each of the indicators across all economies included in *Doing Business* since each indicator was included in *Doing Business*. An economy's distance to frontier is indicated on a scale from 0 to 100, where 0 represents the lowest performance and 100 the frontier. For example, a score of 75 in DB 2012 means an economy was 25 percentage points away from the frontier constructed from the best performances across all economies and across time. A score of 80 in DB 2013 would indicate the economy is improving. In this way the distance to frontier measure complements the yearly ease of doing business ranking, which compares economies with one another at a point in time. [Read about this measure](#) (PDF, 79KB).

Filter by topic: ▼

Overall

[Excel](#)

Economy	DB 2004	DB 2005	DB 2006	DB 2007	DB 2008	DB 2009	DB 2010	DB 2011	DB 2012	DB 2013 ▼
Singapore	90.2	90.2	90.4	90.6	90.9	91.7	91.7	91.7
New Zealand	89.6	89.5	89.5	89.7	89.8	90.1	90.1	90.5
Hong Kong SAR, China	84.0	85.8	85.8	87.2	89.1	89.5	89.5	89.5
United Kingdom	83.2	83.2	83.1	83.0	84.8	85.7	85.8	85.8
Denmark	79.8	81.0	82.9	82.9	83.0	84.4	84.6	84.7
Ireland	83.8	84.1	84.1	84.2	84.7	84.3	83.8	84.6

Potential variables for TF? – Logistic Performance Index

- Logistics Performance Index (LPI) indicates the level of logistic friendliness in 155 countries
- LPI ranking is based on 6 topics: customs, infrastructure, international shipments, logistics competence, tracking and tracing and timeliness
- source: <http://lpiurvey.worldbank.org>



Potential variables for TF? – Logistic Performance Index

DATA TABLE

[Download XLS](#)

Country	Year	LPI Rank	LPI Score ▼	Customs ?	Infrastructure ?	International shipments ?	Logistics competence ?	Tracking & tracing ?	Timeliness ?
Singapore	2012	1	4.13	4.10	4.15	3.99	4.07	4.07	4.39
Hong Kong, China	2012	2	4.12	3.97	4.12	4.18	4.08	4.09	4.28
Finland	2012	3	4.05	3.98	4.12	3.85	4.14	4.14	4.10
Germany	2012	4	4.03	3.87	4.26	3.67	4.09	4.05	4.32
Netherlands	2012	5	4.02	3.85	4.15	3.86	4.05	4.12	4.15
Denmark	2012	6	4.02	3.93	4.07	3.70	4.14	4.10	4.21
Belgium	2012	7	3.98	3.85	4.12	3.73	3.98	4.05	4.20
Japan	2012	8	3.93	3.72	4.11	3.61	3.97	4.03	4.21
United States	2012	9	3.93	3.67	4.14	3.56	3.96	4.11	4.21
United Kingdom	2012	10	3.90	3.73	3.95	3.63	3.93	4.00	4.19
Austria	2012	11	3.89	3.77	4.05	3.71	4.10	3.97	3.79
France	2012	12	3.85	3.64	3.96	3.73	3.82	3.97	4.02
Sweden	2012	13	3.85	3.68	4.13	3.39	3.90	3.82	4.26
Canada	2012	14	3.85	3.58	3.99	3.55	3.85	3.86	4.31
Luxembourg	2012	15	3.82	3.54	3.79	3.70	3.82	3.91	4.19
Switzerland	2012	16	3.80	3.88	3.98	3.46	3.71	3.83	4.01
United Arab Emirates	2012	17	3.78	3.61	3.84	3.59	3.74	3.81	4.10
Australia	2012	18	3.73	3.60	3.83	3.40	3.75	3.79	4.05
Taiwan	2012	19	3.71	3.42	3.77	3.58	3.68	3.72	4.10
Spain	2012	20	3.70	3.40	3.74	3.68	3.69	3.67	4.02
Korea, Rep.	2012	21	3.70	3.42	3.74	3.67	3.65	3.68	4.02

Potential variables for TF? – LSCI

- Liner shipping connectivity Index (LSCI) measures the level of seaport connectivity to the global networks in 159 countries
- LSCI ranking is based on 4 topics: numbers of ships, total container-carrying capacity of ships, maximum vessel size, number of services and number of companies that deploys container ships on services to and from a country's port
- source: <http://data.worldbank.org/indicator/IS.SHP.GCNW.XQ>

Potential variables for TF? – LSCI



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Liner shipping connectivity index (maximum value in 2004 = 100)

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The Liner Shipping Connectivity Index captures how well countries are connected to global shipping networks. It is computed by the United Nations Conference on Trade and Development (UNCTAD) based on five components of the maritime transport sector: number of ships, their container-carrying capacity, maximum vessel size, number of services, and number of companies that deploy container ships in a country's ports. For each component a country's value is divided by the maximum value of each component in 2004, the five components are averaged for each country, and the average is divided by the maximum average for 2004 and multiplied by 100. The index generates a value of 100 for the country with the highest average index in 2004. . The underlying data come from Containerisation International Online.

United Nations Conference on Trade and Development, Review of Maritime Transport 2010.

Catalog Sources World Development Indicators

TABLE MAP GRAPH

Search all indicators

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Featured indicators

Infrastructure

Air transport, registered

carrier departures worldwide

1980-1982 1983-1987 1988-1992 1993-1997 1998-2002 2003-2007 2008-2012

Country name

Afghanistan

Albania

Algeria

American Samoa

2008 2009 2010 2011

2.0 2.3 4.3 4.5
7.8 8.4 31.4 31.1
6.4 4.6 4.8 4.6

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Trade facilitation research – literature example

- Hoekman and Nicita (2008) introduces the use of PPML to gravity, incorporating trade facilitation indicators as part of trade costs
- Main findings related to trade facilitating aspect:
 - logistics performance as well as trade facilitation factors tend to have great positive effect on trade flows



Trade facilitation research – literature example

(Dependent Variable = Value of Imports)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Distance	-0.865 *** (0.048)	-0.826 *** (0.045)	-0.794 *** (0.045)	-0.803 *** (0.043)	-0.768 *** (0.042)	-0.836 *** (0.044)	-0.784 *** (0.042)	-0.820 *** (0.043)
GDP Importer (log)	0.759 *** (0.029)	0.821 *** (0.040)	0.595 *** (0.049)	0.782 *** (0.036)	0.746 *** (0.065)	0.853 *** (0.046)	0.799 *** (0.062)	0.621 *** (0.061)
GDP Exporter (log)	0.771 *** (0.021)	0.737 *** (0.029)	0.592 *** (0.043)	0.714 *** (0.029)	0.586 *** (0.055)	0.736 *** (0.029)	0.599 *** (0.055)	0.518 *** (0.085)
Population Importer (log)	0.072 ** (0.039)	0.068 ** (0.039)	0.220 *** (0.046)	0.061 * (0.033)	0.091 * (0.047)	0.037 (0.043)	0.037 (0.047)	0.250 *** (0.059)
Population Exporter (log)	0.064 ** (0.030)	0.142 ** (0.058)	0.202 *** (0.042)	0.126 *** (0.042)	0.237 *** (0.058)	0.127 * (0.056)	0.210 ** (0.058)	0.325 *** (0.103)
Remoteness Importer (log)	1.069 *** (0.136)	1.210 *** (0.162)	0.969 *** (0.114)	1.003 *** (0.139)	0.969 *** (0.131)	1.218 *** (0.177)	0.946 *** (0.151)	1.055 *** (0.147)
Remoteness Exporter (log)	1.404 *** (0.132)	1.397 *** (0.130)	1.211 *** (0.124)	1.173 *** (0.127)	1.117 *** (0.128)	1.358 *** (0.127)	1.090 *** (0.126)	1.221 *** (0.136)
Landlock Importer	-0.098 (0.104)	-0.028 (0.130)	-0.096 (0.100)	0.023 (0.127)	0.009 (0.124)	-0.010 (0.125)	0.027 (0.123)	0.070 (0.145)
Landlock Exporter	-0.148 ** (0.079)	-0.100 (0.095)	-0.173 ** (0.077)	-0.045 (0.095)	-0.071 (0.097)	-0.114 (0.095)	-0.072 (0.096)	-0.064 (0.115)
Common Border	0.301 *** (0.115)	0.470 *** (0.150)	0.439 *** (0.109)	0.566 *** (0.150)	0.632 *** (0.153)	0.539 *** (0.154)	0.664 *** (0.148)	0.557 *** (0.153)
Common Language	0.244 *** (0.106)	-0.041 (0.140)	0.186 * (0.102)	-0.105 (0.144)	-0.121 (0.141)	0.057 (0.131)	-0.048 (0.135)	-0.203 (0.158)
TTRI	-0.227 *** (0.035)	-0.240 *** (0.042)	-0.219 *** (0.036)	-0.216 *** (0.044)	-0.231 *** (0.044)	-0.238 ** (0.110)	-0.134 (0.088)	-0.204 *** (0.044)
Non Tariff Barriers		-0.181 *** (0.054)	-0.108 ** (0.041)	-0.148 *** (0.046)	-0.147 *** (0.045)	-0.101 * (0.061)	-0.102 * (0.054)	-0.229 *** (0.057)
LPI importer			0.537 *** (0.107)		0.100 (0.143)		0.097 (0.131)	
LPI exporter			0.513 *** (0.107)		0.421 *** (0.133)		0.377 ** (0.131)	
DB Import Costs				-0.481 *** (0.093)	-0.436 *** (0.101)		-0.449 *** (0.107)	
DB Export Costs				-0.474 *** (0.116)	-0.330 *** (0.111)		-0.339 *** (0.109)	
Trade Facilitation Importer								0.257 *** (0.068)
Trade Facilitation Exporter								0.231 ** (0.091)
Relative Preferential Margin						3.548 *** (0.695)	3.403 *** (0.677)	
Pseudo R-squared	0.858	0.859	0.863	0.873	0.871	0.871	0.882	0.862
Observations	10720	10720	10720	10720	10720	10720	10720	4826

Significance level of 1%, 5% and 10% are indicated by ***, ** and * respectively. Standard errors are in parentheses. To capture the effect of preferences, in the last two columns the Trade Policy variable is computed as the MFN Tariff TTRI rather than preferential tariff TTRI.

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Recent breakthrough – from gravity model to trade costs

A What is Trade Costs ?

B ESCAP-WB Trade Cost Database : Definition

C ESCAP-WB Trade Cost Database : Data Source

D Trade costs in developing countries: Findings

E Explaining trade costs

F Conclusion



What is Trade Cost? – Intro/Initiation

- ❑ Importance of trade facilitation has increased in the past 10 years, in particular because of significant reduction in tariffs and some other traditional trade policy barriers
- ❑ Much progress has been made in developing trade facilitation indicators since 2000
 - WB Doing Business (trading across border indicators)
 - Direct measurements (of international transport costs mainly)
 - WB Logistics Performance Index
 - UNCTAD Liner Shipping Connectivity Index, etc....

What is Trade Cost? – Intro/Initiation

❑ However, these trade costs measures have limitations, including:

- Only cover part of the total international trade costs
 - e.g., an objective measure of trade cost proposed is the difference between CIF and FOB values of shipment, but this reflects mainly (only) international shipment costs
- Do not provide information on bilateral or intra regional trade costs
 - e.g., WB Doing Business estimates export time/cost to the nearest sea port, i.e. Trade cost/time of countries through land border is not captured

What is Trade Cost? – Intro/Initiation

According to Anderson and van Wincoop (2004) “Trade Costs”

Broadly defined trade costs include all costs incurred in getting a good to a final user other than the marginal cost of producing the good itself: such as,

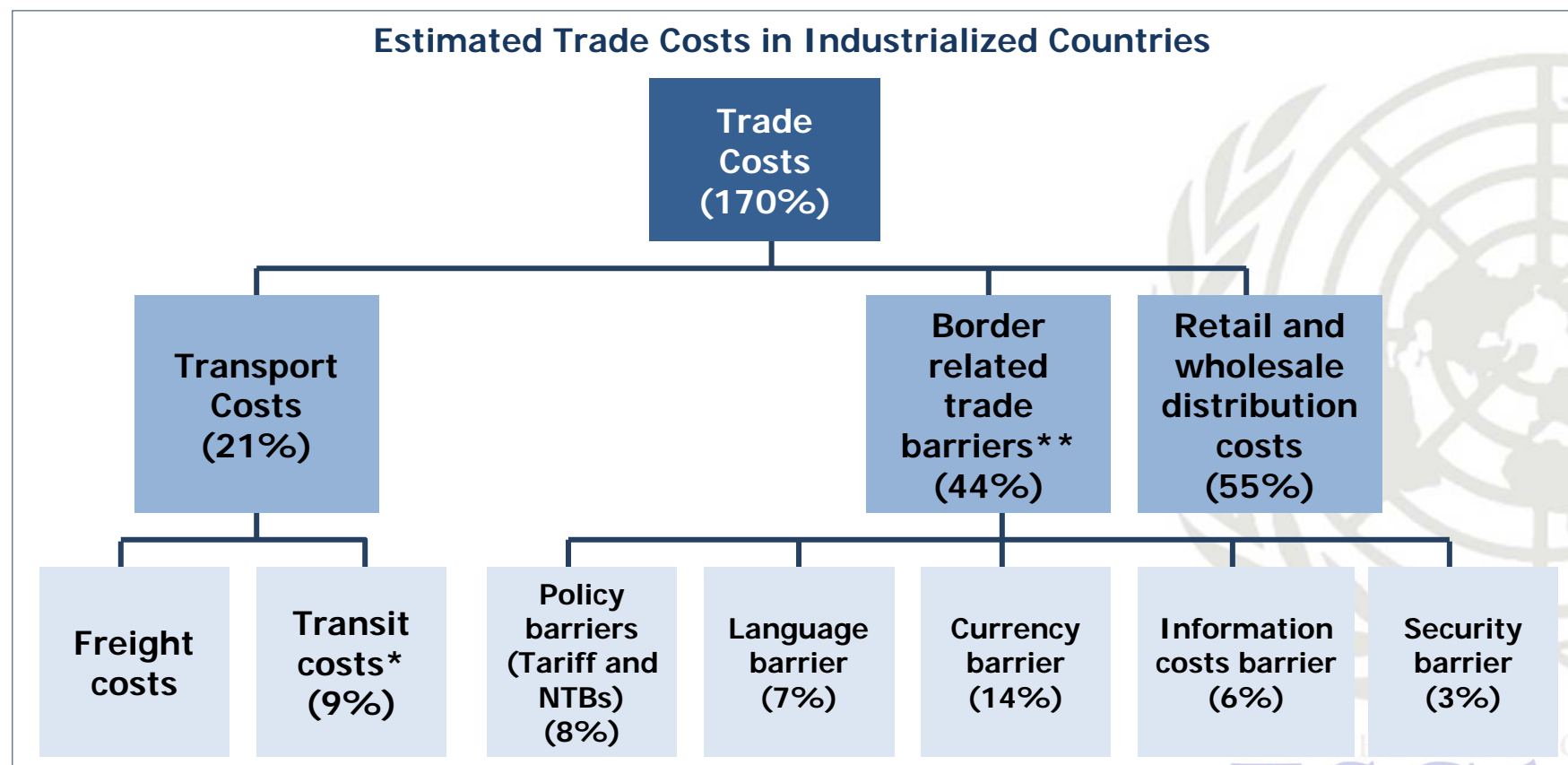
- Transportation costs (both freight costs and time costs)
- Policy barriers (tariffs and non-tariff barriers)
- Information & communication costs
- Contract enforcement costs
- Costs associated with the use of different currencies
- Legal and regulatory costs
- Local distribution costs (wholesale and retail)

Trade costs are reported in terms of their ad-valorem tax equivalent. The 170% headline number breaks down into 55% local distribution costs and 74% international trade costs ($1.7 = 1.55 * 1.74 - 1$)



What is Trade Cost? – Intro/Initiation

Direct evidence on border costs shows that tariff barriers are now low in most countries, on average less than 5% for rich countries, on average between 10-20 % for developing countries.



*Tax equivalent of the time value of goods in transit.

** The combination of direct observation and inferred costs, which, according to author, is an extremely rough breakdown

Source: Anderson and van Wincoop (2004)

Recent breakthrough – from gravity model to trade costs

A What is Trade Costs ?

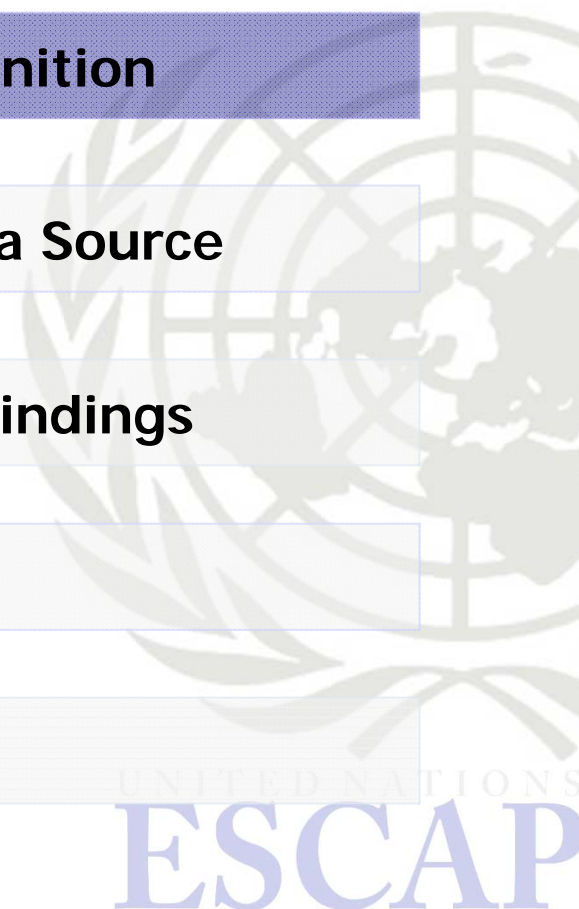
B ESCAP-WB Trade Cost Database : Definition

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ESCAP-WB Trade Cost Database : Definition

- Based on the comprehensive trade costs measure proposed by Jacks, Meissner and Novy (2009)
Measure derived from the theory-consistent gravity equation, i.e., ratio based essentially on Bilateral Trade data and Gross Output data

→ “*objective*” *measure of costs*

- Captures all *additional costs involved in trading goods bilaterally relative to those involved in trading goods domestically*. It includes:
 - International shipping and logistics costs
 - Tariff and non-tariff costs, including indirect and direct costs associated with trade procedures and regulations
 - Costs from differences in language, culture, currencies...



ESCAP-WB Trade Cost Database : Definition

- A typical gravity paper controls for a range of factors (geography and history) and then adds another trade cost source to see whether it has a significant impact on bilateral trade
 - NTMs and product standards
 - RTA membership
 - Trade facilitation
 - Logistics performance
 - Air or maritime connectivity
 - Entry barriers
- In principle, the estimates from different gravity papers can be combined to give an overall picture of the level of trade costs, but only Anderson and Van Wincoop (2004) have done so: hence their 170% “headline” number

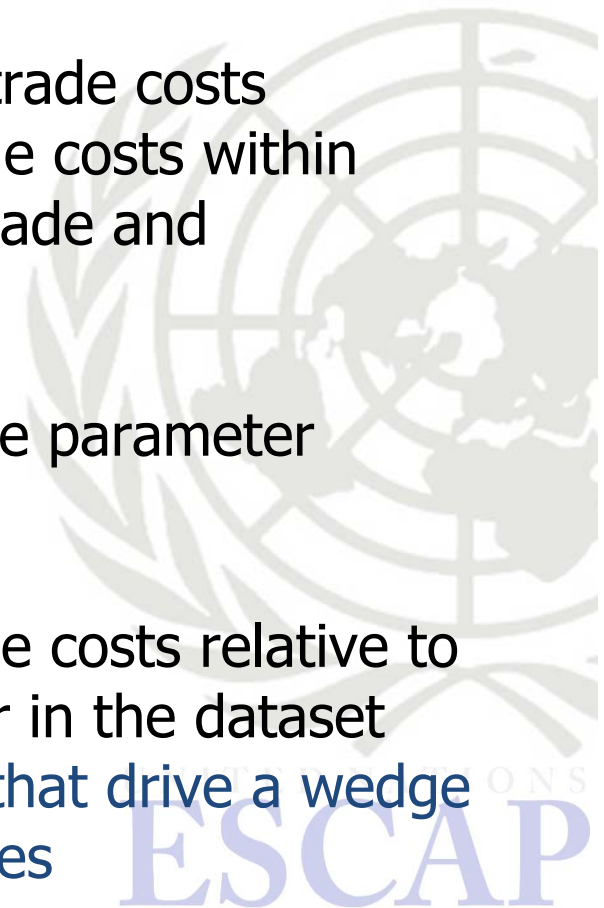


ESCAP-WB Trade Cost Database : Definition

- There are two inter-related problems with the standard approach:
 - The focus is on one source of trade costs at a time, rather than on a comprehensive measure of total trade costs
 - Some policy forums, such as the Asia-Pacific Economic Cooperation, have focused their trade facilitation efforts on the reduction of “trade transaction costs”
 - But measurement and assessment of performance has proved difficult using standard techniques
 - There is always the possibility of omitted variable bias to the extent that an omitted source of trade costs is correlated with an included one (which is highly likely)

ESCAP-WB Trade Cost Database : Definition – Inverse Gravity

- ▶ We adopt a different approach, based on Novy (2013): inverse gravity
- ▶ The intuition is that we can infer the level of trade costs between countries relative to the level of trade costs within countries based on the observed pattern of trade and production around the world
- ▶ Inputs: Data on trade and production, and one parameter assumption
- ▶ Outputs: A measure of total international trade costs relative to total internal trade costs for each country pair in the dataset
 - “Total” means inclusive of all factors that drive a wedge between domestic and international prices



ESCAP-WB Trade Cost Database : Definition – Inverse Gravity

- The methodology is very simple, and is based on some basic algebra done with the standard gravity model
- Take two countries i and j
- That gives four gravity models for each direction of international trade, and two types of internal (intra-national) trade
- The four equations allow us to eliminate the two unobservable multilateral resistance terms as well as GDP, leaving just intra-national and inter-national trade and intra- and inter-national trade costs
- Note that there is no assumption that trade is balanced or that trade costs are identical in both directions



ESCAP-WB Trade Cost Database : Definition – Inverse Gravity

- Anderson and Van Wincoop (2003, 2004) provide the canonical model:

$$X_{ij} = \frac{Y_i Y_j}{Y_w} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma}$$

- ▶ X is exports from i to j
- ▶ Y is GDP
- ▶ t is iceberg trade costs
- ▶ Sigma is the intra-sectoral elasticity of substitution
- ▶ Pi and P are the multilateral resistance terms



ESCAP-WB Trade Cost Database : Definition – Inverse Gravity

$$X_{ii} = \frac{Y_i Y_i}{Y_w} \left(\frac{t_{ii}}{\Pi_i P_i} \right)^{1-\sigma}$$

$$X_{jj} = \frac{Y_j Y_j}{Y_w} \left(\frac{t_{jj}}{\Pi_j P_j} \right)^{1-\sigma}$$

$$X_{ij} = \frac{Y_i Y_j}{Y_w} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma}$$

$$X_{ji} = \frac{Y_j Y_i}{Y_w} \left(\frac{t_{ji}}{\Pi_j P_i} \right)^{1-\sigma}$$

ESCAP-WB Trade Cost Database : Definition – Inverse Gravity

Multiply the equations for internal trade and the equations for international trade to give two new equations:

$$X_{ii}X_{jj} = \frac{Y_i Y_i}{Y_w} \left(\frac{t_{ii}}{\Pi_i P_i} \right)^{1-\sigma} \frac{Y_j Y_j}{Y_w} \left(\frac{t_{jj}}{\Pi_j P_j} \right)^{1-\sigma}$$

$$X_{ij}X_{ji} = \frac{Y_i Y_j}{Y_w} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma} \frac{Y_j Y_i}{Y_w} \left(\frac{t_{ji}}{\Pi_j P_i} \right)^{1-\sigma}$$

Divide those two equations and GDP and multilateral resistance cancel out:

$$\frac{X_{ij}X_{ji}}{X_{ii}X_{jj}} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}} \right)^{1-\sigma}$$



ESCAP-WB Trade Cost Database : Definition

Our measure of **ad valorem trade costs**:

$$\tau_{ij} = \tau_{ji} = \left(\frac{t_{ij} t_{ji}}{t_{ii} t_{jj}} \right)^{\frac{1}{2}} - 1 = \left(\frac{X_{ii} X_{jj}}{X_{ij} X_{ji}} \right)^{\frac{1}{2(\sigma-1)}} - 1$$

where

τ_{ij} denotes geometric average trade costs between country i and country j

t_{ij} denotes international trade costs from country i to country j

t_{ji} denotes international trade costs from country j to country i

t_{ii} denotes intranational trade costs of country i

t_{jj} denotes intranational trade costs of country j

X_{ij} denotes international trade flows from country i to country j

X_{ji} denotes international trade flows from country j to country i

X_{ii} denotes intranational trade of country i

X_{jj} denotes intranational trade of country j

σ denotes intra-sectoral elasticity of substitution (which is set = 8)



ESCAP-WB Trade Cost Database : Definition

Our measure of **ad valorem** trade costs:

$$\tau_{ij} = \tau_{ji} = \left(\frac{t_{ij} t_{ji}}{t_{ii} t_{jj}} \right)^{\frac{1}{2}} - 1 = \left(\frac{X_{ii} X_{jj}}{X_{ij} X_{ji}} \right)^{\frac{1}{2(\sigma-1)}} - 1$$

- Intuition: keeping all else constant, a rise in the ratio of international trade relative to domestic trade must be associated with a fall in international trade costs relative to domestic trade costs
- *Ad valorem* ? → bilateral trade costs are expressed in % of the value of goods (like tariffs generally are)
- Important note: Change in the value of sigma can change the absolute value of trade costs → **better to look at trade cost relative to each other**



ESCAP-WB Trade Cost Database : Definition

Our measure of **ad valorem** trade costs:

$$\tau_{ij} = \tau_{ji} = \left(\frac{t_{ij} t_{ji}}{t_{ii} t_{jj}} \right)^{\frac{1}{2}} - 1 = \left(\frac{X_{ii} X_{jj}}{X_{ij} X_{ji}} \right)^{\frac{1}{2(\sigma-1)}} - 1$$

Note that:

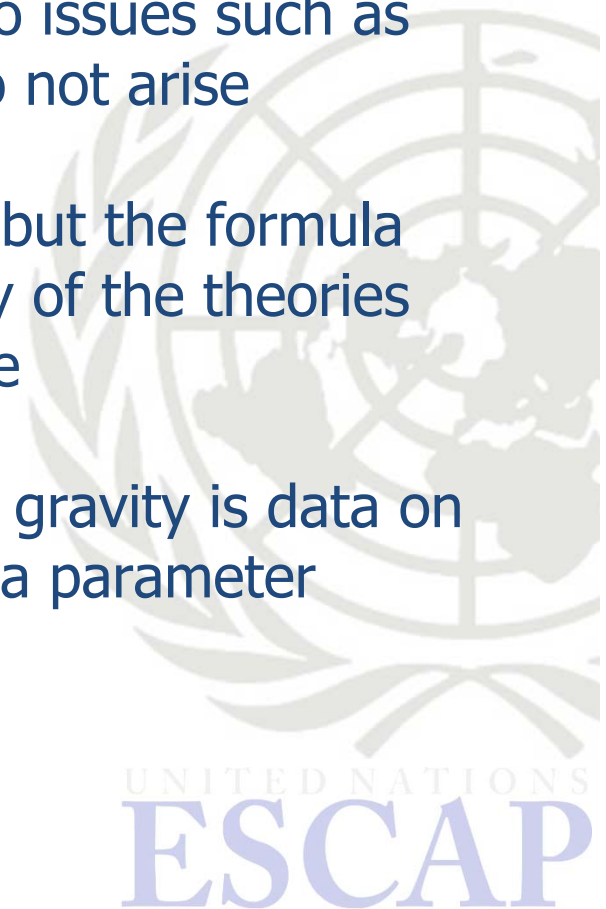
- Our trade costs are always expressed in terms of international relative to intra-national trade costs
- Our trade costs are the geometric average of trade costs in both directions (country i to j and country j to i)

→ This can makes the identification of policy effects challenging



ESCAP-WB Trade Cost Database : Definition

- Points to note about our approach:
 - ▶ This is not an econometric estimation, so issues such as endogeneity and omitted variables bias do not arise
 - ▶ Inverse gravity relies heavily on theory, but the formula for τ takes basically the same form for any of the theories that are currently standard in the literature
 - ▶ All that is required to implement inverse gravity is data on inter- and intra-national trade, along with a parameter assumption as to sigma



Recent breakthrough – from gravity model to trade costs

A What is Trade Costs ?

B ESCAP-WB Trade Cost Database : Definition

C ESCAP-WB Trade Cost Database : Data Source

D Trade costs in developing countries: Findings

E Explaining trade costs

F Conclusion

ESCAP-WB Trade Cost Database : Data Source

- To calculate trade costs between countries i and j , we need data on:
 - Exports from i to j
 - Exports from j to i
 - Production in country i that is also consumed there, in gross shipments terms (not value added)
 - Production in country j that is also consumed there, in gross shipments terms (not value added)
- Getting the international trade data is straightforward:
 - WITS-UN Comtrade
 - Aggregate into two macro-sectors, manufacturing (ISIC D) and agriculture (ISIC A and B) using a WITS concordance
 - Adjustment for re-exports using other sources for a small number of countries
- Getting the intra-national trade data is not straightforward



ESCAP-WB Trade Cost Database : Data Source

- For some countries, data on domestic production in gross shipments terms are available through the UN national accounts system

- Coverage is up to 124 countries
- Conversion from LCU to USD using the WDI GDP exchange rate
- Calculation of intra-national trade as domestic production less total exports to the rest of the world



ESCAP-WB Trade Cost Database : Data Source

- For those countries that lack domestic production in gross shipments terms:

- We take GDP data by ISIC aggregate from the WDIs, supplemented by the UN national accounts system
- GDP data cannot be used directly because they are in value added not gross shipments terms (i.e., they net out intermediate input use)
- We therefore calculate average gross shipments to value added ratios for the two ISIC aggregates for those countries where we have both sets of data
- We use those ratios to “gross up” the value added data to their estimated gross shipments equivalents
- We then calculate intra-national trade as domestic production less total exports to the rest of the world

ESCAP-WB Trade Cost Database : Data Source

The end result:

- 178 countries with at least some coverage
- 1995-2010
- Two macro-sectors, agriculture and manufacturing
- Linear interpolation applied to fill in missing trade costs observations



Recent breakthrough – from gravity model to trade costs

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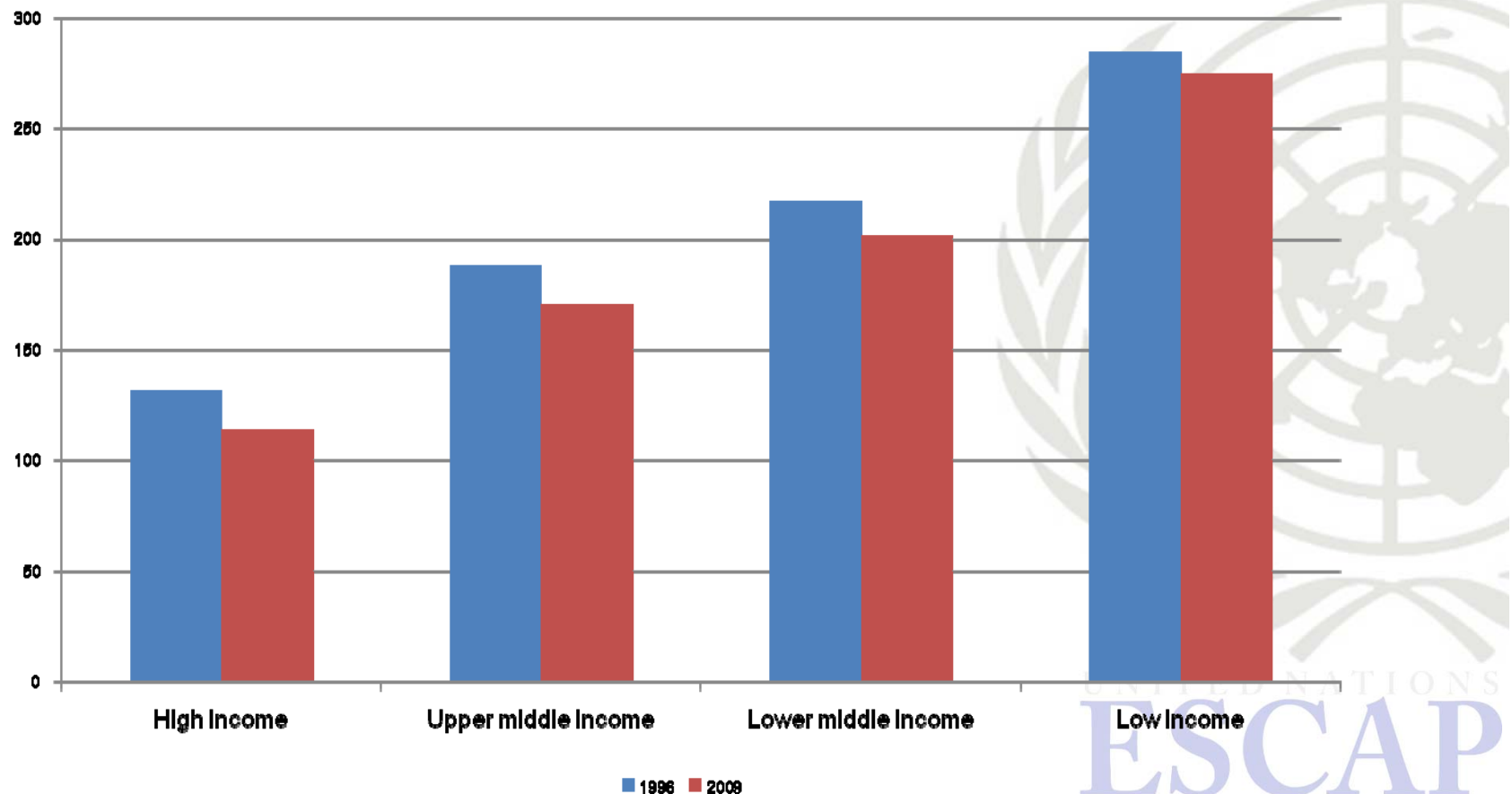
Trade costs in Developing Countries: Findings – Arvis et al, 2013

1. All-inclusive international trade costs are at least one order of magnitude (10 times) larger than tariffs
 - Our “all-inclusive” measures cover tariffs, NTMs of all types, trade facilitation, connectivity, and logistics, as well as geographical factors, and cultural/historical/institutional factors—everything that drives a wedge between domestic and international prices
 - Consistent with Anderson and Van Wincoop (2004), who provide a guesstimate of 5% ad valorem for average rich country tariffs, compared with 74% ad valorem for international trade costs



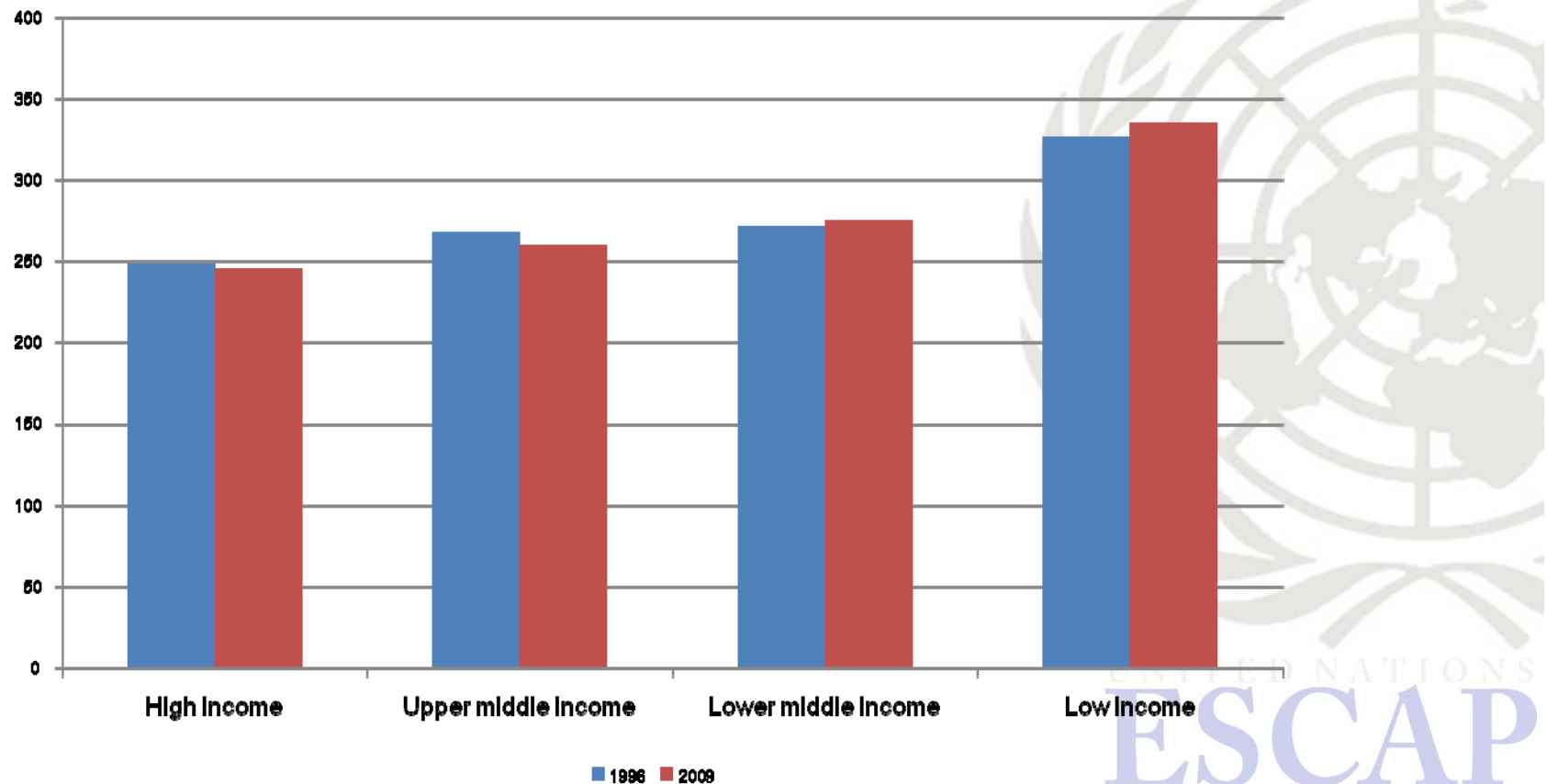
Trade costs in Developing Countries: Findings – Arvis et al, 2013

2. Trade costs in developing countries are much higher than in developed countries, and they are falling more slowly



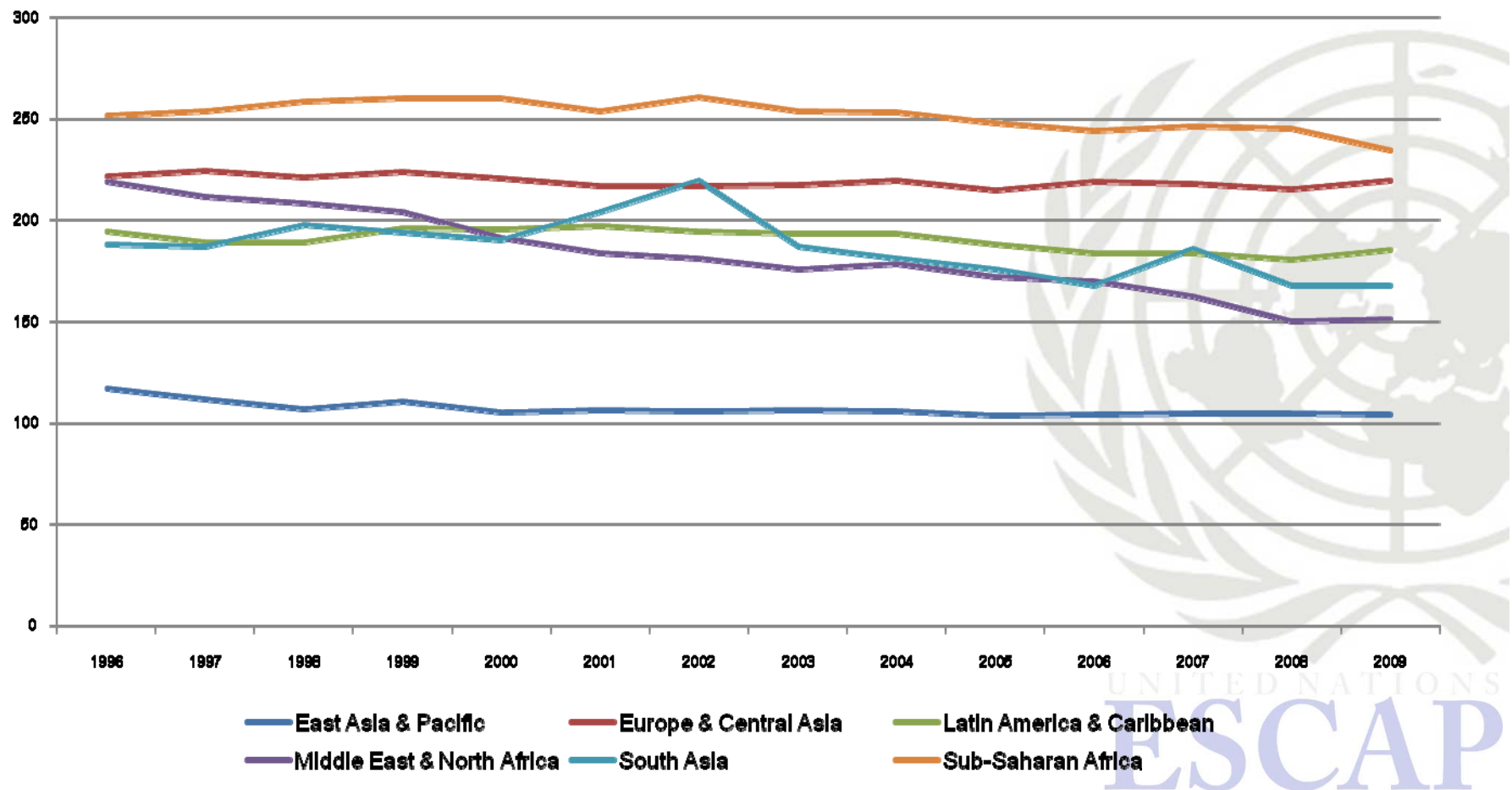
Trade costs in Developing Countries: Findings – Arvis et al, 2013

3. Trade costs in agriculture are much higher than trade costs in manufacturing in all income groups, and they are basically static over time



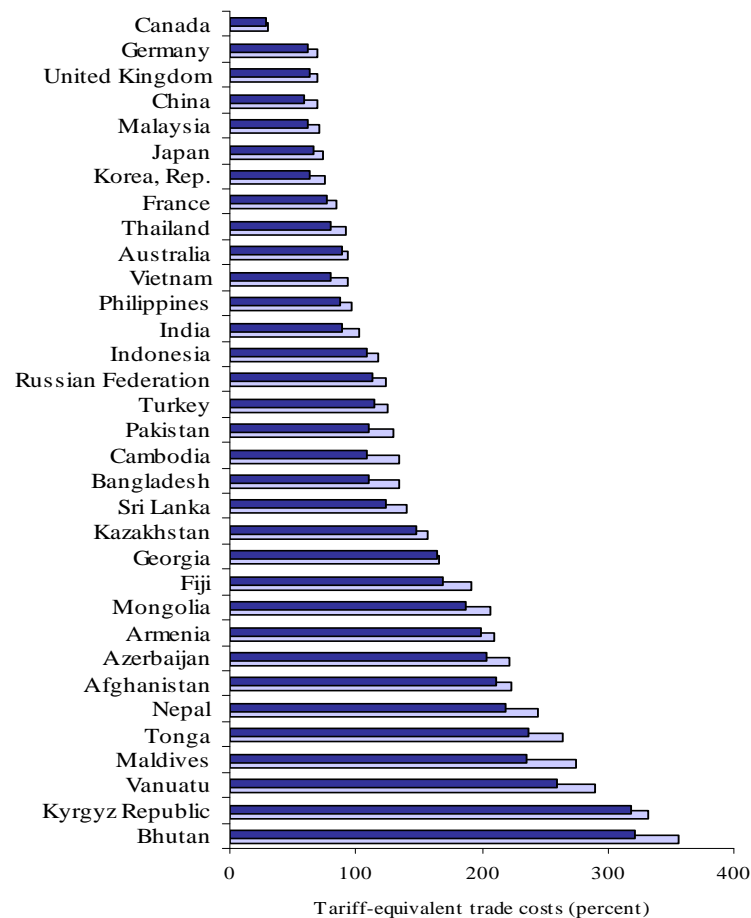
Trade costs in Developing Countries: Findings – Arvis et al, 2013

4. Differences in policy and geography/culture translate into different levels of trade costs in different regions

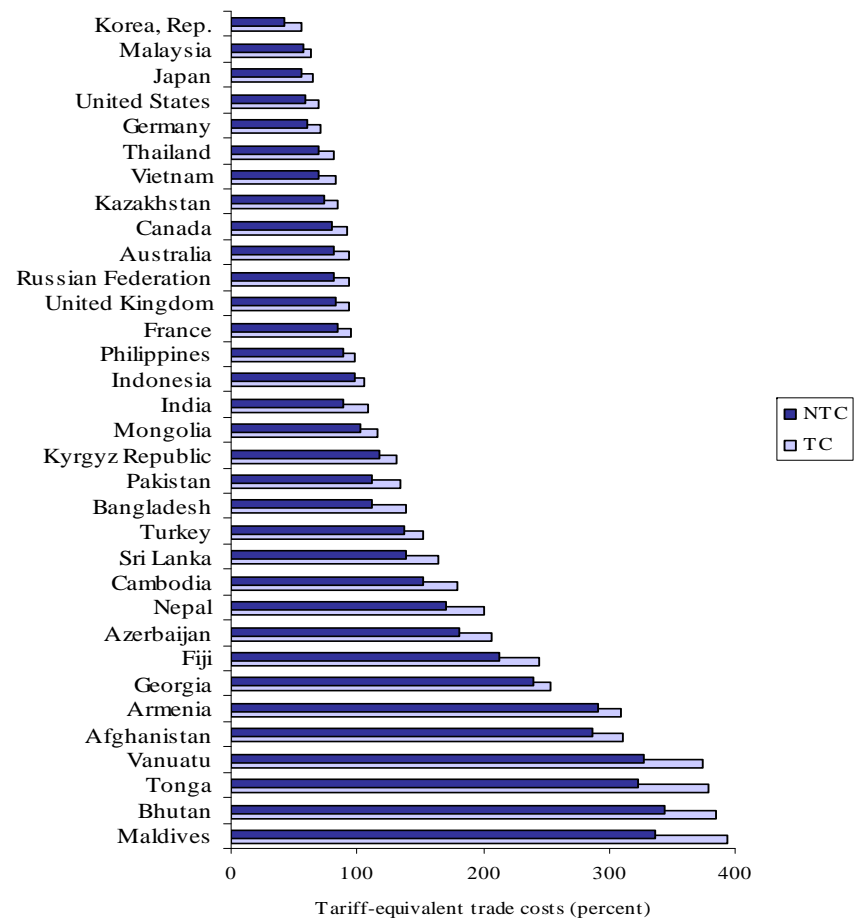


Trade costs in Developing Countries: Findings – Asia-Pacific Perspective: TC and NTC

Trade Costs (TC) and TC excluding tariff (NTC) between selected economies and the United States of America (2007-2010)



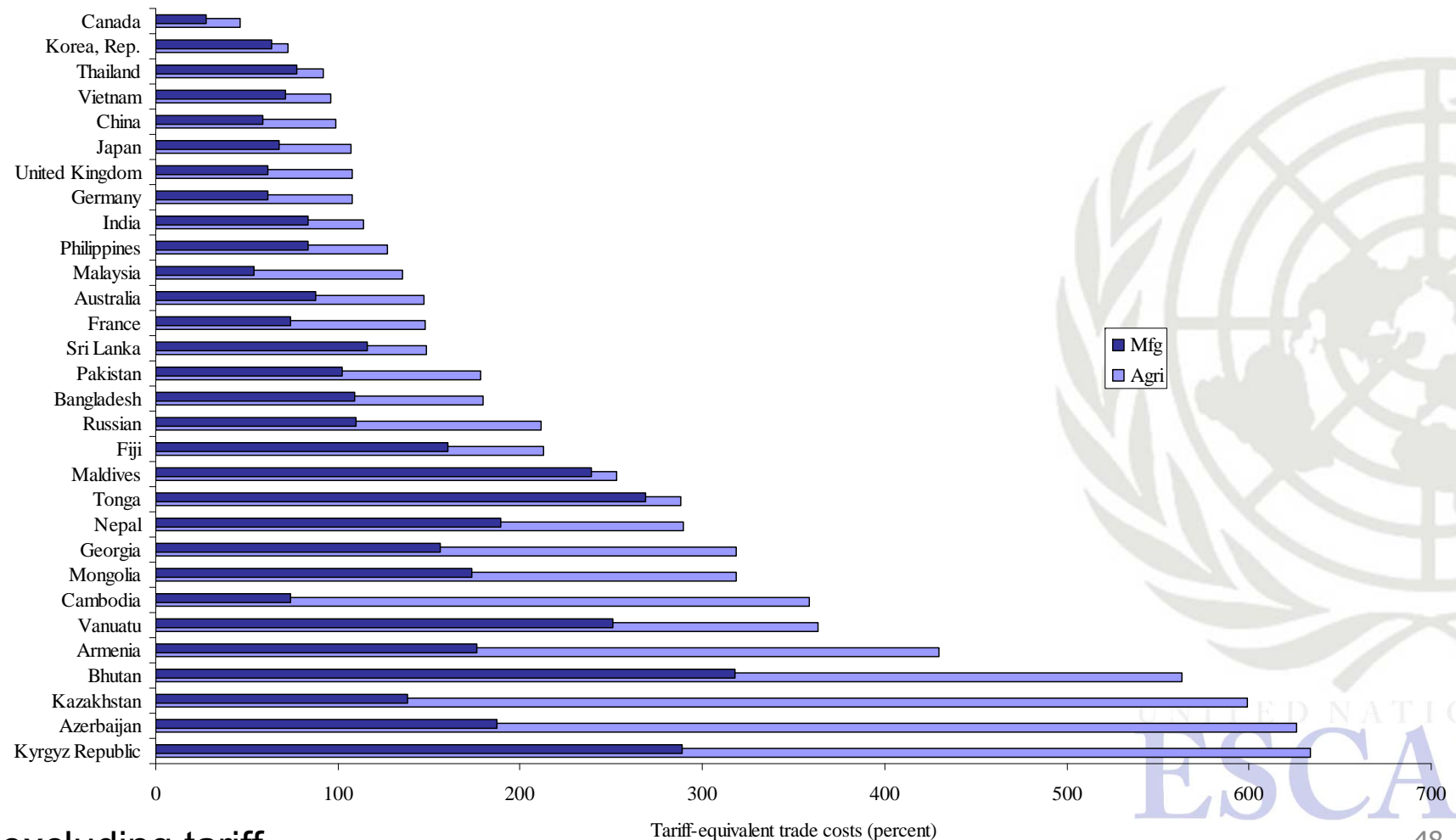
Trade Costs (TC) and TC excluding tariff (NTC) between selected economies and China (2007-2010)



$$NTC_{ij} = TC_{ij} / (1 + \text{tariff}_{ij*ji}). \text{ where } \text{tariff}_{ij*ji} \text{ is the geometric average of } \text{tariff}_{ij} \text{ and } \text{tariff}_{ji}$$

Trade costs in Developing Countries: Findings – Asia-Pacific Perspective: TC and NTC

Agricultural and Manufacturing trade costs* between Selected Economies and the USA



Trade costs in Developing Countries: Findings – Asia-Pacific Perspective: TC and NTC

Region	ASEAN-4	East Asia-3	North and Central Asia	SAARC-4	AUS-NZL	EU-3	USA
ASEAN-4	75.40% (3.08%)	77.58% (7.71%)	381.31% (7.94%)	125.79% (0.74%)	86.09% (-11.54%)	110.22% (6.58%)	84.35% (12.36%)
East Asia-3	77.58% (7.71%)	51.83% (-8.46%)	220.76% (-12.09%)	124.88% (1.85%)	80.14% (-14.21%)	85.75% (-5.59%)	63.03% (-1.36%)
North and Central Asia	381.31% (7.94%)	220.76% (-12.09%)	141.27% (0.47%)	261.12% (-13.15%)	295.77% (-14.39%)	165.83% (-4.86%)	191.13% (3.46%)
SAARC-4	125.79% (0.74%)	124.88% (1.85%)	261.12% (-13.15%)	104.96% (-0.65%)	127.04% (-8.08%)	115.22% (5.96%)	107.84% (8.26%)
AUS-NZL	86.09% (-11.54%)	80.14% (-14.21%)	295.77% (-14.39%)	127.04% (-8.08%)		102.07% (-5.90%)	89.70% (-4.67%)
EU-3	110.22% (6.58%)	85.75% (-5.59%)	165.83% (-4.86%)	115.22% (5.96%)	102.07% (-5.90%)	45.93% (-0.38%)	67.19% (1.07%)
USA	84.35% (12.36%)	63.03% (-1.36%)	191.13% (3.46%)	107.84% (8.26%)	89.70% (-4.67%)	67.19% (1.07%)	

*Data analysis by ESCAP. Percentage changes in trade cost between 2001-2004 and 2007-2010 are in parentheses. Trade costs shown here exclude tariffs.

Trade costs in Developing Countries: Findings – Asia-Pacific Perspective: TC and NTC

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Recent breakthrough – gravity model to trade costs

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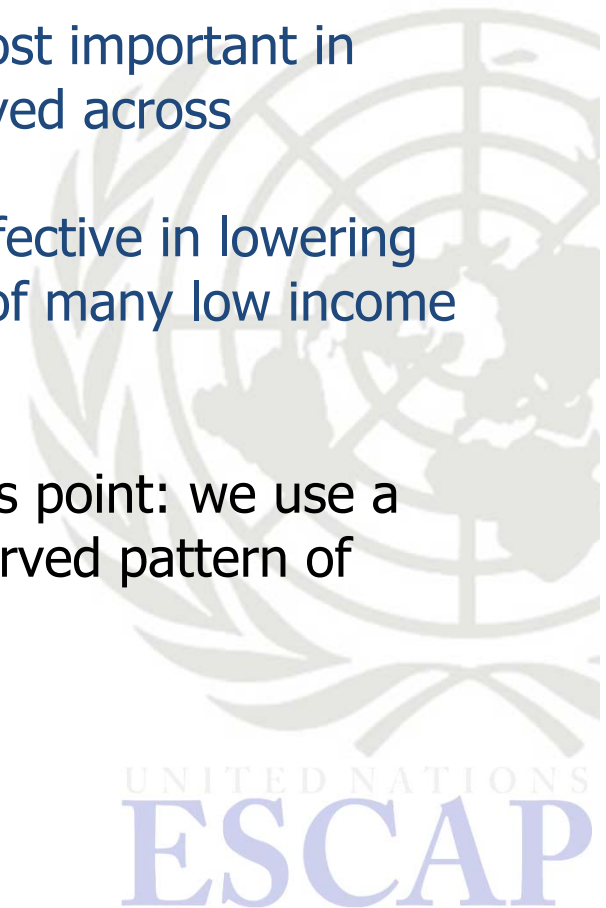
Explaining trade costs – Arvis et al, 2013

- From a policy perspective, it is important to break trade costs down into their component parts

→ Which sources of trade costs are the most important in terms of determining the overall pattern observed across countries?

→ What sorts of policies would be most effective in lowering trade costs and reducing the relative isolation of many low income countries?

- Econometric estimation becomes necessary at this point: we use a model with trade cost variables to explain the observed pattern of trade costs across countries

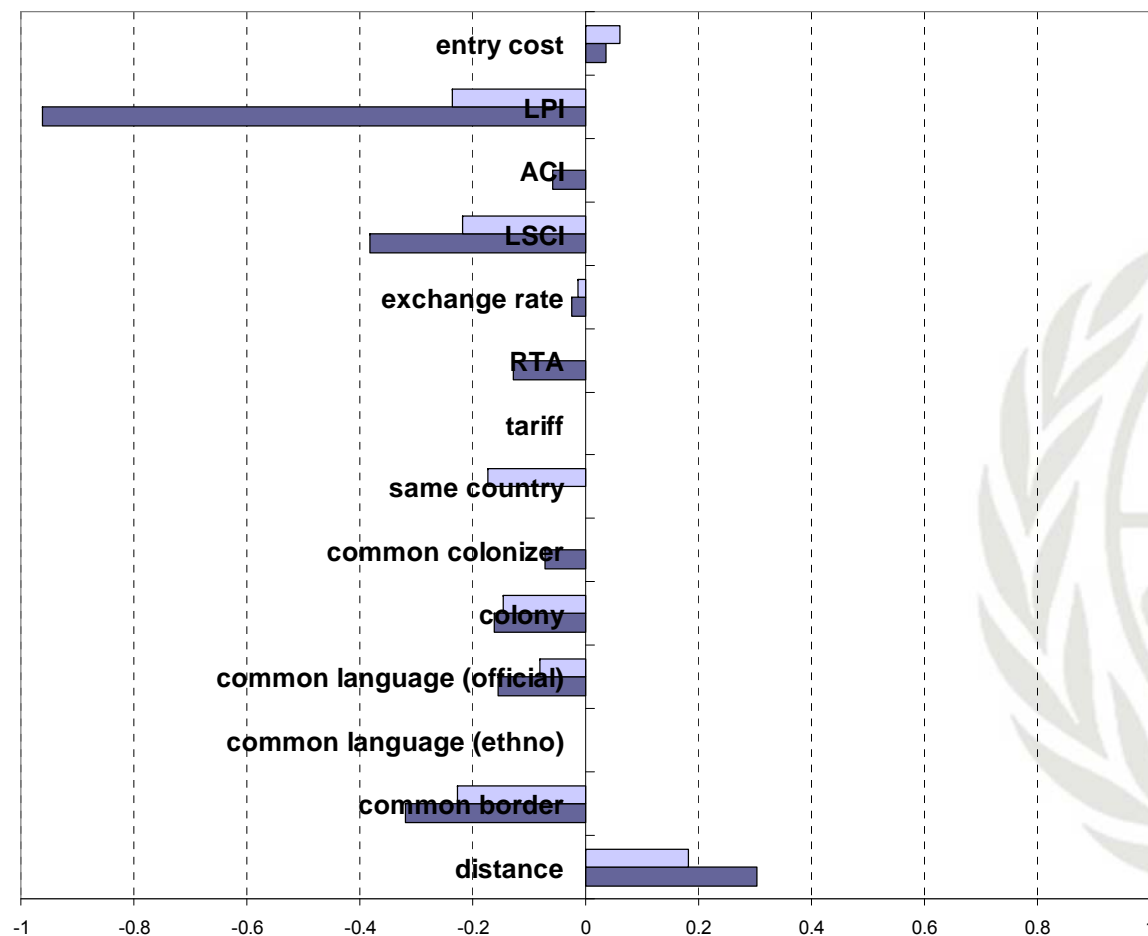


Explaining trade costs – Arvis et al, 2013

- Factors included in the trade cost model are:
 - Distance
 - Common border
 - Common language
 - Existence of a colonial relationship
 - Common colonial heritage
 - Once part of the same country
 - Tariffs
 - Membership of the same RTA
 - Exchange rate
 - Liner shipping connectivity (UNCTAD)
 - Air connectivity (Arvis and Shepherd)
 - Logistics Performance Index
 - Cost of starting a business
- We estimate the models for a single year for all countries, in agriculture and manufacturing sectors

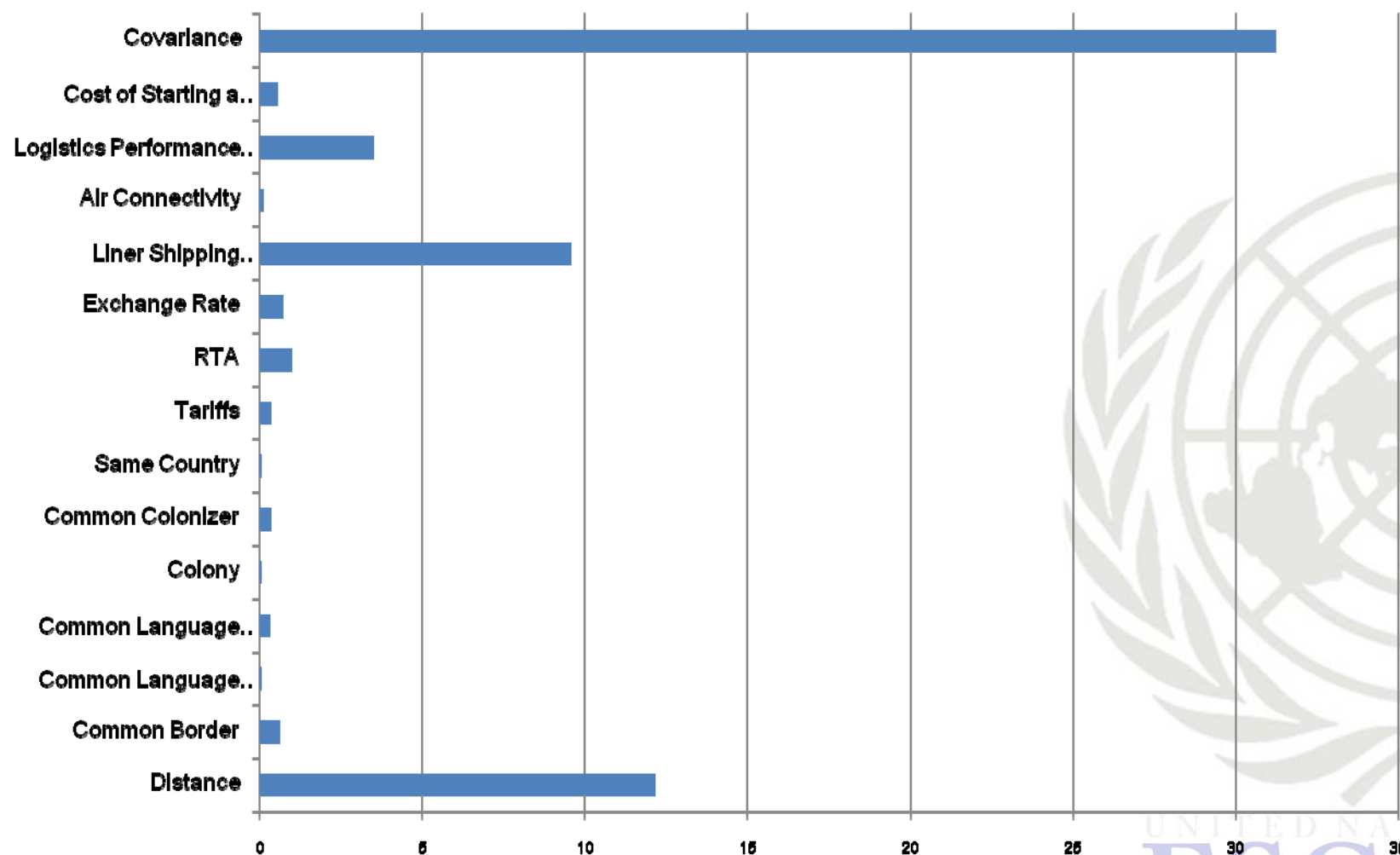


Explaining trade costs – Arvis et al, 2013



*the amount of increase in trade costs (measured in standard deviations) that is associated with a one standard deviation increase in each independent variable

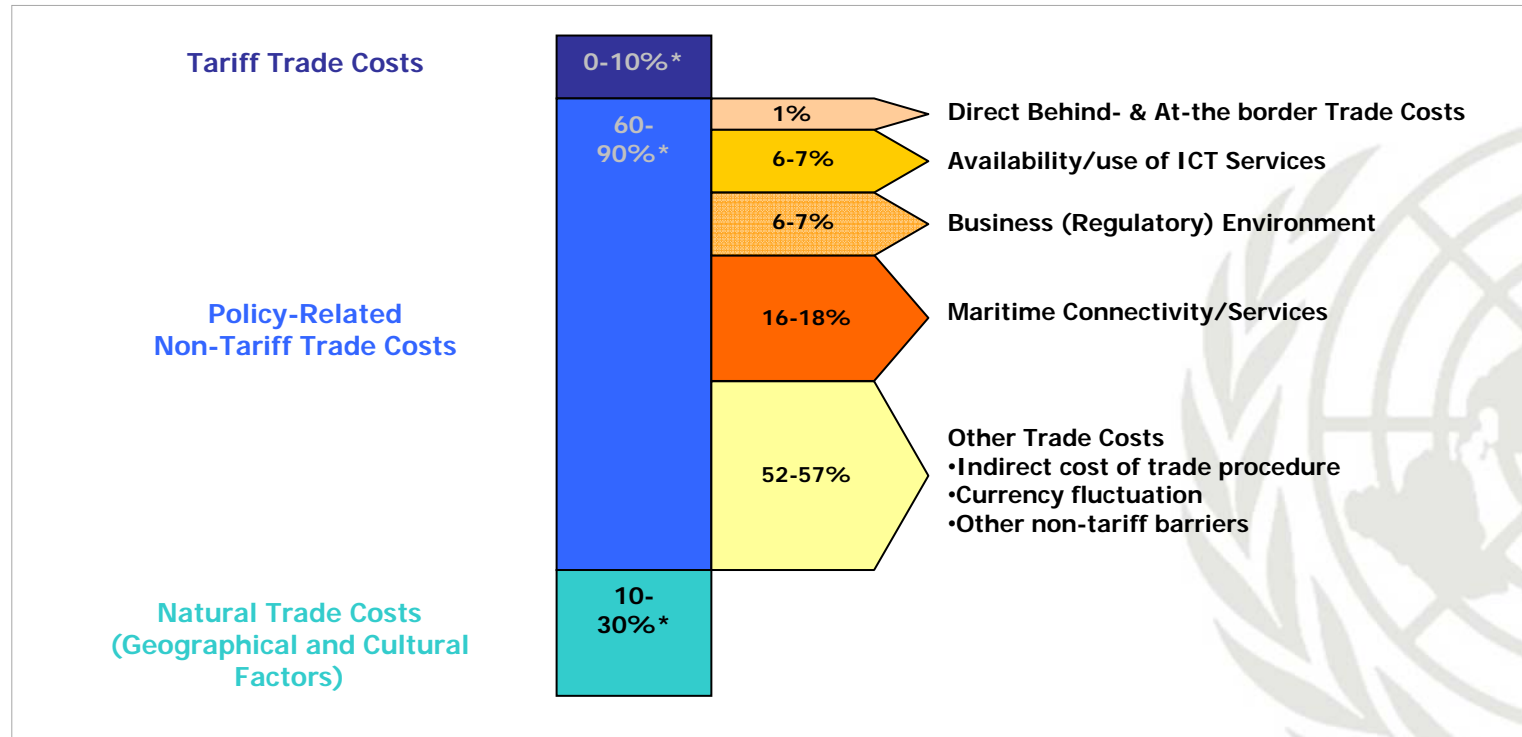
Explaining trade costs – Arvis et al, 2013



* the proportion of the observed variation in trade costs that is accounted for by each independent variable, after controlling for the influence of the other independent variables

Explaining trade costs – Asia-Pacific Perspective

Contribution of natural barriers, behind-the border facilitation and trade-related practice to trade costs



* Illustrative based on casual observation of the data only. Natural trade costs for landlocked countries may be outside the range shown for natural trade costs.

- **Improving access to efficient maritime services** (liner shipping connectivity) as well as to **information and communication technology** facilities are essential to making progress.
- Given limited resources available, **focusing on improving the overall business environment** may be often more effective in facilitating trade than implementing soft measures solely targeted at speeding up movement of goods between factory and the port.

Recent breakthrough – from gravity model to trade costs

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Conclusion

- Joint project between UNESCAP and the WB
- New dataset on international relative to intra-national trade costs:
 - 178 countries
 - 2 macro-sectors (manufacturing and agriculture)
 - 1995-2010 (earlier years available on request)
- Online now at: <http://www.unescap.org/tid/artnet/trade-costs.asp> or on the World Bank website
- Full details available in working paper (PRWP No. 6309, Jan. 2013, or ARTNeT WP No. 121, Dec. 2012)

Conclusion

Key findings:

1. All-inclusive trade costs more than an order of magnitude higher than tariff rates
2. Trade costs in developing countries much higher than in developed countries, and falling more slowly
3. Trade costs in agriculture much higher than trade costs in manufacturing in all income groups, and static over time
4. Very different levels of trade costs in different developing regions
5. Often cheaper for developing countries to trade with far-away developed countries than to trade with neighbors
6. Geography not the only factor responsible for the relative isolation of developing countries (i.e., higher trade costs): policy also matters



Conclusion

Note for Asia and Pacific perspective::

From higher to lower trade costs in A-P:

Central Asia → South Asia → Southeast Asia →
East Asia (excluding Mongolia)



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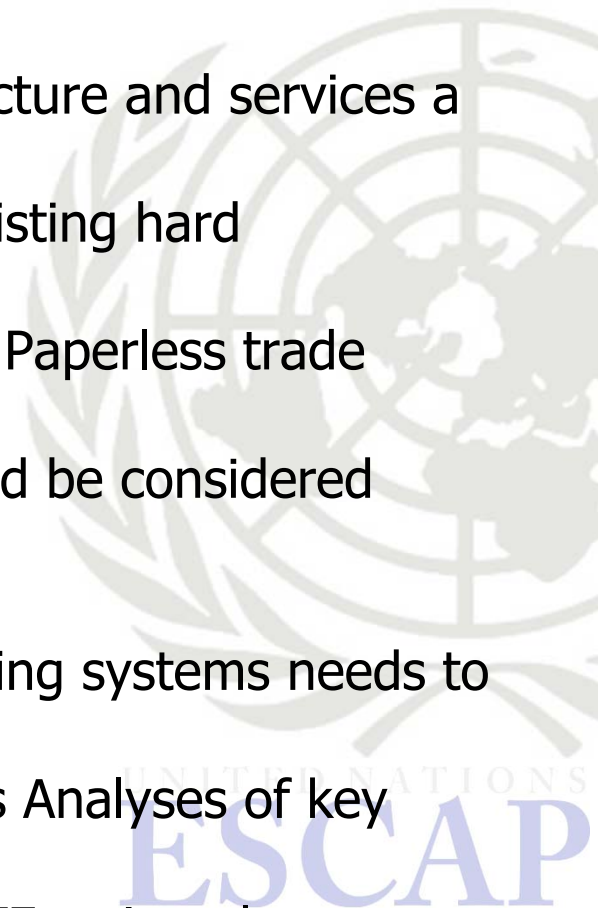
Exercises

Conclusion and way forward

- Some preliminary implications:
 - Streamlining trade procedures (narrow TF), maritime connectivity and logistics most important policy areas for moving forward on trade costs
 - East Asia and the Pacific may provide an important stock of best practice in the developing world when it comes to reducing trade costs
 - To successfully reduce trade costs, action necessary on a number of fronts at once—a broad agenda is appropriate
 - Sectoral focus (on agriculture) of technical assistance/capacity building on trade facilitation may be effective approach
 - Particular attention needed on reducing intra-regional trade costs
- The analysis of trade costs provide a useful starting point in engaging with countries on their trading environment... other tools (micro-level) needed to identify actual bottlenecks and develop solutions
 - E.g., ESCAP-UNECE UNNExT Business Process Analysis Guide

Conclusion and way forward

- A lot of room for improvement in trade facilitation
- Important to take a holistic approach to facilitating trade
 - Many components to trade costs
 - Availability and quality of logistics infrastructure and services a key component
 - Goal is to make the best possible use of existing hard infrastructure
 - Use of modern ICT also one of the keys → Paperless trade
- Sectoral focus of trade facilitation initiatives should be considered (e.g., agriculture)
- Micro-level trade facilitation performance monitoring systems needs to be developed
 - e.g., Standardized & Regular Trade Process Analyses of key products
 - to form the basis of national/sub-regional TF action plans



Conclusion and way forward

Way Forward:

- Continuous updating of the database
- Deepen analysis on agricultural trade cost
- Explore ways to breakdown the “all-inclusive” trade cost measure into components (isolate the “policy-related” component in particular)
- Improve on the trade cost models to include more factors
- Calculate trade costs at a more disaggregated level & add service sector
- Include more developing countries (particularly LDCs and LLDCs in the database)
- ...



How to Access Trade Cost Data

1 Go to
www.unescap.org

The screenshot shows the UN ESCAP website. At the top, there is a navigation bar with links for 'UN Web Site', 'UN Web Site Locator', 'Home', 'Contacts', and a search bar. Below this is the ESCAP logo and a secondary navigation bar with links: 'About ESCAP', 'Executive Secretary', 'Our Work', 'Partners', 'Research & Data', 'Media Centre', and 'Events'. The main content area features a large banner for the 'Asia-Pacific Trade and Investment Report 2012' with a 'Read More' button. Below the banner is a horizontal menu with various topics: 'Disaster Risk Reduction', 'Environment', 'Information & Communications Technology', 'Macroeconomic', 'Social Development', 'Statistics', 'Trade & Investment' (highlighted with a red dashed box and a large blue arrow pointing to it), and 'Transport'. Below this menu are three columns: 'ESCAP News' with a story about International Women's Day, 'Highlights' with a story about the Asia-Pacific economic slump, and 'Events' with upcoming meetings in Bangkok, Thailand.

2 Click
Trade and Investment

How to Access Trade Cost Data



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Committee on Trade and Investment

Trade and Investment Division (TID)

APBF Core Activities APTA APTIAD APTIR I4D UNNExT

ARTNeT

Recent and upcoming activities

- UNNExT Capacity Building Workshop on Electronic Message Development for Single Window Environment in Mongolia, 30 November-2 December 2011, Ulaanbaatar, Mongolia
- Regional Network Meeting on Foreign Direct Investment (FDI) in Least Developed Countries, Landlocked Economies and Countries with Economies in Transition in Asia and the Pacific, 1 December 2011, Bangkok, Thailand
- Seminar on the future direction of APTA, 6 December 2011, Seoul, Republic of Korea
- WIPO-ESCAP Regional Workshop on Research on Intellectual Property (IP) Economics and Policy, 8-9 December 2011, Bangkok, Thailand
- WTO/ESCAP Advanced Government Procurement for Asian Economies, 20-22 December 2011, Bangkok, Thailand
- Past events

3 Click
ARTNeT



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Asia-Pacific Research and Training Network on Trade

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Useful links

Recent events **New publications** **Calls**

- Special Lecture : the Role of Developing Countries in Global Governance by Prof. Peter Lloyd, Thursday 9 February 2012, 10.30-12.00 at Meeting room B, 1st Floor, UNCC
- ARTNeT/RIS Capacity Building Workshop on Use of Gravity Modeling, 9-11 November 2011, RIS, New Delhi, India
- Training on Evidence-based Policy-making in Trade and Investment, 26-29 July 2011, Bangkok, Thailand
- ARTNeT Symposium "Towards a Return of Industrial Policy?" 25-26 July 2011, UNCC, Bangkok
- ARTNeT Seminar on "Global Governance after the Failure of Doha and IGC Climate Change Negotiations" by Professor Peter Lloyd, Wednesday 23 February 2011, 10.30-11.30 hours, Trade and Investment Division, ESCAP, 4th Floor, Block B (TID meeting room)

ARTNeT Database of Trade Publications

Please choose 'Trade Focus Area' for specific search.

Trade Focus Area :
All Trade Focus Area

Check box to include related publications from other 'Trade Focus Area' ☐

Keyword:

Search in:
All fields

Type of Publication :

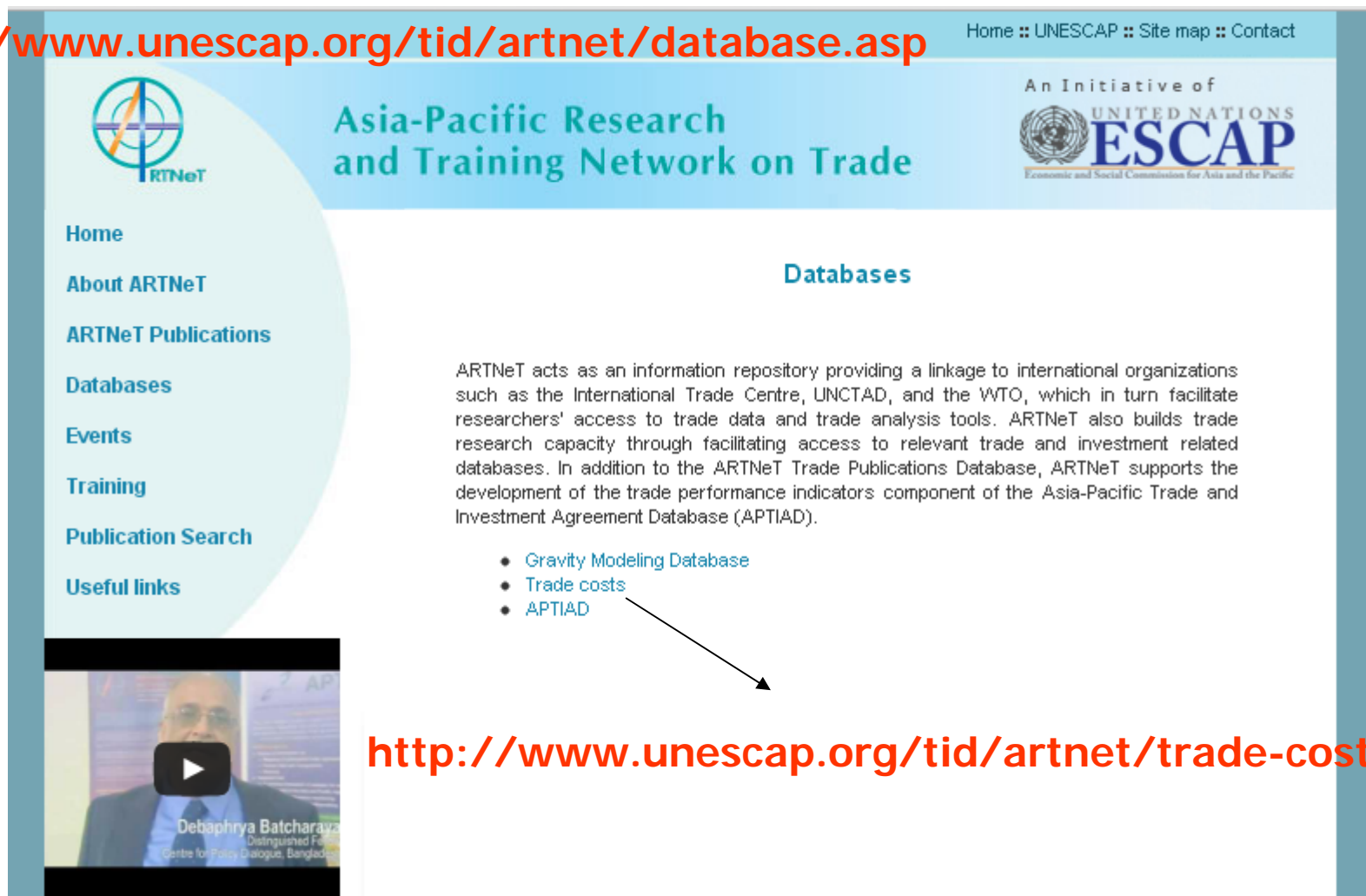
Year :
All Years

Go

4 Click
Database

How to Access Trade Cost Data

<http://www.unescap.org/tid/artnet/database.asp>



The screenshot shows the ARTNeT website interface. At the top, there is a navigation bar with links: Home :: UNESCAP :: Site map :: Contact. Below this, the header features the ARTNeT logo on the left, the title 'Asia-Pacific Research and Training Network on Trade' in the center, and the UNESCAP logo on the right with the text 'An Initiative of UNITED NATIONS ESCAP Economic and Social Commission for Asia and the Pacific'. A left sidebar contains a menu with links: Home, About ARTNeT, ARTNeT Publications, Databases, Events, Training, Publication Search, and Useful links. The main content area is titled 'Databases' and contains a paragraph explaining ARTNeT's role as an information repository. Below this paragraph is a bulleted list of databases: Gravity Modeling Database, Trade costs, and APTIAD. An arrow points from the 'Trade costs' link to the URL <http://www.unescap.org/tid/artnet/trade-costs.asp> shown below the screenshot. At the bottom left of the screenshot, there is a video player showing a man speaking, with the name 'Debabhrya Batcharaya' and his title 'Distinguished Fellow, Centre for Policy Dialogue, Bangladesh' visible below the video.

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ARTNeT

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Databases

ARTNeT acts as an information repository providing a linkage to international organizations such as the International Trade Centre, UNCTAD, and the WTO, which in turn facilitate researchers' access to trade data and trade analysis tools. ARTNeT also builds trade research capacity through facilitating access to relevant trade and investment related databases. In addition to the ARTNeT Trade Publications Database, ARTNeT supports the development of the trade performance indicators component of the Asia-Pacific Trade and Investment Agreement Database (APTIAD).

- Gravity Modeling Database
- Trade costs
- APTIAD

<http://www.unescap.org/tid/artnet/trade-costs.asp>


Debabhrya Batcharaya
Distinguished Fellow
Centre for Policy Dialogue, Bangladesh


ESCAP

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ESCAP-World Bank Trade Cost Database


(Global version issued December 2012)

The ESCAP Trade and Investment Division, in support to the ARTNeT research programme on trade facilitation, initiated development of a bilateral trade cost database in 2010 in an effort to increase understanding of the cost of trading between countries in Asia and the Pacific and beyond. The trade cost measure, based on Novy (2012), is a comprehensive all-inclusive measure based on micro-theory and calculated using macro-economic data, providing an alternative measure of trade facilitation performance. Following release of a first version of the database in 2010 using trade and GDP data, [1] an improved and expanded version 2 was released in December 2011 - based on gross output data and providing sectoral trade cost estimates for about 100 countries.[2]

In late 2011, United Nations ESCAP and the World Bank (WB) joined hands to develop a common standard methodology for calculating comprehensive international trade costs and provide the research and policy community with a global reference. The resulting ESCAP-World Bank Trade Cost Database covers 178 countries and is available below, as well as on the WB website.[3]

- ESCAP-World Bank Trade Cost [Database](#) [stata file]
- ESCAP-World Bank Trade Cost [Database \(2005-2010\)](#) [excel]
- [Metadata](#)
- [User Note](#)

Note: Earlier versions of the databases are available upon request to the authors.




Debapriya Batcharaya
Distinguished Fellow
Centre for Policy Dialogue, Bangladesh



How to Access Trade Cost Data

<http://data.worldbank.org/data-catalog/trade-costs-dataset>

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Trade Costs Dataset

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The Trade Costs Dataset provides estimates of bilateral trade costs in agriculture and manufactured goods for the 1995-2010 period. It is built on trade and production data collected in 178 countries. Symmetric bilateral trade costs are computed using the Inverse Gravity Framework (Novy 2009), which estimates trade costs for each country pair using bilateral trade and gross national output.

[Print](#)

Type	Global
Periodicity	Annual
Coverage	All Countries
Number of economies	178
Start date	1995
End date	2010
Update frequency	Annual
Last update	2012
Source/Citation	The World Bank UNESCAP Trade costs Database.

Resources

Not available in the API

[DATABANK](#)

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Exercises – Gravity and Trade Facilitation

- For gravity model, Poisson Pseudo Maximum Likelihood (PPML) is used (Silva and Tenreyro, 2006)
- `ppml [dependvar] [indevar1 indevar2 indevar3], option`
 - ▶ recommended option: `cluster()`
 - ▶ `ppml` is the same as `poisson [dependvar] [indevar]`, robust so robust has taken into account
 - ▶ recap:
 - ▶ robust takes care of heteroskedasticity
 - ▶ cluster takes care of correlation within groups
- For panel data, run the model with dummies
 - ▶ `quietly tab [variable], gen(dum)`
 - ▶ `ppml [dependvar] [indevar1 2 3 dum1 2 3], option`



Exercises – Gravity and Trade Facilitation

- Use `dum*` to includes all dummies.
- Stata automatically drop one dummy so there would be no perfect collinearity
- Trade cost by construction is greater than zero
- `reg [dependvar] [indevar1 indevar2 indevar3], option`
 - ▶ option to make OLS to GLS: `robust cluster()`
 - ▶ recap (again):
 - ▶ `robust` takes care of heteroskedasticity
 - ▶ `cluster` takes care of correlation within groups
- For panel data, run the model with dummies
 - ▶ `quietly tab [variable], gen(dum)`
 - ▶ `reg [dependvar] [indevar1 2 3 dum 1 2 3], option`



Exercises – Gravity and Trade Facilitation

- For trade cost model, generalized least square (GLS) is used
- Trade cost by construction is greater than zero
- `reg [dependvar] [indevar1 indevar2 indevar3], option`
 - ▶ option to make OLS to GLS: `robust cluster()`
 - ▶ recap (again):
 - ▶ `robust` takes care of heteroskedasticity
 - ▶ `cluster` takes care of correlation within groups
- For panel data, run the model with dummies
 - ▶ `quietly tab [variable], gen(dum)`



Thank you

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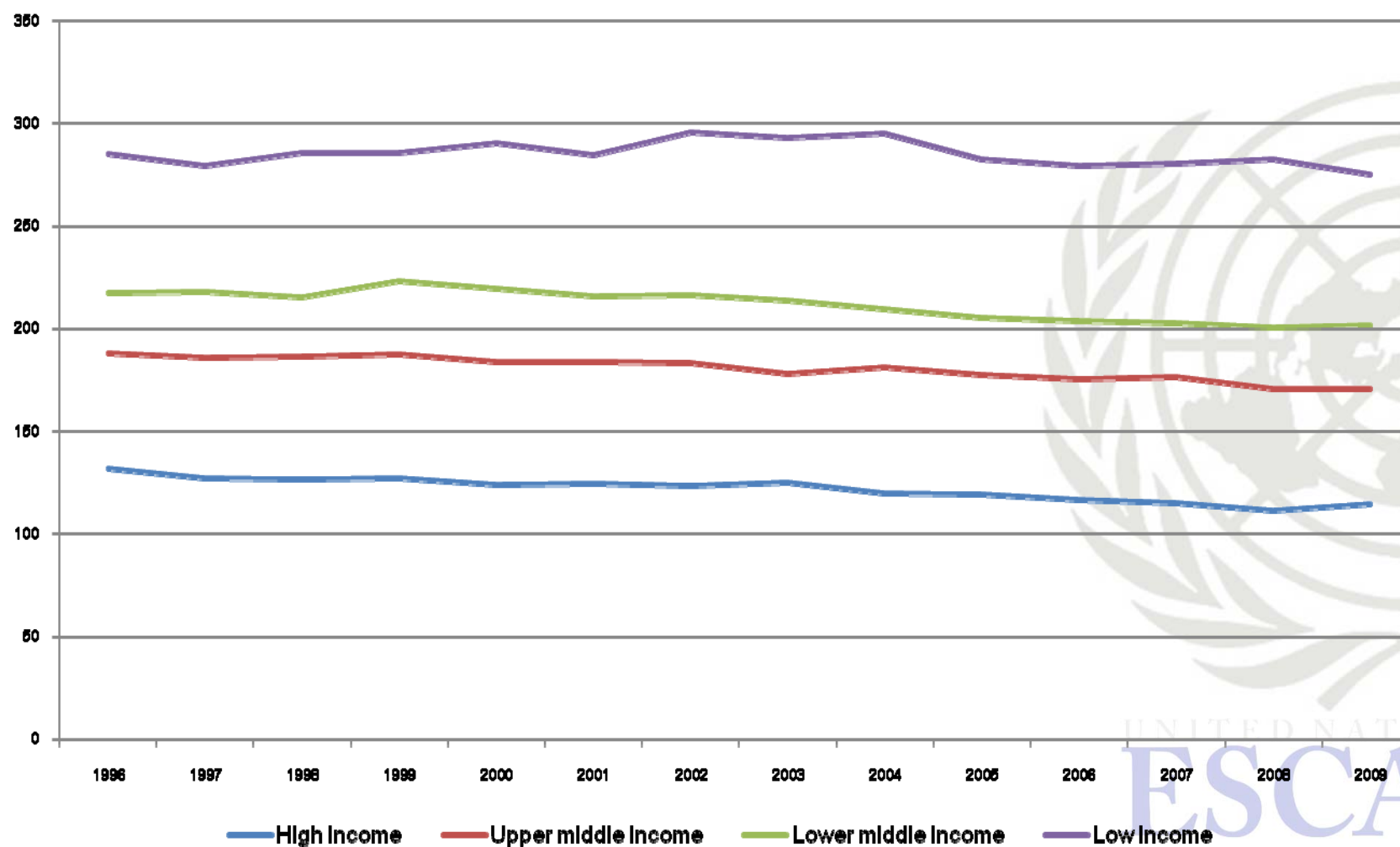
Appendix

- Trade cost in comparative perspective
 - Trade costs by income group
 - Trade costs by region
 - Manufacturing vs. agriculture
 - Trade costs over time
- Derivation of trade costs equation
- Comparison with other measures
- TID staff working paper: SWP 4/11

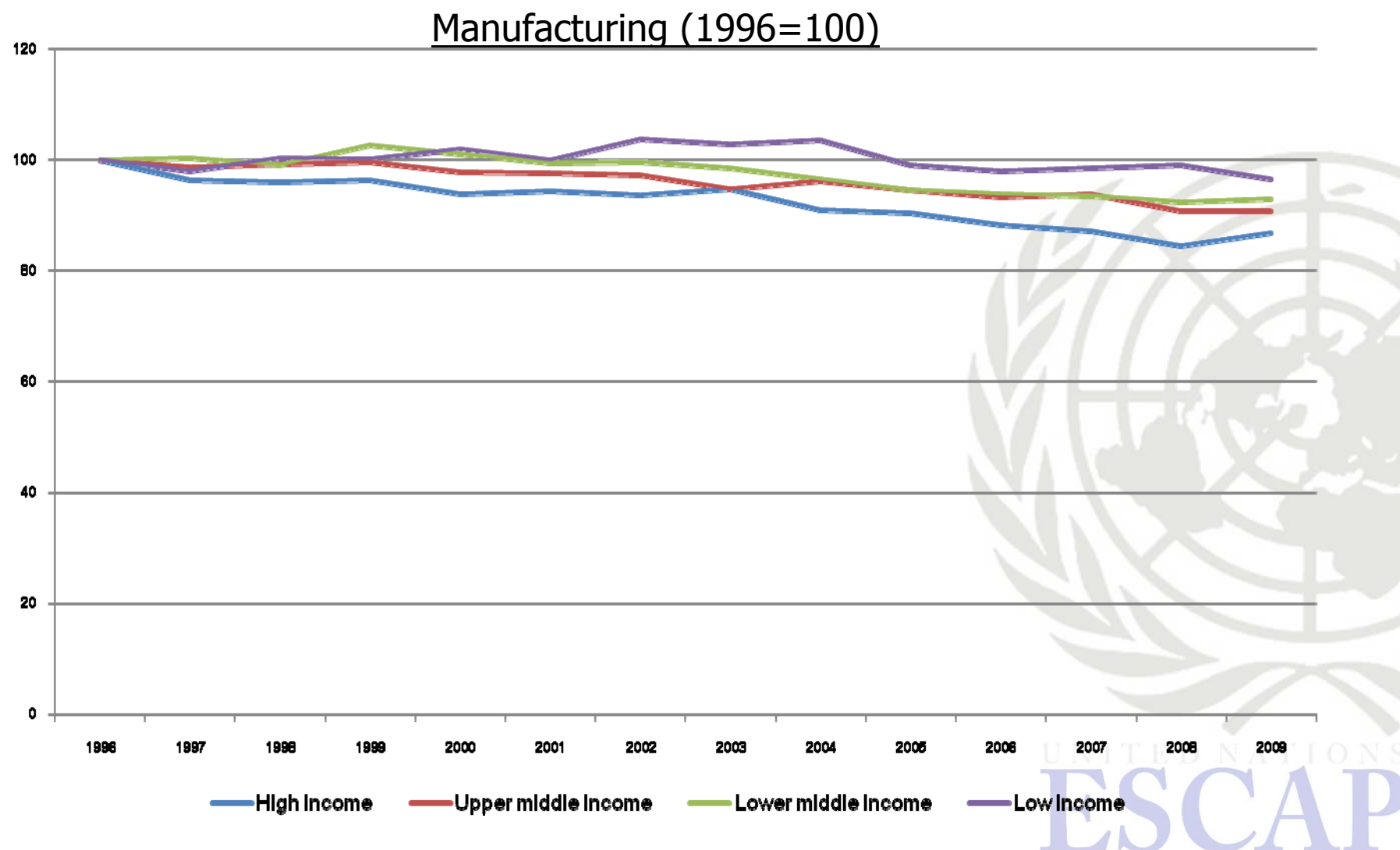


Appendix – Trade costs in comparative perspective

Manufacturing

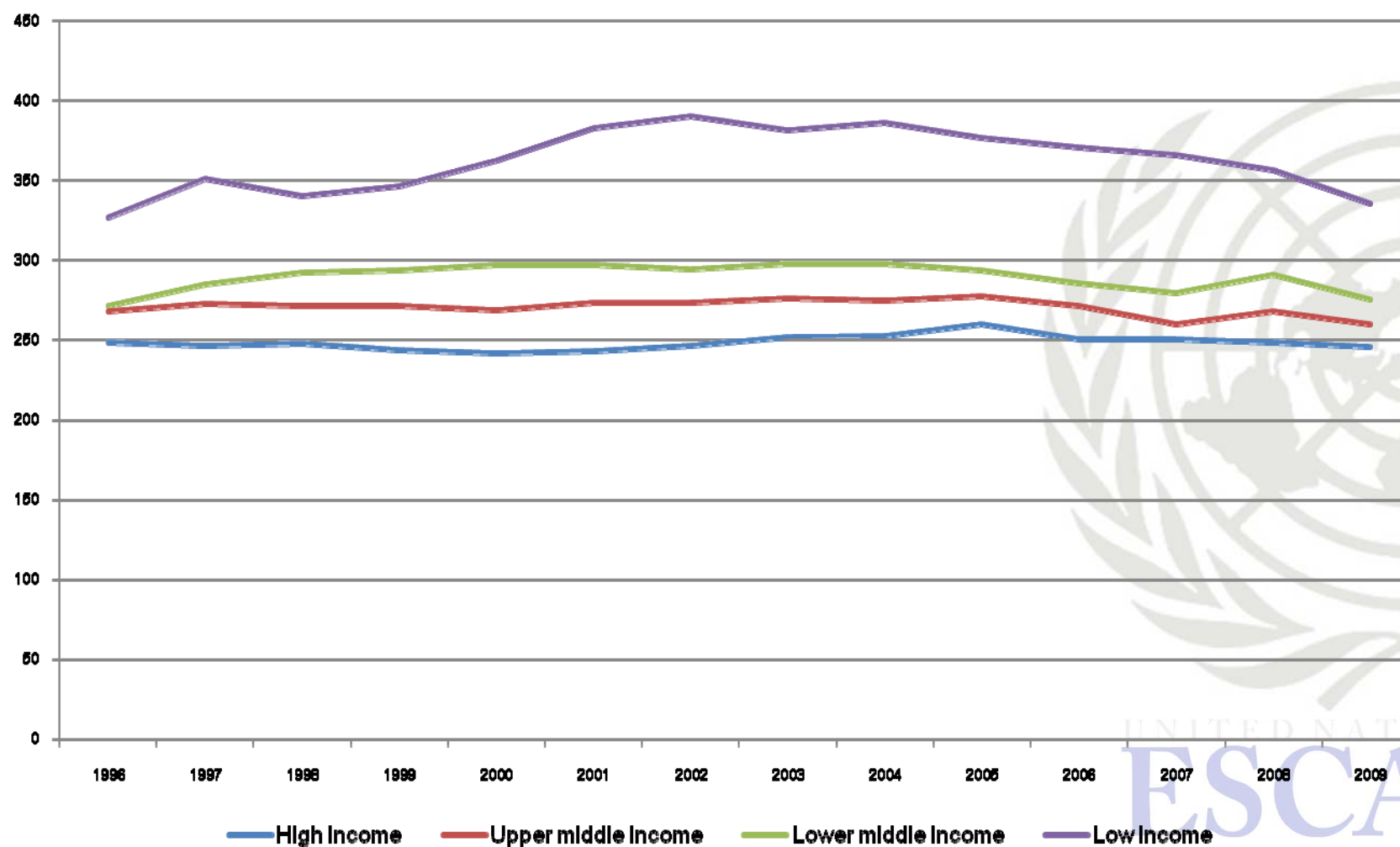


Appendix – Trade costs in comparative perspective



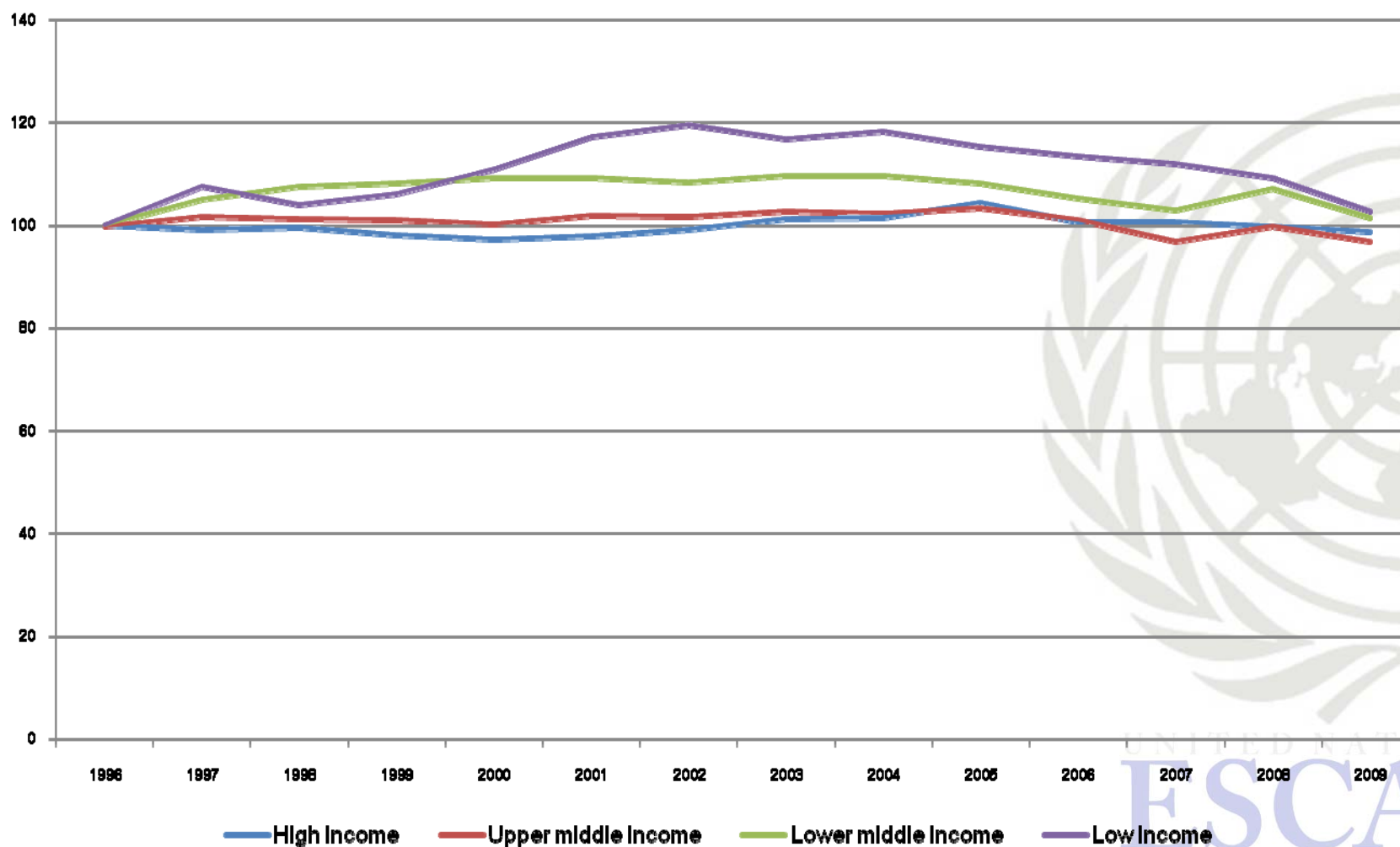
Appendix – Trade costs in comparative perspective

Agriculture



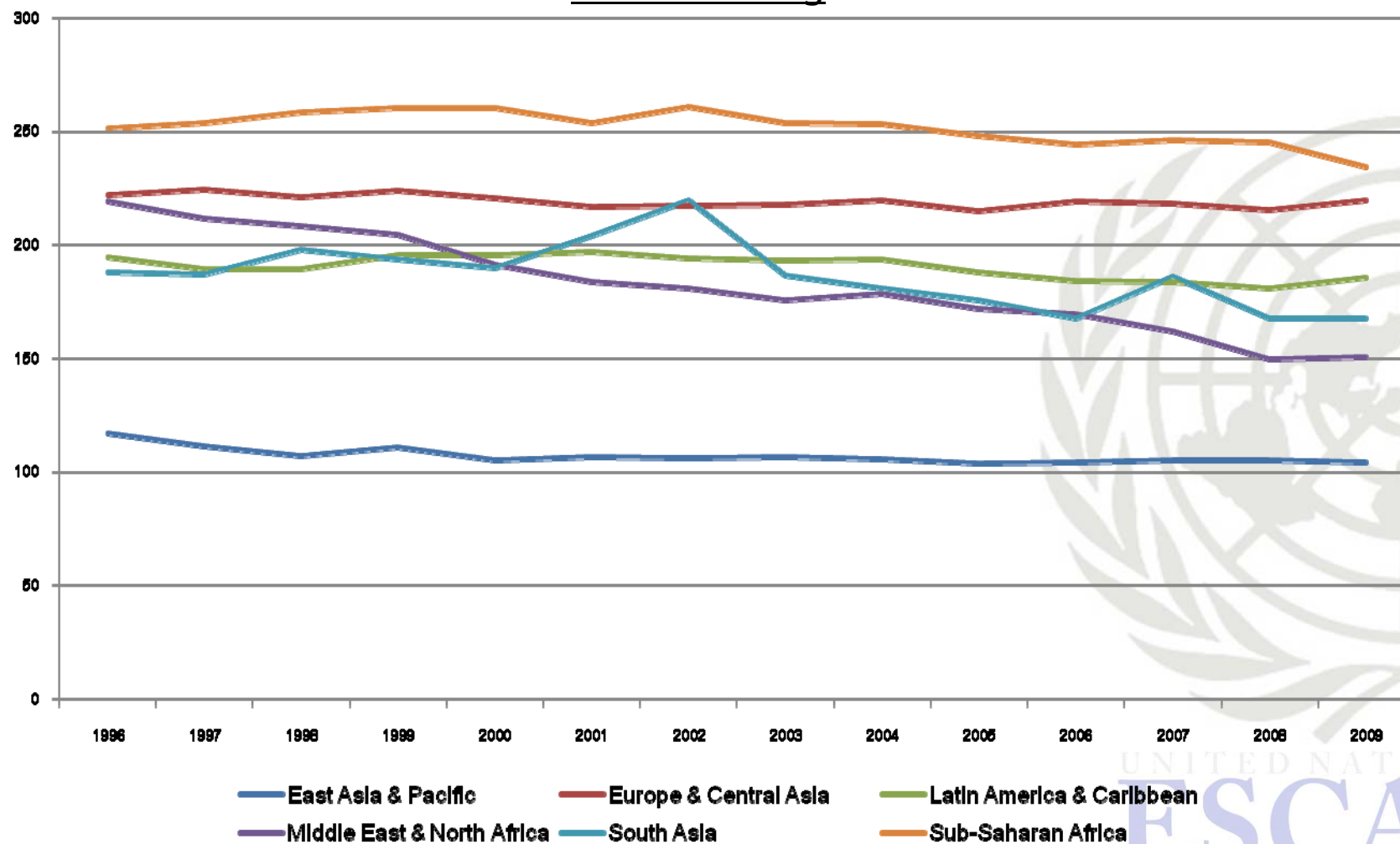
Appendix – Trade costs in comparative perspective

Agriculture (1996=100)

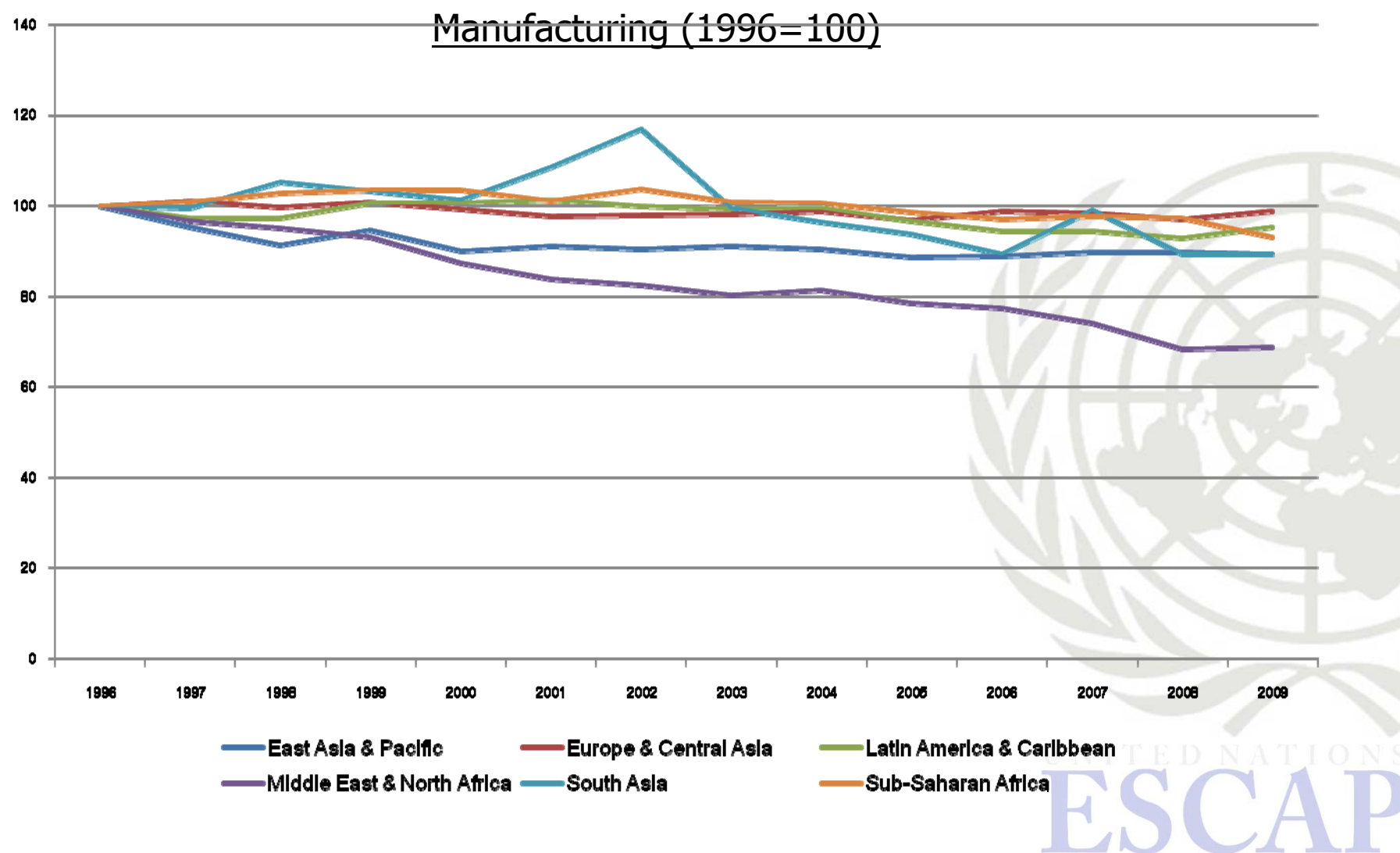


Appendix – Trade costs in comparative perspective

Manufacturing

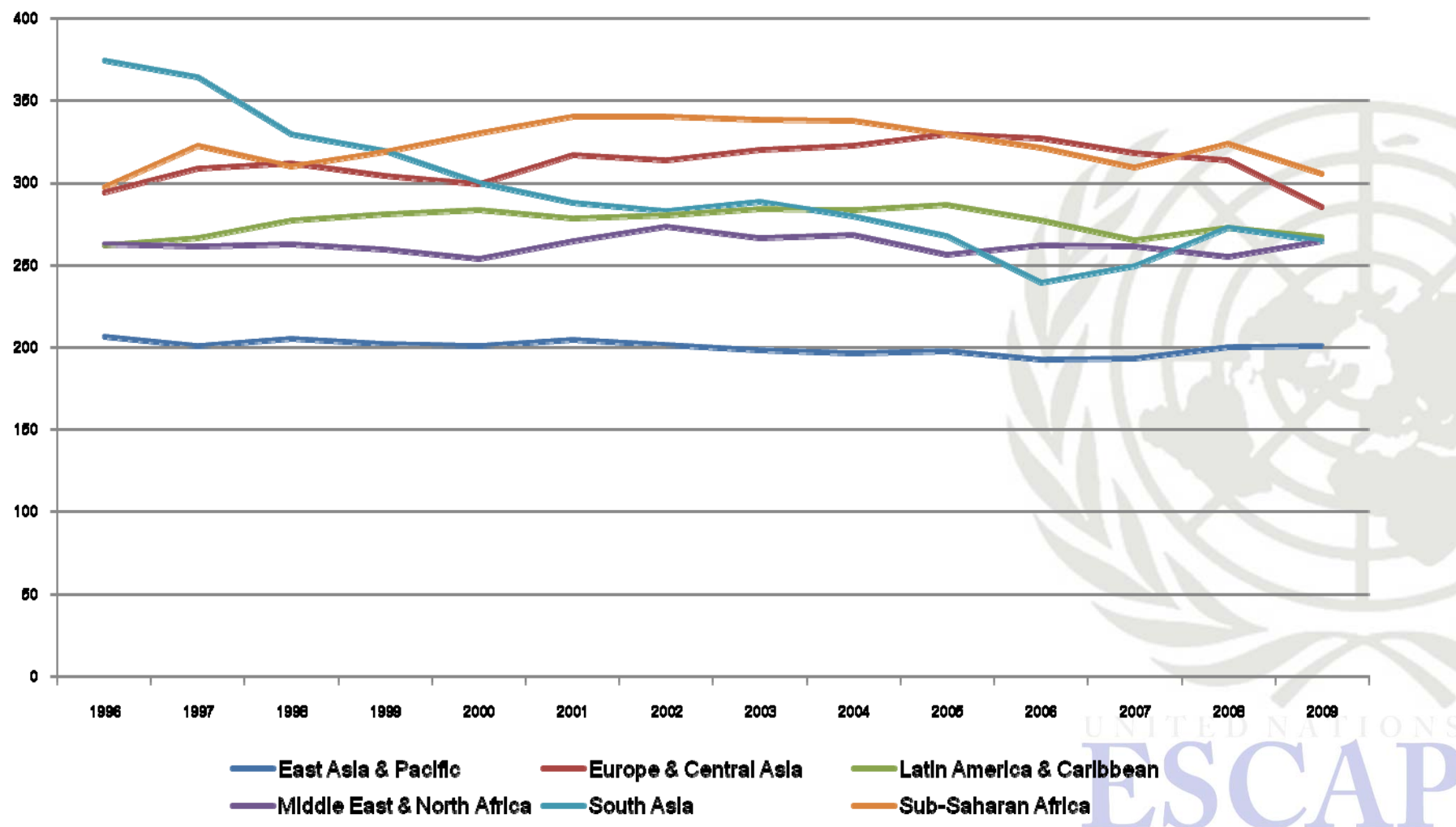


Appendix – Trade costs in comparative perspective



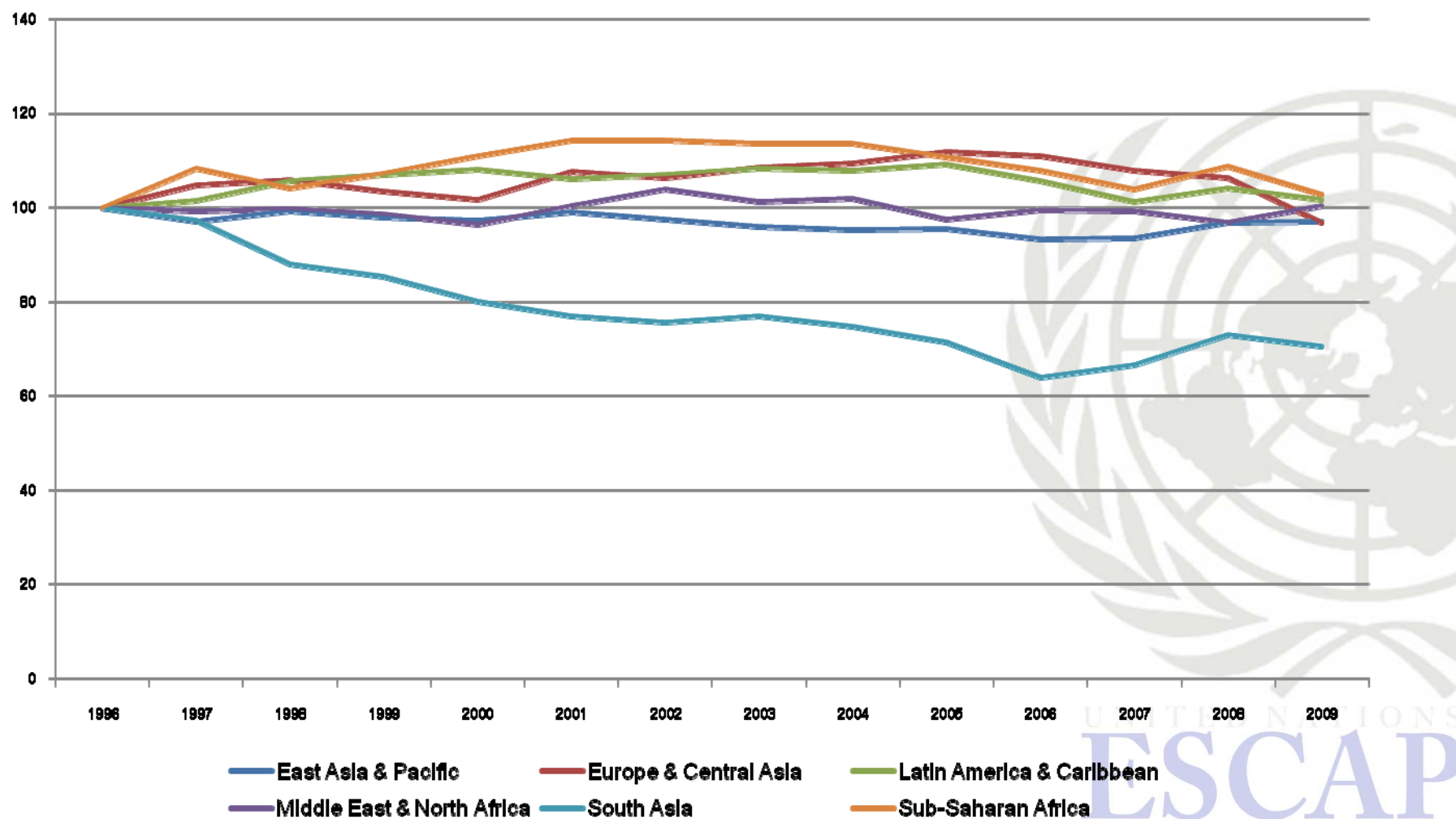
Appendix – Trade costs in comparative perspective

Agriculture



Appendix – Trade costs in comparative perspective

Agriculture (1996=100)



Appendix – Derivation of Trade Cost Equation

Anderson and van Wincoop (2003) derived the micro-founded gravity equation with trade cost component as;

$$x_{ij} = \frac{y_i y_j}{y^w} \left(\frac{t_{ij}}{\Pi_i P_j} \right)^{1-\sigma} \quad (1)$$

where x_{ij} denotes nominal exports from i to j ; y_i and y_j denotes nominal income from country i and j respectively; y^w denotes world income; $\sigma > 1$ denotes elasticity of substitution across goods; Π_i and P_j denotes price index of country i and j respectively; t_{ij} denotes bilateral trade costs (as one plus ad valorem term).

Anderson and van Wincoop (2003) defines Π_i and P_j as multilateral resistance term as those price indices incorporate average trade barriers with all other trading partners. Novy (2009) suggests the expression of intra-national trade as

$$x_{ii} = \frac{y_i y_i}{y^w} \left(\frac{t_{ii}}{\Pi_i P_i} \right)^{1-\sigma} \quad (2)$$

where t_{ii} becomes intra-national trade costs.

Appendix – Derivation of Trade Cost Equation

Re-arranging (2) as the product of multilateral resistance term as follows:

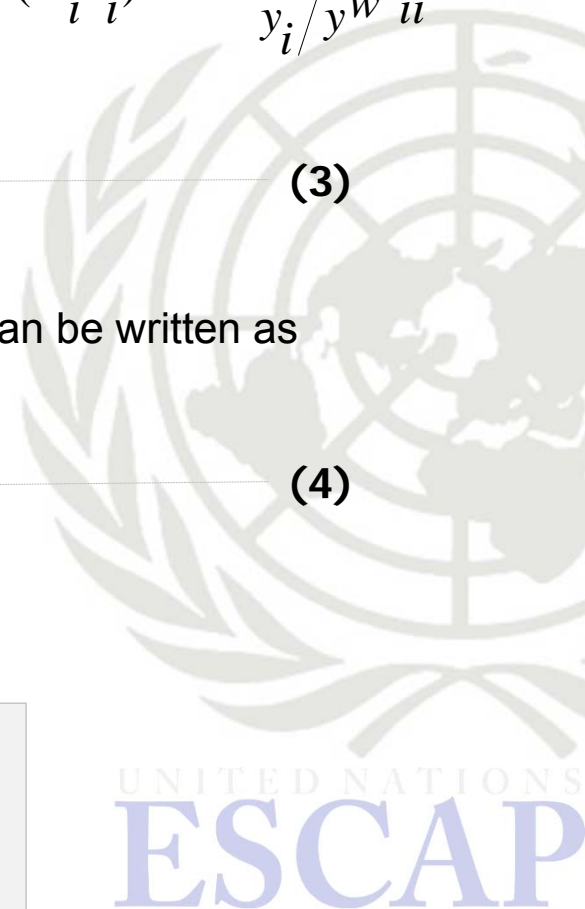
$$\begin{aligned}
 x_{ii} &= \frac{y_i y_i}{y^w} \left(\frac{\Pi_i P_i}{t_{ii}} \right)^{\sigma-1} \Rightarrow (\Pi_i P_i)^{\sigma-1} = \frac{x_{ii} y^w}{y_i y_i} t_{ii}^{\sigma-1} \Rightarrow (\Pi_i P_i)^{\sigma-1} = \frac{x_{ii}/y_i}{y_i/y^w} t_{ii}^{\sigma-1} \\
 &\Rightarrow \Pi_i P_i = \left(\frac{x_{ii}/y_i}{y_i/y^w} \right)^{\frac{1}{\sigma-1}} t_{ii} \quad \text{--- (3)}
 \end{aligned}$$

In the same analogy, the opposite direction of trade flows in (1) can be written as

$$x_{ji} = \frac{y_j y_i}{y^w} \left(\frac{t_{ji}}{\Pi_j P_i} \right)^{1-\sigma} \quad \text{--- (4)}$$

Multiply (1) and (4) together and get

$$x_{ij} x_{ji} = \left(\frac{y_i y_j}{y^w} \right)^2 \left(\frac{t_{ij} t_{ji}}{\Pi_i \Pi_j P_i P_j} \right)^{1-\sigma}$$



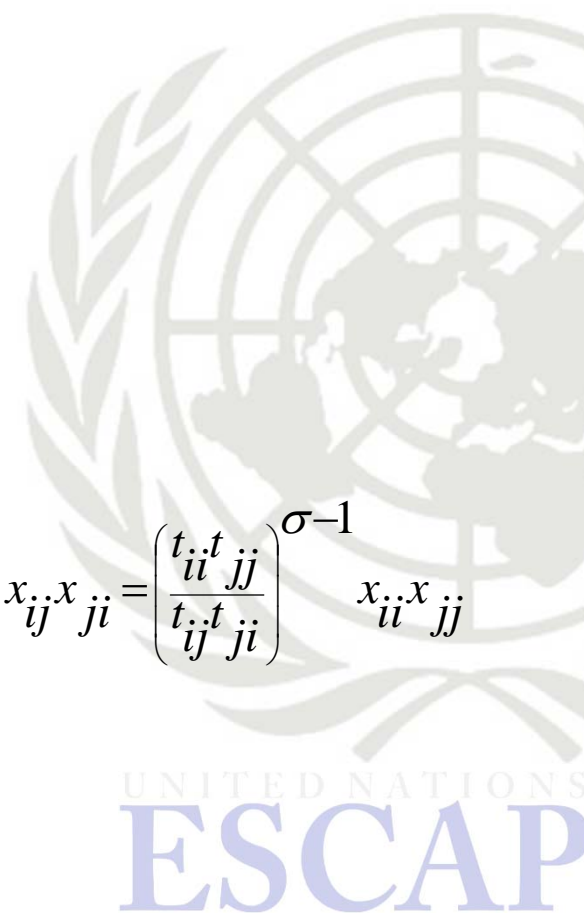
Appendix – Derivation of Trade Cost Equation

Substitute the result from (3)

$$x_{ij}^{\cdot} x_{ji}^{\cdot} = \left(\frac{y_i y_j}{y^w} \right)^2 \left(\frac{\Pi_i \Pi_j P_i P_j}{t_{ij}^{\cdot} t_{ji}^{\cdot}} \right)^{\sigma-1}$$

$$\Rightarrow x_{ij}^{\cdot} x_{ji}^{\cdot} = \left(\frac{y_i y_j}{y^w} \right)^2 \left(\frac{1}{t_{ij}^{\cdot} t_{ji}^{\cdot}} \right)^{\sigma-1} \left(\frac{x_{ii}^{\cdot} / y_i}{y_i / y^w} \right)^{\sigma-1} t_{ii}^{\sigma-1} \left(\frac{x_{jj}^{\cdot} / y_j}{y_j / y^w} \right)^{\sigma-1} t_{jj}^{\sigma-1}$$

$$\Rightarrow \frac{x_{ij}^{\cdot} x_{ji}^{\cdot}}{x_{ii}^{\cdot} x_{jj}^{\cdot}} = \left(\frac{t_{ii}^{\cdot} t_{jj}^{\cdot}}{t_{ij}^{\cdot} t_{ji}^{\cdot}} \right)^{\sigma-1} \Rightarrow \left(\frac{t_{ij}^{\cdot} t_{ji}^{\cdot}}{t_{ii}^{\cdot} t_{jj}^{\cdot}} \right)^{\sigma-1} = \frac{x_{ii}^{\cdot} x_{jj}^{\cdot}}{x_{ij}^{\cdot} x_{ji}^{\cdot}} \Rightarrow x_{ij}^{\cdot} x_{ji}^{\cdot} = \left(\frac{t_{ii}^{\cdot} t_{jj}^{\cdot}}{t_{ij}^{\cdot} t_{ji}^{\cdot}} \right)^{\sigma-1} x_{ii}^{\cdot} x_{jj}^{\cdot}$$



Appendix – Derivation of Trade Cost Equation

Then, the product of bidirectional trade costs relative to the product of their intra-national trade costs is equivalent to

$$\frac{t_{ij}^t t_{ji}}{t_{ii}^t t_{jj}} = \left(\frac{x_{ii} x_{jj}}{x_{ij} x_{ji}} \right)^{\frac{1}{\sigma-1}} \quad (5)$$

Therefore, geometric average of bilateral trade costs is defined as

$$T_{ij} = \left(\frac{t_{ij}^t t_{ji}}{t_{ii}^t t_{jj}} \right)^{\frac{1}{2}} = \left(\frac{x_{ii} x_{jj}}{x_{ij} x_{ji}} \right)^{\frac{1}{2(\sigma-1)}} \quad (6)$$

Tariff-equivalent term is done by deducting one from (6) and thus,

$$\tau_{ij} = \left(\frac{t_{ij}^t t_{ji}}{t_{ii}^t t_{jj}} \right)^{\frac{1}{2}} - 1 = \left(\frac{x_{ii} x_{jj}}{x_{ij} x_{ji}} \right)^{\frac{1}{2(\sigma-1)}} - 1 \quad (7)$$

Appendix – Comparison with other measures

- How does our methodology compare with other measures that capture concepts similar to trade costs?

→ OTRI: Captures tariffs and NTMs for which data are available only; does not include other policy factors (trade facilitation, connectivity, logistics) or non-policy factors (geography, history, institutions)

→ Doing Business: Captures costs between the seller's factory and the port only; excludes international transport costs, trade barriers in the importing country, and other factors that drive a wedge between prices

→ Logistics Performance Index: Also only captures costs between the seller's factory and the port; excludes “between the border” factors, as well as geography, history, etc.

→ CIF/FOB ratios: Captures international transport costs only, not other factors that make it more costly to trade internationally rather than domestically



TID Staff Working Paper 04/11

**“Trade Costs in the India-Mekong Subregion:
Identifying Policy Priorities for Trade Facilitation”,
TID Staff Working Paper 04/11**



TID Staff Working Paper 04/11

Empirical Analysis: Comprehensive trade costs are modeled as follows

- Limited guidance to policy makers on which measures or policies they need to change to achieve the goal.
- Develop a simple model of comprehensive trade cost and then estimate that model to identify **which trade-related policies and other factors affect bilateral CTC the most.**

$$CTC_{ijt} = Dist_{ij}^{\beta_1} Tariff_{ij*ji}^{\beta_3} LSCI_{ij}^{\beta_4} ICT_{ij}^{\beta_5} DirectC_{ij}^{\beta_7} e^{\beta_0 + \beta_2 Cult_{ij} + \beta_6 Doingbiz_{ij} + \varepsilon_{ijt}}$$

where,

Dist _{ij}	is bilateral distance between trading partners in kilometers
Cult _{ij}	is a set of dummy variables of cultural distance, which consists of
contig	(contiguity) dummy variable indicating “1” if 2 countries are contiguous and “0” otherwise
comlang_off	(common official language) dummy variable indicating “1” if 2 countries shares official language and “0” otherwise
Tariff _{ij*ji}	is a geometric average of tariff _{ij} and tariff _{ji}
LSCI _{ij}	is a geometric average of lsci _i (liner shipping connectivity index) and lsci _j
ICT _{ij}	is a geometric average of internetusers_per100ppl _i (number of internet users per 100 inhabitants) and internetusers_per100ppl _j
Doingbiz _{ij}	is a geometric average of ease of doing business indicators of i and j, which consist of getloan_creditinfo : depth of credit information index (0-6) investprotect_disclosure : extent of disclosure index (0-10) contractenforce_steps : procedure of enforcing contract (number of steps)
DirectC _{ij}	is a geometric average of direct monetary cost of moving a container from factory-to-port and from port-to-warehouse



TID Staff Working Paper 04/11

Results of CTC and NT-CTC Model Estimations

Model:	(1)	(2)	(3)	(4)
VARIABLES	OLS:CTC:2006	OLS:NT-CTC:2006	PPML:CTC:2006	PPML:NT-CTC:2006
ln_dist	0.155*** [22.62]	0.150*** [23.69]	0.171*** [20.19]	0.164*** [21.55]
contig	-0.138*** [-4.793]	-0.144*** [-4.952]	-0.166*** [-5.233]	-0.169*** [-5.323]
comlang_off	-0.0205 [-0.986]	-0.0182 [-0.876]	-0.00432 [-0.139]	-0.00296 [-0.0947]
ln_tariff_ij_ji_ga	0.579*** [3.275]		0.635*** [3.041]	
ln_lsci_ij	-0.183*** [-18.76]	-0.183*** [-18.63]	-0.203*** [-16.78]	-0.202*** [-16.73]
ln_internetusers_per100ppl_ij	-0.0611*** [-6.418]	-0.0539*** [-5.967]	-0.0633*** [-5.407]	-0.0583*** [-5.242]
getloan_creditinfo_ij	-0.0203*** [-4.814]	-0.0197*** [-4.695]	-0.0249*** [-5.113]	-0.0244*** [-5.057]
investprotect_disclosure_ij	-0.00712** [-2.418]	-0.00668** [-2.289]	-0.00591 [-1.627]	-0.00502 [-1.411]
contractenforce_steps_ij	0.00720*** [3.978]	0.00637*** [3.564]	0.00904*** [3.677]	0.00817*** [3.396]
ln_trade_usd_ij	0.0810*** [3.558]	0.0812*** [3.577]	0.0954*** [3.249]	0.0908*** [3.158]
Constant	-0.351* [-1.888]	-0.322* [-1.715]	-0.547** [-2.228]	-0.477* [-1.960]
Observations	3,320	3,320	3,320	3,320
R-squared	0.569	0.523	0.481	0.441
Clustered SE	Country pair	Country pair	Country pair	Country pair
Adj. R-squared	0.567	0.522	.	.

Note: Dependent variable in (1) and (2) are ln(ctc) and ln(ctctariff) respectively; Dependent variable in (3) and (4) are ctc and ctctariff respectively

*** p<0.01, ** p<0.05, * p<0.1

t-stat. in square brackets



TID Staff Working Paper 04/11

Contribution of natural barriers, behind-the border facilitation and trade-related practice to trade costs

	(1)	(2)
“Natural” cost component		
Geographic distance (ln_dist)	20.4%	19.3%
Contiguity (Contig)	1.7%	1.9%
Common Official language (Comlang_off)	0.1%	0.1%
Tariff costs (ln_tariff_ij_ji_ga)	3.1%	
Non-tariff cost component:		
Maritime logistic services (ln_lsci_ij)	16.6%	17.9%
ICT services (ln_internetusers_per100ppl_ij)	7.2%	5.9%
Business regulatory environment		
Ease of getting credit (getloan_creditinfo_ij)	3.5%	3.4%
Investor protection (investprotect_disclosure_ij)	1.0%	1.0%
Ease of enforcing contract (contractenforce_steps_ij)	2.4%	1.9%
Direct factory-to-ship/ship-to-warehouse costs (ln_trade_usd_ij)	0.8%	0.9%
Total variation explained by Model	56.87%	52.32%
Unexplained variation	43.13%	47.68%

- The need to give highest priority to policies aimed at facilitating access to such services, including support to maritime infrastructure development and competition policy reforms.
- Policies and measures aimed at enhancing ICT infrastructure and services- and their usage through education- should receive special attention in countries that want to facilitate trade.
- Continued negotiations on reducing tariff rates may still be worthwhile even though tariff rates already came down significantly since the mid 1990s.