Indonesian Interprovincial Trade: What can be Revealed from a Gravity Modeling?

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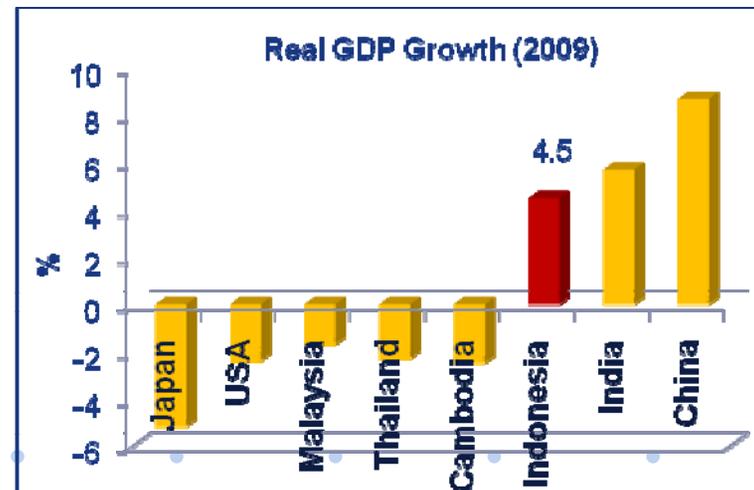
RESEARCH BACKGROUND (1)

❑ **The recent global economic crisis has shown the importance of domestic trade to support the economy**

→ as countries that are highly dependent on foreign trade were collapsed during the crisis

❑ **Indonesian economy in 2009 still experienced a positive growth at 4.5 percent, even though its export growth was negative**

→ because of a strong domestic consumption to support the economic growth

a strong domestic consumption **should be supported by a respectable domestic trade** to maintain flows of goods and services within a country

Real GDP Growth (2009)

Japan, USA, Malaysia, Thailand, Cambodia, Indonesia 4.5, India, China

RESEARCH BACKGROUND (2)

- ❑ **Indonesia is consisting of many provinces → interprovincial trade is very important to support a strong domestic trade**

- ❑ **Unfortunately there are no many studies that have been undertaken on Indonesian domestic trade, due to limitation of data availability and no interregional trade customs statistics**

APPLICATIONS OF GRAVITY MODELING:
Some Recent Studies

Most of the gravity models are applied for international trade analysis

a. **Lwin (2009) :** trade patterns in CLM countries (Cambodia, Lao, and Myanmar).

   Findings: CLM's trade patterns are mainly determined by GDP of trading partner countries, distance, common border, difference in GDP per capita, and existence of Free Trade Agreement (FTA).

b. **Sohn (2001) :** patterns of Korean bilateral trade.

   Findings:

- the distance effects differ across product groups of manufacturing products:
  - ➤ Petroleum and coal products, chemicals, rubber and plastic products, and steel and machinery are greatly dependent on distance factors
  - ➤ Textile, leather products and wearing apparel have relatively lower distance effects
- Trade conformity index, to explain why Korea tends to trade more with United States rather than wih China and Japan.

c. **Bhattacharya and Wolde (2010):** export performance in MENA (Middle East and North Africa) region.

   Findings:

- The standard gravity models cannot explain MENA's export under-performance
- Augmentation of the standard gravity model with relevant variables from the World Bank's Business Enterprise surveyscan end up with the conclusion that transport constraints and inefficiencies during customs clearance processes in MENA region are important to explain the under-performance of trade in that region.

APPLICATIONS OF GRAVITY MODELING:
Some Recent Studies

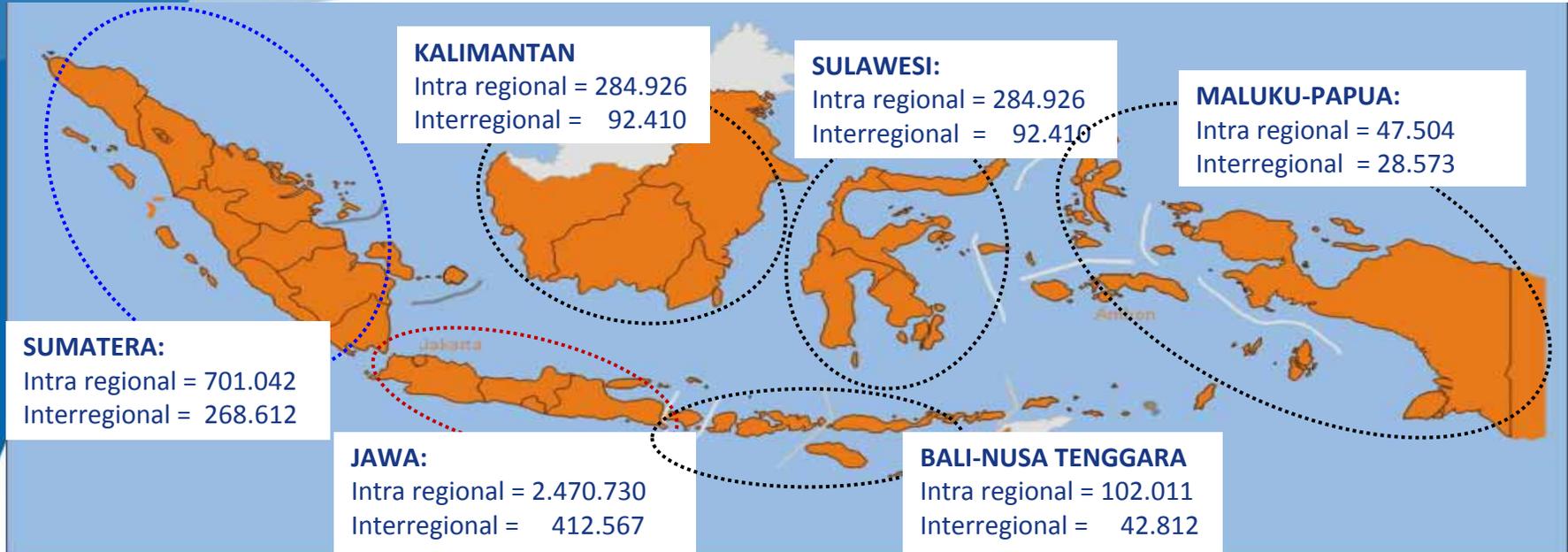**Only few of the gravity models are applied for domestic trade analysis**

Li and Xu (2008) estimate the China's 30-region trade for 42 sectors based on the 2002 regional Input-Output Tables and some other inter-regional trade data such as the trade through railway.

Findings:

- China has mainly three economic centers:JingjingJi district, the Yangzi river delta and the Pearl river delta.
- Most inland provinces, no matter how far they are away from these economic centres, they often trade much commercial with these three economic centre regions than with the nearby regions.

Facts of Indonesian Interregional Trade (1)

KALIMANTAN
Intra regional = 284.926
Interregional =   92.410

SULAWESI:
Intra regional = 284.926
Interregional =   92.410

MALUKU-PAPUA:
Intra regional = 47.504
Interregional = 28.573

SUMATERA:
Intra regional = 701.042
Interregional = 268.612

JAWA:
Intra regional = 2.470.730
Interregional =   412.567

BALI-NUSA TENGGARA
Intra regional = 102.011
Interregional =   42.812

❑ There are some unbalances in trade flows among Indonesian regions, as trade flows are mostly concentrated in Jawa island

❑ Intraregional trade flows in any province are always higher than its interregional trade flows; which means people prefer to trade with others located in the same island

Facts of Indonesian Interregional Trade (2)

Value of Trade Flows Between Islands in Indonesia (billion rupiah)

	Sumatera	Jawa	Kalimantan	Sulawesi	Bali, NTB, NTT	Maluku and Papua
Sumatera	701,042.4	95,916.0	5,843.7	6,180.6	4,872.6	1,346.2
Jawa	144,044.5	2,470,730.4	40,192.0	26,624.2	18,742.2	11,538.0
Kalimantan	7,905.1	31,318.5	284,925.8	2,544.0	1,507.6	600.0
Sulawesi	1,103.9	15,791.6	1,508.7	160,577.9	669.1	372.2
Bali, NTB, NTT	1,127.3	14,648.0	889.4	152.1	102,011.2	123.3
Maluku dan Papua	272.8	13,752.5	100.7	387.2	80.0	47,504.1

❑ Jawa and Sumatera are the two islands that have a stronger trade linkage than other with other islands.

❑ However, in any island, Jawa is always being the main supplier of trade sourcing from out of the island.

❑ For Jawa itself, the main source of trade coming from inter-island is Sumatera.

Model

❑ The empirical gravity model in this study was formulated as follow:

$$X_{ij} = \alpha + Z' \beta + \varepsilon_i$$

Where:

X_{it} : Total flow of trade from province i to province j at year 2005

Z : Vector of five exogenous variables which are as follow:

    1. Log of **real regional gross domestic product o**f province i at year 2005 (PDB);

    2. Log of **Population size** of province i at year 2005 (Pop);

    3. Log of **Transportation cost** from province i to province j at year 2005 (Trans);

    4. Log of **Human development index** of province i at year 2005 (HDI)

❑ There are four equations which are estimated:

1. flows of trade among all provinces in Indonesia
2. flows of trade among provinces in each of Sumatera Island
3. flows of trade among provinces Java Island
4. flows of trade among provinces Eastern Indonesia.

Data and Methodology

❑ The equation was estimated using ordinary least squares (OLS), using Eviews 6

❑ The data of flows trade among provinces are taken from Indonesia Interregional Input Output Table 2005 of 30 provinces

❑ The data of regional gross domestic product, population size, and human development index of each province are for the year 2005 and obtained from Indonesia Central Statistical Agency.

❑ The transportation cost data is proxied by expedition cost, obtained from Indonesian Postal Office.

Estimation Results

Variable	Indonesia	Sumatera	Java	Eastern Indonesia
Real RGDP	0.7135[a]	0.4325	.0.5878	0.5227
	(.0.000)[b]	(.0.193)	(.0.236)	(.0.038)
Population size	1.1466	1.0569	0.5952	1.4466
	(.0.000)	(.0.001)	(.0.093)	(.0.000)
Transportation cost	-1.5064	-1.749	0.7430	-1.4378
	(.0.000)	(.0.088)	(0.736)	(.0.010)
HDI	5.213	-4.490	2,7300	0.5691
	(.0.018)	(.0.819)	(0.794)	(0.115)
R-sq:	25.5%	39.9%	17.1%	22.5%
F-hit	70.83	12.67	2.69	14.22
	(0.000)[b]	(0.000)[b]	(0.069)[b]	(0.000)[b]

Note: a. Estimated parameter
           b. *P-value*

Interpretation of Results (1)

INDONESIA

❑ The increases in human development index, population size and real regional gross domestic product will raise the flows of trade among provinces in Indonesia

❑ The increase in transportation cost will lower the demand for goods and services of host provinces from others.

❑ The flows of trade is very responsive to the change in human development index and transportation cost. If the human development index increases one percent, the flows of trade to host province will rise 5.2 percent.
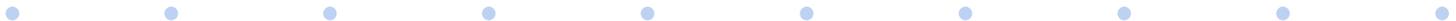
A higher human development index represents a better economic and social (health, education) condition → Higher demand

❑ A decrease of 1 percent in transportation cost will increase the flows of trade to a host province of 1.5 percent → a more efficient transportation will be able to push the trade among provinces in Indonesia.

Interpretation of Results (2)

SUMATERA, JAWA, AND EASTERN PARTS

❑ **Sumatera:** Factors affecting trade flows within Sumatera is population size and transportation cost

❑ **Jawa:** Trade flows are only affected by population size. Transportation cost, real GDP, and HDI are statistically insignificant

❑ **Eastern Indonesia:**

- human development index does not statistically influence the flows of trade among provinces

- Trade flows within Eastern Indonesia is influenced by Real GDP, population size, and transportation cost

- the coefficient of population size is statistically significant and the most elastic. This means in Eastern Indonesia, the demand for goods and services is mostly determined by the size of population.
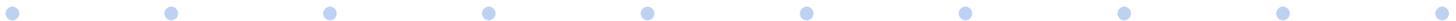
Policy Implication

❑ The gravity modeling on Indonesian interregional trade is a first step to reveal factors affecting flows of trade between provinces in Indonesia. **These findings are very useful to the inputs of policy makers**.

❑ **Recommendation:**

   a. The government should focus on reducing cost of transportation, as the high transportation cost is really a matter reducing flows of trade.

      o Therefore, the implementation of national logistic system blue print is needed to be speeded-up

      o removing any red-tapes and levies along the goods and services distribution channels should be a focus of central and regional governments

   b. The government should encourage economic and social development in regional areas. Meaning that national development should also focus on minimizing economic disparity across regions, increasing regional economic activities, and developing human resources in regional levels. All of these can help increase the human development index.

Conclusion

❑ This paper suggests that the applications of Gravity modeling can be extended to explain patterns of domestic trade.

❑ The results suggest that factors, i.e real regional gross domestic product, population size, transportation cost, and human development index, are significantly influenced trade flows among provinces in Indonesia.

❑ The trade pattern in each region (Sumatera, Jawa, and Eastern Indonesia) differs, as the elasticity is quite varied, which is due to the nature of the island.

❑ The findings of the paper suggest that the government should really focus on reducing cost of transportation, as the high transportation cost is really a matter reducing flows of trade. In addition, the central government should encourage economic and social development in regional areas in order to improve human development index

THANK YOU