

# Pan-Asian Natural Gas Trade in Competitive Market Frameworks

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International Energy Workshop 2008  
30 June – 2 July 2008

International Energy Agency  
Paris, France

# Supply Potentials in Asia

- Natural gas trade potential in Pan-Asia is huge
  - But gas industries in some countries are at an infancy stage
  - Some regions exhibit declining production, others have limited trade links
  - Large gas deposits located in countries that may be politically/economically unstable

# Demand for Natural Gas in Asia

- Natural gas as an alternative fuel source
  - Recent high oil/gas price ratio increases the viability of natural gas as an alternative fuel
  - More efficient CCGT reinforces the role of gas in electricity generation in Asia
- Demand growth of natural gas is huge
  - Countries like China and India have become major importers of natural gas
  - Environmental pressure increases a need for cleaner fuels

# Market Developments in Asia

- Energy sector restructuring
  - Countries in Asia are moving towards market liberalization to increase efficiency
- Potential sources of supply
  - Russia is deemed to play a pivotal role in cross-border natural gas trading

# Objectives of the Study

- To examine liberalization feasibility and dynamics of the Pan-Asian gas market under two types of competitive framework
  - Competitive trade framework
    - Under the current trade links and gas markets
  - Competitive full-fledged trade framework
    - Under the full development of hypothetical trade links

# Model: An Overview

- Model adapted from GTM by Manne et al (1984)
- Static parametric competitive equilibrium model
  - Maximizes consumer surplus less producer surplus and transport costs
- Transportation networks determine trade linkages among countries
  - LNG and pipelines determine price transmission and trade flows
  - Straight forward transportation model

# Model Structure

- Demand function
  - Aggregated country specific demand function
  - Industry specific demand is subsumed under country level estimates
- Supply function
  - Conjectured/best-estimated supply function
- Transportation variables
  - Per unit LNG and pipeline delivery charges

# Data

- Data sources
  - IEA, APERC, BIWGTM and various reports
- Net supply countries
  - Australia, Bangladesh, Brunei, Indonesia, Malaysia, Myanmar, Russia, Qatar, Oman and the UAE
- Net demand countries
  - The Philippines, Singapore, Thailand, Vietnam, China, India, Japan and Korea

# Model Equations

- Demand function:

$$g(z_j) = \alpha_j z_j^{\beta_j}$$

- Supply function:

$$f(y_i) = \chi_i + \frac{\delta_i}{(c_i - y_i)}$$

- Transport costs =  $p_{ij} x_{ij} + l_{ij} x_{ij}$

# Objective Function

- System maximand:

$$\sum_j \int_{w=W}^{z_j} g_j(w) dt - \sum_i \int_{w=0}^{y_i} f_i(w) dt - \left[ \sum_{i,j} p_{ij} x_{ij} + \sum_{i,j} l_{ij} x_{ij} \right]$$

- Typical social welfare maximizing NLP.

# Competitive Gas Trade Model

- It examines the feasibility of competitive trade given current market conditions and linkages.
- Assumptions:
  - Immediate switch of gas trading to competitive framework.

# Competitive Trade Model: Results

- Given current gas market development and linkages, a competitive framework would fail
- Generally, higher gas prices would prevail in Asia.
- This is because gas markets are under-developed (lack of linkages) to survive in a competitive environment.
- Hence, government support is necessary for the effective functioning of the gas markets in its current state.

# Competitive Trade Model: Results

Table 4.3: Competitive model, Flows (TCF) and Prices (\$/MCF)

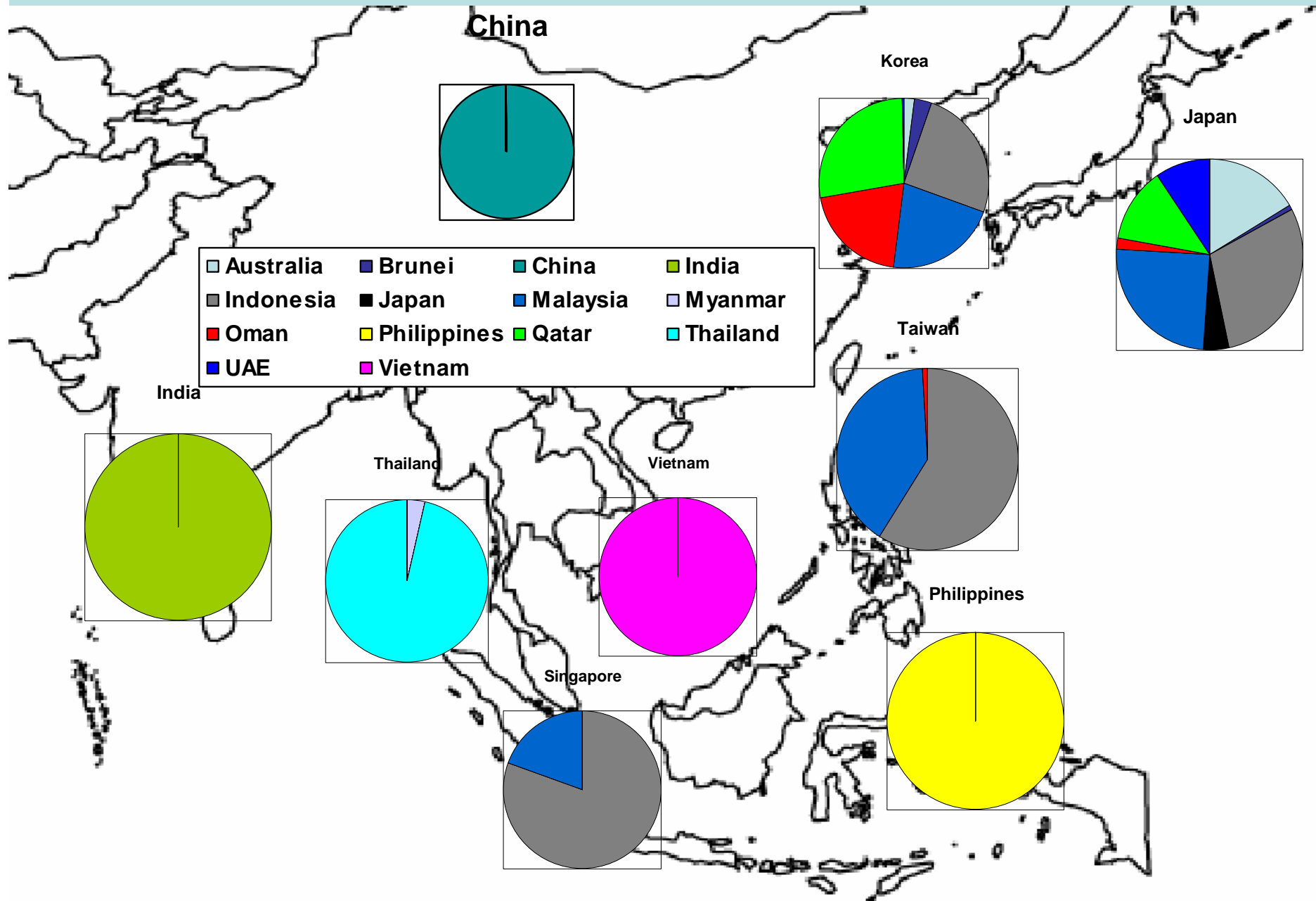
From \ To	China	India	Japan	Korea	Philippines	Singapore	Taiwan	Thailand	Vietnam	Supply Price
Australia			0.43	0.02						3
Brunei			0.018	0.031						5.664
China	1.1									1.54
India		0.9								1.4
Indonesia			0.77	0.25		0.249	0.19			3.152
Japan			0.118							5.864
Malaysia			0.65	0.21		0.06	0.13			2.973
Myanmar								0.03		0.908
Oman			0.05	0.2			0.003			2.943
Philippines					0.099					3.263
Qatar		0	0.33	0.27						2.9
Thailand								0.8		2.931
UAE			0.25	0.003			0			3.35
Vietnam									0.126	2.774
Demand Price	8.666	2.511	6.764	6.764	3.963	4.352	4.809	6.785	3.474	*****

Note 1: To get total supply quantity for country, sum horizontally.

Note 2: To get total demand quantity for country, sum vertically.

Source: Model's output.

# Trade Flows in Competitive Trade Model



# Competitive Full-Fledged Trade Model

- It examines the feasibility of competitive framework in Asia in the long-run.
- Assumptions:
  - Current liberalization continues.
  - Most probable trade linkages are assumed to exist.
  - Russia is able to bring its resources in the Far East to the Asian market.

## Full-Fledged Trade Model: Results

- It brings depression of gas prices in Asia
- There appears that increase in consumption of natural gas as compared to Competitive case.
- This is because a large source of gas has come online, i.e., Russia.
- And increased linkages allow for a more efficient allocation of resources.

# Full-Fledged Trade Model: Results

Table 4.6: Full-Trade model, Flows (TCF) and prices (\$/MCF)

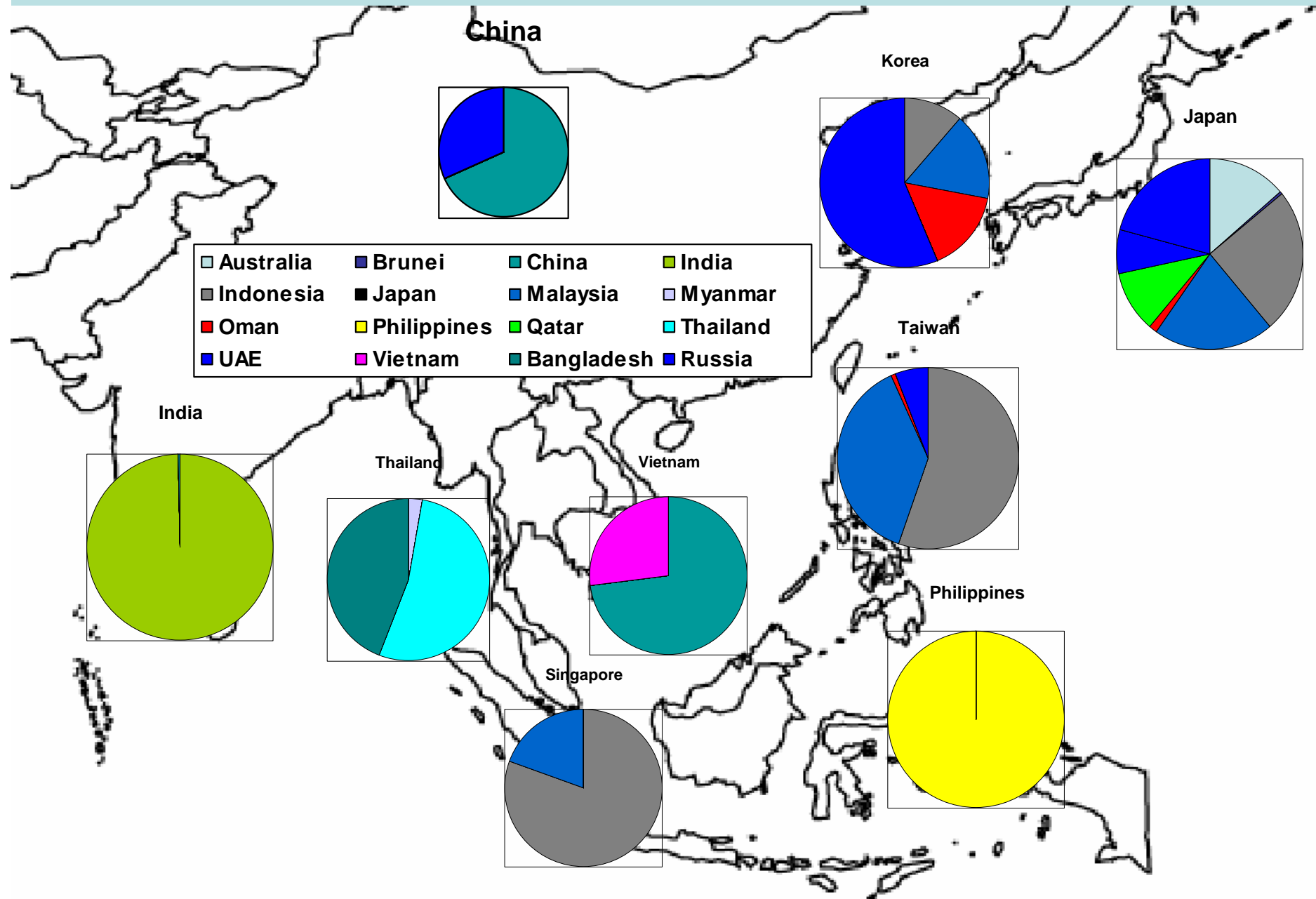
From \ To	China	India	Japan	Korea	Philippines	Singapore	Taiwan	Thailand	Vietnam	Supply Price
Australia			0.43	0		0				2.9
Bangladesh		0.002						0.5		1.6
Brunei			0	0						0
China	1.1								0.031	1.544
India		0.9								1.4
Indonesia	0	0	0.77	0.147	0	0.249	0.19			3.133
Japan			0							0
Malaysia	0	0	0.65	0.21	0	0.06	0.13			2.973
Myanmar								0.03		0.908
Oman			0.05	0.2			0.003			2.861
Philippines					0.099					3.263
Qatar		0	0.33	0						2.858
Russia	0.511		0.65	0.72		0				3.375
Thailand								0.6		2.495
UAE			0.237	0			0.002			3.02
Vietnam									0.115	1.944
Demand Price	4.275	2.5	4.76	4.383	3.963	4.333	4.75	3.195	2.644	*****

Note 1: To get total supply quantity for country, sum horizontally.

Note 2: To get total demand quantity for country, sum vertically.

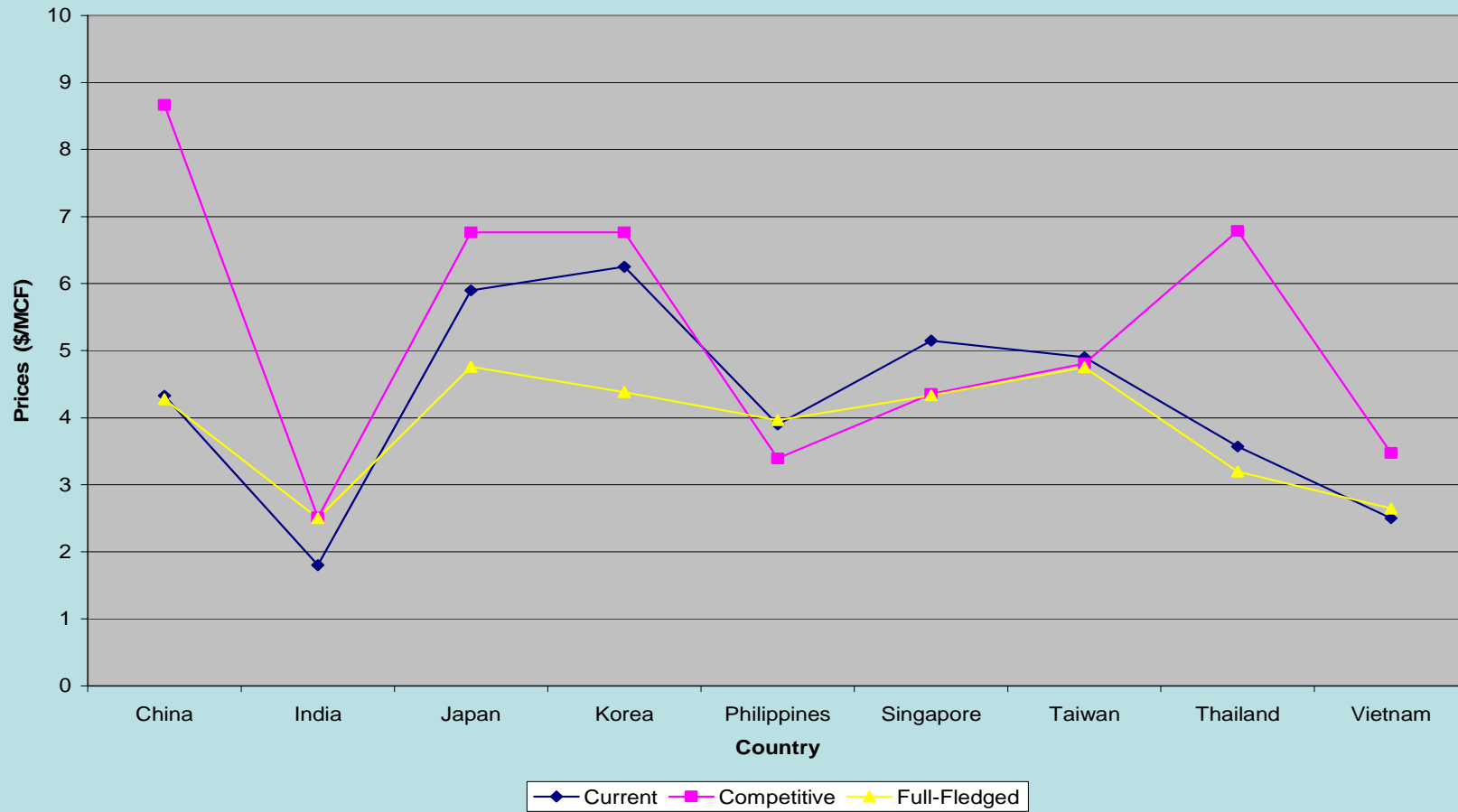
Source: Model's output.

# Trade Flows in Full-Fledged Trade Model



# Natural Gas Prices: Comparisons

Natural Gas Prices: Current, Competitive and Full-Fledged Markets



# Conclusion

- High crude prices are here to stay.
  - Given the rise in environmental concerns, natural gas as a substitute fuel is highly plausible.
- As Asian energy markets continue to develop and liberalize, a competitive gas trade industry becomes increasingly desirable.

# Concluding Remarks

- Pan-Asian natural gas trade would benefit from a competitive trade framework.
- However, the pre-requisites for successful competitive gas trading are the presence of a large resource origin (i.e., Russia), greater trade linkages (i.e., pipeline linkages and LNG tankers/trains.), and probably political will.

# Thank you!!

If you have any comments or suggestions,  
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