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Empirical Estimated of Trade Costs for Asia

*Prabir De, RIS. New Delhi*

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**Inter-American Development Bank  
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# **Empirical Estimates of Trade Costs for Asia**

**Prabir De  
RIS, New Delhi**

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# Why Trade Costs

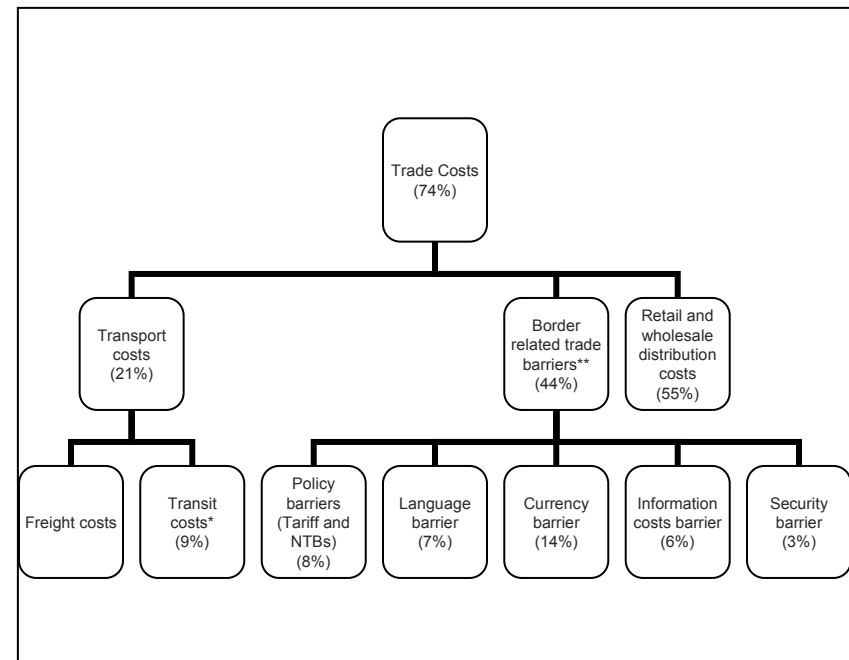
- Trade costs are cited as an important determinant of the volume of trade
- Tariffs are no longer the major barriers of trade
- A whole lot of 'other' barriers do exist and penalising trade
  - Some are policy barriers, such as tariffs and non-tariff barriers (NTBs)
  - Some are relating to environment, such as infrastructure quality
- Costs appearing from these barriers can be termed as 'trade costs',
- Measured as the mark-up between export and import prices, where this mark-up roughly indicates the relative costs of transfer of goods from one country to another (Hummels, 1999a; Anderson and van Wincoop, 2004).

# Theoretical Discourse

- The neo-classical trade theory completely ignores the transport costs.
- The factor abundance model, Heckscher, Ohlin and Samuelson (HOS) model, comparative advantage is determined by cross-country differences in relative abundance of factor endowments. Some assumptions perfect competition
  - homogeneous goods
  - production with constant returns to scale
  - no transport costs,
  - mobility of factors between industries and not between countries.
- In new trade theory, transport cost is incorporated as a factor of determinant, where trade is analyzed in models in a world of increasing returns to scale, and monopolistic competition (e.g. Dixit and Stiglitz, 1977; Krugman 1979, 1980).
- One of the implications of the new trade theory is growing interdependence between countries through increased trade and/or increased factor mobility where transport costs play a pivotal role in integrating the countries and/or factors.

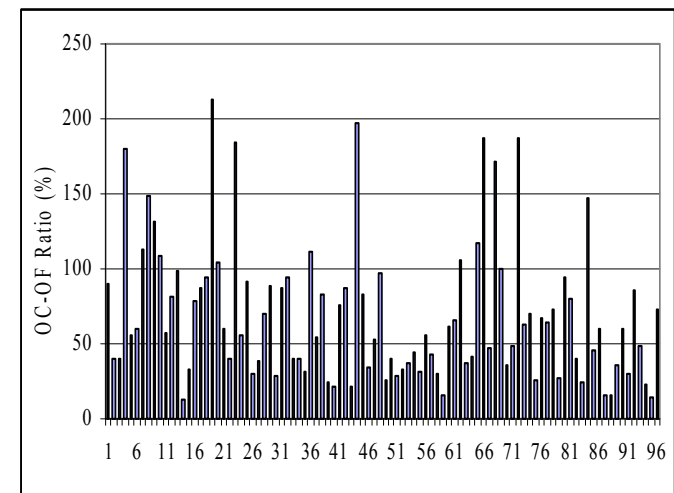
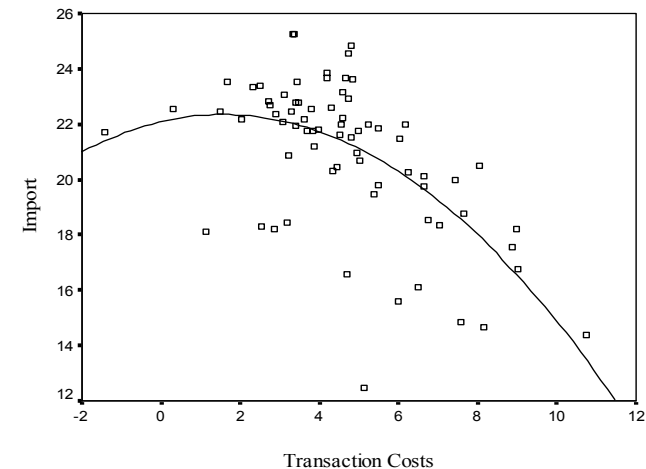
# Trade Costs and Its Relevance

- Trade costs account all the direct and indirect costs that an exporter / importer incurs.
  - Transport costs
  - Border related costs
  - Distribution costs
- Trade costs are richly linked to economic policy.
  1. Policy instruments = Tariffs, NTBs, Quotas, Exchange rates
  2. Environmental barriers = infrastructure, language)
- Trade costs have large welfare implications



# Relevance of the Study

- High transport cost is an obstacle to trade and impede the realization of gains from trade liberalisation.
- Tariff barrier in Asia has become low.
- Despite technological advancement, cost of movement of goods across countries has not fallen
- Ocean freight for movement of vessels has been reduced, but subsidiary charges have witnessed steep rise, thereby not only offsetting the gains arising from tariff liberalisation, but also making the entire trade costlier.
- A major part of these subsidiary charges like documentation fees, government taxes and levies, etc. are the 'soft' barriers to trade and very much implicit in system, on which shippers (exporters and importers) have less control.



# Rising Shipping Rates

Origin	Destination	Ocean freight		Other charges <sup>2</sup>		Total	
		2003	2005	2003	2005	2003	2005
(US\$ per container)							
Japan	China	250	275	178	223	428	498
Japan	Korea	300	275	238	289	538	564
Japan	Hong Kong	196	200	419	425	615	625
Japan	Malaysia	366	375	244	296	610	671
Japan	Singapore	312	325	307	321	619	646
Japan	India	1546	1600	489	523	2035	2123
Japan	Thailand	312	275	232	258	544	533
China	Japan	900	800	162	366	1062	1166
China	Korea	300	500	190	240	490	740
China	Hong Kong	412	400	331	345	743	745
China	Malaysia	620	600	213	217	833	817
China	Singapore	410	400	240	241	650	641
China	India	2109	2000	288	302	2397	2302
China	Thailand	608	600	166	180	774	780
Korea	Japan	300	400	218	262	518	662
Korea	China	250	350	203	220	453	570
Korea	Hong Kong	444	450	419	422	863	872
Korea	Malaysia	388	400	267	282	655	682
Korea	Singapore	398	400	309	318	707	718
Korea	India	2010	1950	517	528	2527	2478
Korea	Thailand	395	400	251	255	646	655

# [ Objective of the Paper ]

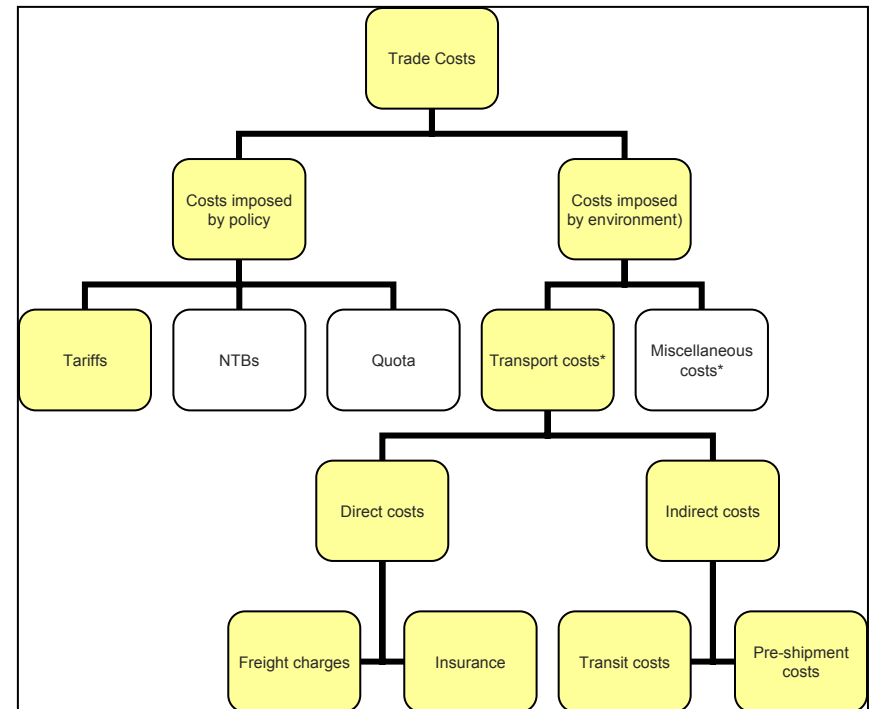
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- How do the non-price and price determinants of international trade such as infrastructure and transport costs affect trade in Asia?



# Trade Costs and Its Components

- We deal with direct trade costs, imposed by—
  1. Policy (tariff)
  2. Environment (transport and others)
- Transport cost is the major component of trade cost



# Methodology (1/3)

## ■ To measure transport costs

- the difference of ad-valorem trade-weighted freight rate

$$t_{ij}^k = \left( \frac{IM_{ij}^k}{EX_{ji}^k} - 1 \right) S_i^k$$

- the differences of inter-country costs of transportation using shipping rate, collected from shipping agents

$$t_{ij}^k = \frac{Q_{ij}^k f_{ji}^k}{Q_{ij}}$$

# Methodology (2/3)

## ■ To measure infrastructure quality

- Constructed an index using PCA

$$II_{ij} = \sum W_{kj} X_{ki}$$

- Variables taken - railway length density (km per 1000 sq. km of surface area), (ii) road length density (km per 1000 sq. km of surface area), (iii) air transport freight (million tons per km), (iv) air transport, passengers carried (percentage of population), (v) aircraft departures (percentage of population), (vi) country's percentage share in world fleet (percent), (vii) container port traffic (TEUs per terminal) (viii) fixed line and mobile phone subscribers (per 1,000 people), and (ix) electric power consumption (kwh per capita).

Country	Score	Rank
Singapore	6.01	1
Hong Kong	5.60	2
Japan	4.23	3
Korea	3.22	4
China	1.92	5
Malaysia	1.74	6
Thailand	0.99	7
India	0.59	8
Philippines	0.59	9
Indonesia	0.46	10
Vietnam	0.40	11

# [ Methodology (3/3) ]

## ■ The Model

- Model followed Anderson and van Wincoop (2003)

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

- Gravity equation

$$\ln IM_{ij} = \alpha_0 + \alpha_i + \beta_1 \ln Y_i Y_j + \beta_2 \ln I_i + \beta_3 \ln I_j + \beta_4 \ln TC_{ij} + \beta_5 \ln T_{ij} + \beta_6 \ln R_i + \beta_7 \ln R_j + \beta_8 \ln D_{ij} + \beta_9 d_1 + \beta_{10} d_2 + \beta_{11} d_3 + \varepsilon_{ij}$$

# [ Data ]

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- The augmented gravity model considered here uses data for the year 2004 for 10 Asian countries, namely, China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Singapore, Taiwan and Thailand
- Applied on eight commodity groups (sectors) such as food, chemical, textile and clothing, machinery, electronics, auto components, steel and metal, and transport equipment.
- The model suffers from data limitation when we estimate transport costs. On average 56 percent of total observations for all sectors are found to be either zero or negative or missing.
- About 61,000 observations at 4-digit HS
- Sources of data - UNSD, WB WITS, WB WDI

# Data Reporting Errors

Importer	Total number of observations at HS 4	Total number of observations with positive transport costs at HS 4	Total number of observations with zero/negative/missing transport costs at HS4
China	6380	2847	3533
Hong Kong	5734	2626	3108
India	5652	2566	3086
Indonesia	6213	2916	3297
Japan	5582	2548	3034
Korea	5705	2599	3106
Malaysia	6736	2924	3812
Singapore	6937	2755	4182
Taiwan	5517	2266	3251
Thailand	6463	2584	3879
Grand Total	60919	26631	34288

# Results

- Estimated gravity models explain 52 to 80 percent of the variations in direction of trade flows.
- Strong influence of transport costs on trade in all the sectors:
  - higher the transport costs between each pair of partners, the less they trade.
- Exporters infrastructure is more important than the importers
- Significant country effects – particularly China

# Pooled OLS Estimates

- Country effects dummies have appeared with expected sign
- Significant FTA dummy,
- Coefficients of tariffs is insignificant, but carry negative sign
- Exporting country's infrastructure quality produces negative signs (and significant)
- Both the models explain about 52 to 65 percent of variations in trade flows.
- Country's infrastructure quality and transport costs are the main two determinants of cross-country variations of trade flows

	Model 2			
	With censored $t_{ij}$		With replaced $t_{ij}$	
	Coefficients	t-values	Coefficients	t-values
GDP of importing countries	0.032	1.210	0.318	7.460
GDP of exporting countries	0.242	3.100	0.367	8.740
Infrastructure of importing countries	-0.019	-0.320	-0.068	-0.500
Infrastructure of exporting countries	-0.110	-5.200	-0.057	-2.740
Tariff	-0.010	-0.590	-0.037	-1.080
Trade-weighted transport costs <sup>#</sup>	-0.120	-9.120	-0.588	-10.270
Remoteness of importing countries	-0.190	-1.900	-0.106	-1.108
Remoteness of exporting countries	-0.610	-6.840	-1.292	-7.340
Distance	-0.520	-8.650	-0.578	-9.420
FTA Dummy	0.080	2.900	0.180	7.640
Adjacency Dummy	0.146	3.750	0.151	4.690
Language Dummy	0.035	1.560	0.022	0.103
<i>Country effect</i>				
China	0.399	6.670	0.538	7.360
Hong Kong	Insignificant		Insignificant	
India	Insignificant		Insignificant	
Indonesia	-0.076	-1.800	-0.748	-14.190
Japan	Insignificant		Insignificant	
Korea	0.058	1.830	0.133	3.880
Malaysia	0.363	4.950	0.249	7.080
Singapore	Insignificant		Insignificant	
Thailand	0.101	2.240	0.207	4.930
No of observations	28591		60919	
Adjusted R <sup>2</sup>	0.647		0.515	



# [ Research Advancement ]

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- First, we introduce infrastructure quality that we believe have an impact on trade.
- Second, we introduce bilateral tariffs, which are largely ignored in the empirical gravity literature in context of Asia.
- Third, in order to ensure unbiased estimates, we used resistance parameters.
- Fourth, in order to find out the relative robustness of the transport costs, we used trade-weighted transport costs from cross-country shipping rates, which is also a new in the gravity literature.

# Conclusions

- Variations in transport costs along with infrastructure facilities have significant influence on regional trade flows in Asia.
- Tariffs have a relatively large and negative impact on trade when we consider individual sectors.
- Among the sectors, except transport equipment, trade in all other sectors is influenced by tariffs, transport costs and infrastructure quality.
- For transport equipment, bilateral tariff has less significant role as trade is more demand-driven.
- Importance of distance is not diminished even if we include quality of infrastructure and transport costs.

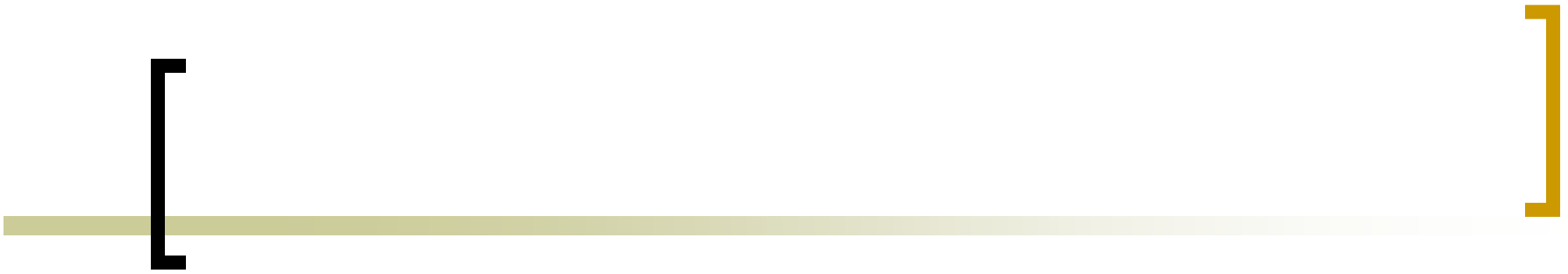
# Government Duties and Levies on Ocean Freight in 2005

Top 10 OD Pairs

Origin	Destination	Rate(%)
Japan	China	13.05
Japan	Thailand	12.19
Japan	Malaysia	11.95
Japan	Taiwan	11.42
Hong Kong	Korea	11.06
Japan	Hong Kong	10.40
Malaysia	Korea	10.40
Japan	Korea	10.36
Korea	China	10.09
Japan	Singapore	10.07

Bottom 10 OD Pairs

Origin	Destination	Rate(%)
Thailand	Indonesia	3.47
Hong Kong	India	3.45
Thailand	Hong Kong	3.44
China	Philippines	3.16
Indonesia	India	3.15
Singapore	Philippines	3.14
Indonesia	Philippines	3.05
Hong Kong	Taiwan	2.12
Hong Kong	Indonesia	2.05
Hong Kong	China	1.88



**Thank you**