



# **An Estimation of International Tourism Attraction Indexes of East and Southeast Asia and Oceania Countries and Regions and their Application to Temporal and Spatial Comparative Analyses**

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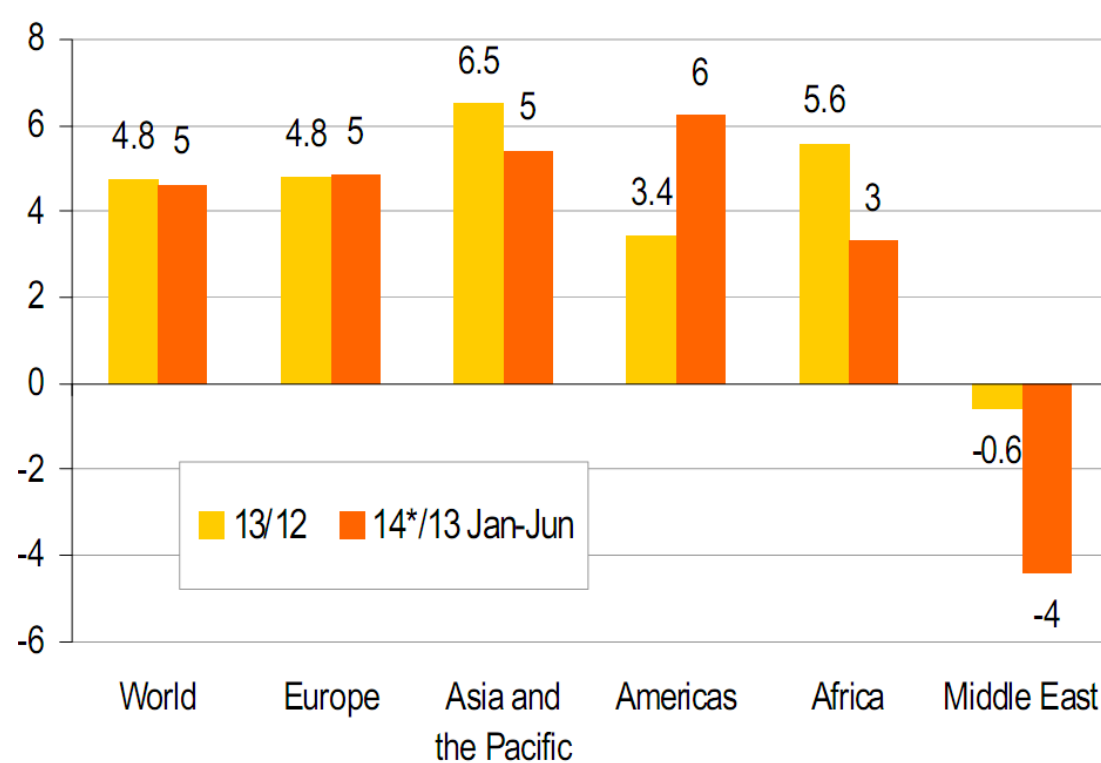
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\* Note: “Country” means country and region in this presentation.

# 1. Introduction: Background

- The world tourism demand has been increasing successively as a whole.
- It is however noted that there exists a wide difference in international tourist arrivals by regional block in the world.



**Fig. International Tourist Arrivals, (% change)**

Source: UNWTO World Tourism Barometer, Vol.12, 2014.8

# 1. Introduction: Background(continued)

- **The number of international visitors** has been widely adopted as an attraction and/or performance indicator.
- The number is **determined by various factors** as follows:
  - ✓ Tourism resources of Destination countries,
  - ✓ Population and Economic situations of Origin countries, and
  - ✓ Transportation condition between Origin and Destination countries.
- It is therefore required that international tourism demand should be estimated to **separate the effect of distance resistance and that of attraction power (ex. population density)** with each other.
  - This would enable each country and region to evaluate **its positioning, competitive conditions** and performances for the decision making of the tourism policies.

# 1. Introduction: Objectives

- Two objectives of this paper;
  - To **develop an attraction index** for international tourism, and
  - To **identify longitudinal characteristics** of the indexes by country as well as those of the estimated distance parameters from 1995 to 2012.
- The paper focuses on;
  - While the developed index is defined as a quantitative measure, it has a feature with **indicating how international tourists gravitate toward the destination country/region**.
  - The attraction index is developed using the basic concept of **Huff model**.

This typed model can take into account the competitive alternative destination in tourism marketing.

## 2. Literature Review

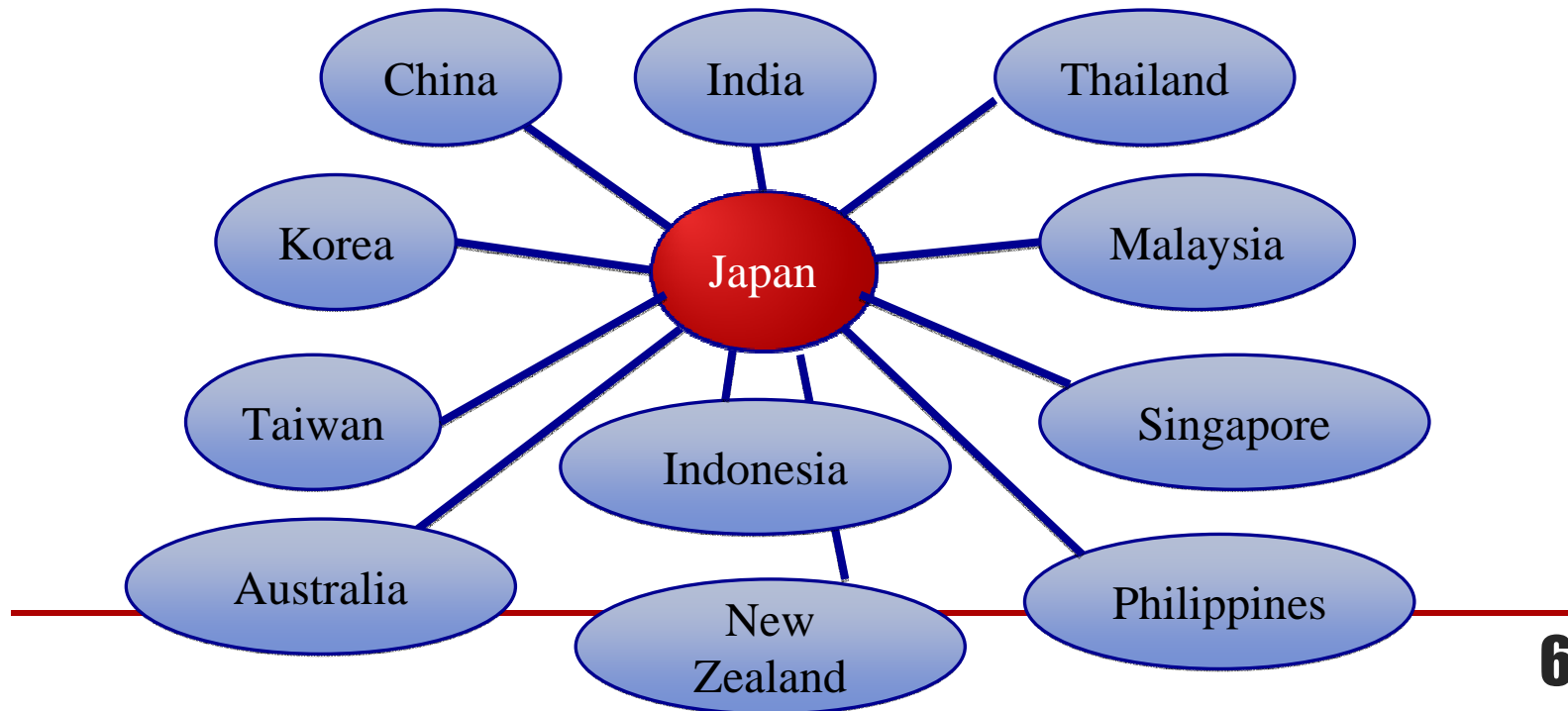
	Previous Researches	This paper
Viewpoints of international tourism	Transportation environment, Accommodations, Tourism information, and so on	In addition to viewpoints in the previous researches, <b>the market-positioning among competitive countries/regions</b> is focused on.
Models and methodological aspects	Gravity-typed model, Logit-typed model (classified into a bottom-up typed model)	<b>The inverse method is applied to the Huff-typed model</b> to estimate parameters of OD distribution.
Indicators developed	Not only number of international visitors but also the amount of consumption by taking economic effect into consideration	<b>The developed index can include a variety of the factors</b> determining the number of international visitors.

### 3. Data sets:

#### International Tourism Travel Flow in Asia and Oceania Area

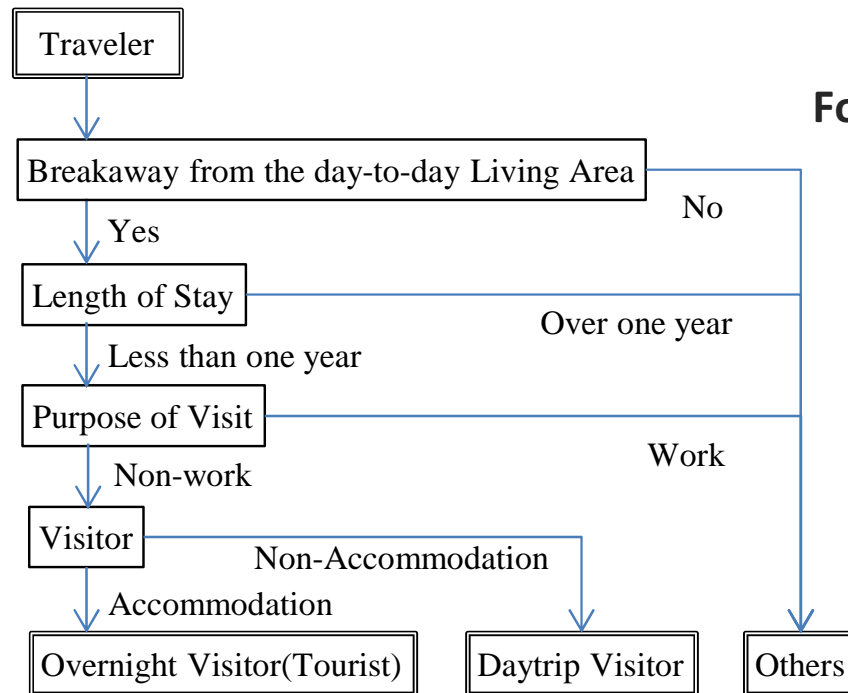
#### ➤ Introducing the targeted data sets of OD travel volume

- The **Origin-Destination Table** during **1995-2012**.
  - Sources: UNWTO, Yearbook of Tourism Statistics
- Targets: Eleven countries and one region



# Definition of OD table data set:

- Depending on regulations of each country/region, there exists difference in definition of “tourist”, “visitor”, and “others” by arrival country.
- Following sequential steps, foreign travelers can be classified into three categories; “tourist”, “visitor”, and “others” .

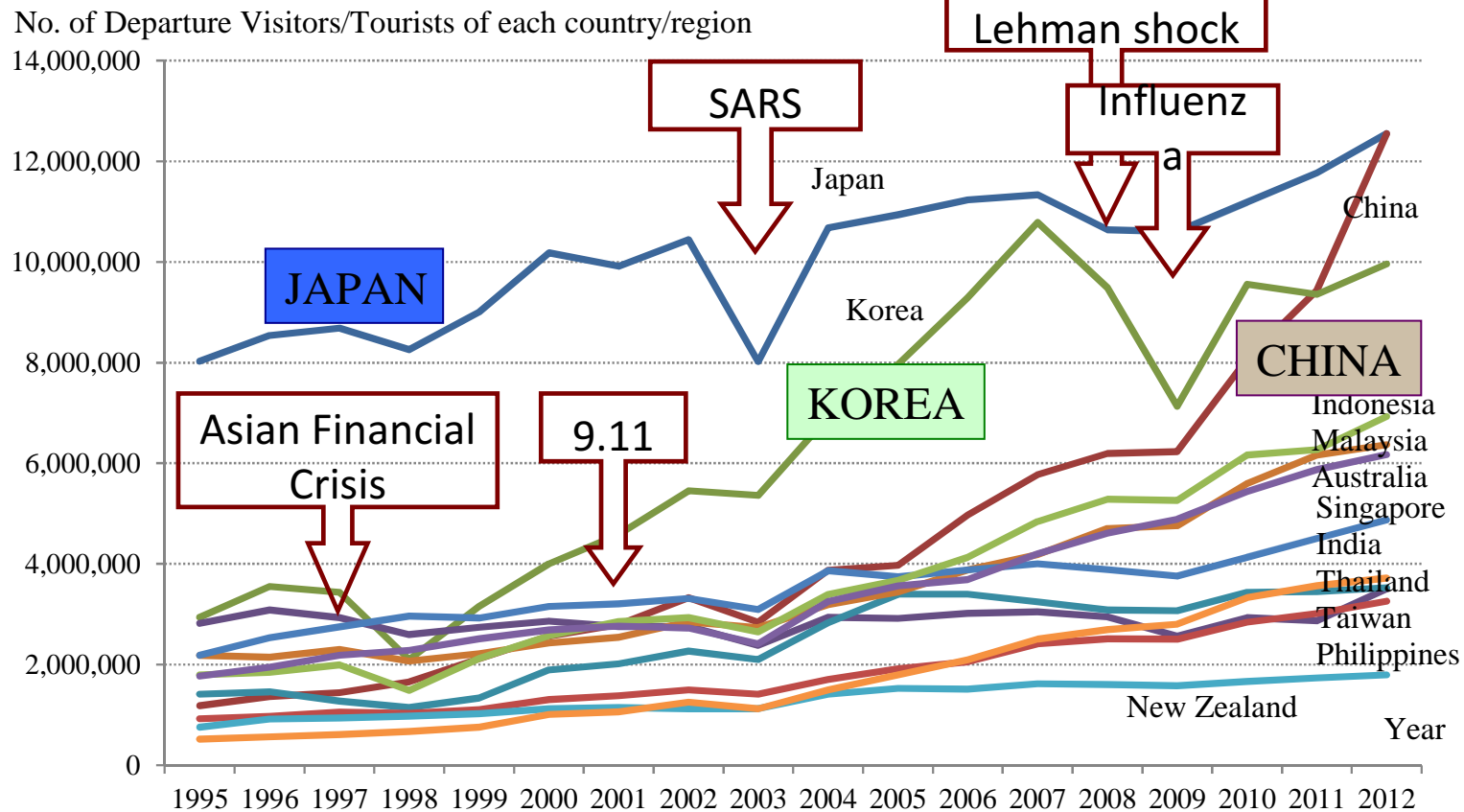


Foreign traveler data categories by arrival country

Country/Region	Classification		Aggregate Unit	
	Visitor	Tourist	Nationality	Residence
Japan		○*	○	
People's Republic of China	○		○	
Republic of Korea	○		○	
Taiwan	○			○
Kingdom of Thailand		○	○	○
Malaysia		○		○
Republic of Singapore	○		○	○
Republic of the Philippines		○		○
Republic of Indonesia		○	○	○
Australia	○			○
New Zealand	○			○
India		○	○	

Sequential Steps for classification of  
Tourist, Visitor and Others

# Trend in **outbound** tourists by country/region

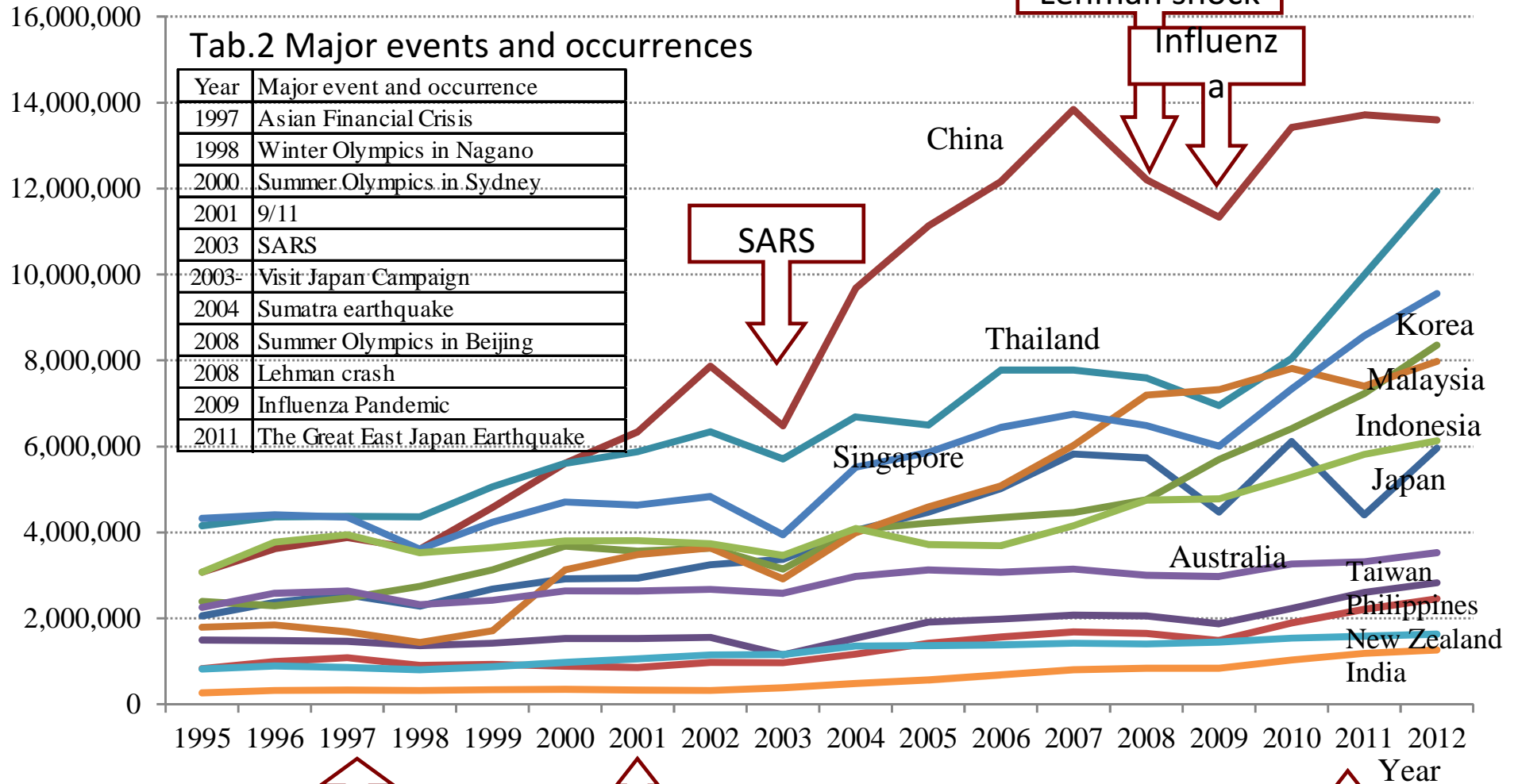


- The number of outbound tourists from Japan has kept the top of studied countries.
- It is notable that Korea and China have rapidly increased the number of outbound for the last decade.



# Trend in Inbound tourists by country/region

No. of Arrival Visitors/Tourists of each country/region



Asian Financial Crisis

9.11

The Great East Japan Earthquake

## Trend in Inbound tourists by country/region

- **Different trend in inbound tourists by country & region:**
  - ✓ China: most rapidly increasing since Asian economic crisis in 1997
  - ✓ Malaysia and Singapore: gradually increasing since 1998-1999
  - ✓ Thailand & Korea: increasing with a low level and rapidly increasing since 2009
  - ✓ Japan and Indonesia: steadily increasing since 2003
  - ✓ Other countries and region: increasing with a low level and relatively stable during these 17 years
- Some major **unexpected occurrences and economic crises** have significantly offered **negative effect** on both outbound and inbound tourists: SARS in 2003, Lehman shock in 2008, and Influenza in 2009
- **The economic growth policy and the related tourism promotion** as a tourist destination country have **accelerated the increasing rate** of inbound tourists: Beijing Olympics in 2008, and Visit Japan Campaign in 2003.

# The characteristics of international tourism travel flow

## Change in destination choice probability between 1995 and 2012

$(P_{ij_{2012}} - P_{ij_{1995}}) [\%] (j=1, \dots, 12)$ , for each  $i$ -departure country

 : decreasing       : increasing

	Japan	China	Korea	Taiwan	Thailand	Malaysia	Singapore	Philippines	Indonesia	Australia	New Zealand	India
Japan		12%	7%	0%	1%	0%	-9%	-1%	-2%	-7%	-1%	1%
People's Republic of China	-7%		8%		10%	4%	-1%	1%	2%	1%	1%	1%
Republic of Korea	-9%	23%		-2%	-4%	0%	-7%	6%	-1%	-4%	-3%	1%
Taiwan	21%		11%		-6%	-4%	12%	-1%	-6%	-3%	-2%	1%
Kingdom of Thailand	4%	6%	6%	-8%		-2%	-5%	0%	1%	-3%	-1%	2%
Malaysia	0%	8%	1%	3%	-9%			0%	-2%	-1%	0%	1%
Republic of Singapore	1%	9%	1%	4%	1%			2%	16%	-2%	0%	0%
Republic of the Philippines	-6%	6%	-8%	-6%	1%	11%	7%		-3%	-1%	0%	0%
Republic of Indonesia	-1%	2%	0%	0%	1%	21%	-17%	0%		-5%	-1%	0%
Australia	-1%	5%	1%	0%	4%	1%	-3%	-1%	-3%		-4%	1%
New Zealand	-2%	4%	1%	0%	2%	1%	-2%	0%	-1%	-4%		1%
India	-3%	8%	-4%	-1%	3%	13%	-12%	-2%	-2%	1%	0%	

- It is here hypothesized that the number of arrivals (that is to say, the developed attraction index) could be determined by both the effect of **OD pair distance resistance** and the **total volume** of international tourism demand.

## 4. Research method -Probabilities Definition-

Type 1

$$\tilde{P}_{ij} = \frac{\frac{A_j}{D_{ij}^\gamma}}{\sum_k \frac{A_k}{D_{ik}^\gamma}} \quad (1a)$$

Type 2

$$\tilde{P}_{ij} = \frac{A_j \cdot \exp(\gamma D_{ij})}{\sum_k A_k \cdot \exp(\gamma D_{ik})} \quad (1b)$$

$$\text{Sub to. } A_j > 0, \quad (2) \quad \sum_j A_j = 10n \quad (3)$$

Objective function:

$$\min SSE = \sum_i \sum_j \left( P_{ij} - \tilde{P}_{ij} \right)^2 \quad (4)$$

Where

$A_j$  = Attraction index of a certain country/region j,

$D_{ij}$  = Spatial distance between ij OD pair (mile),

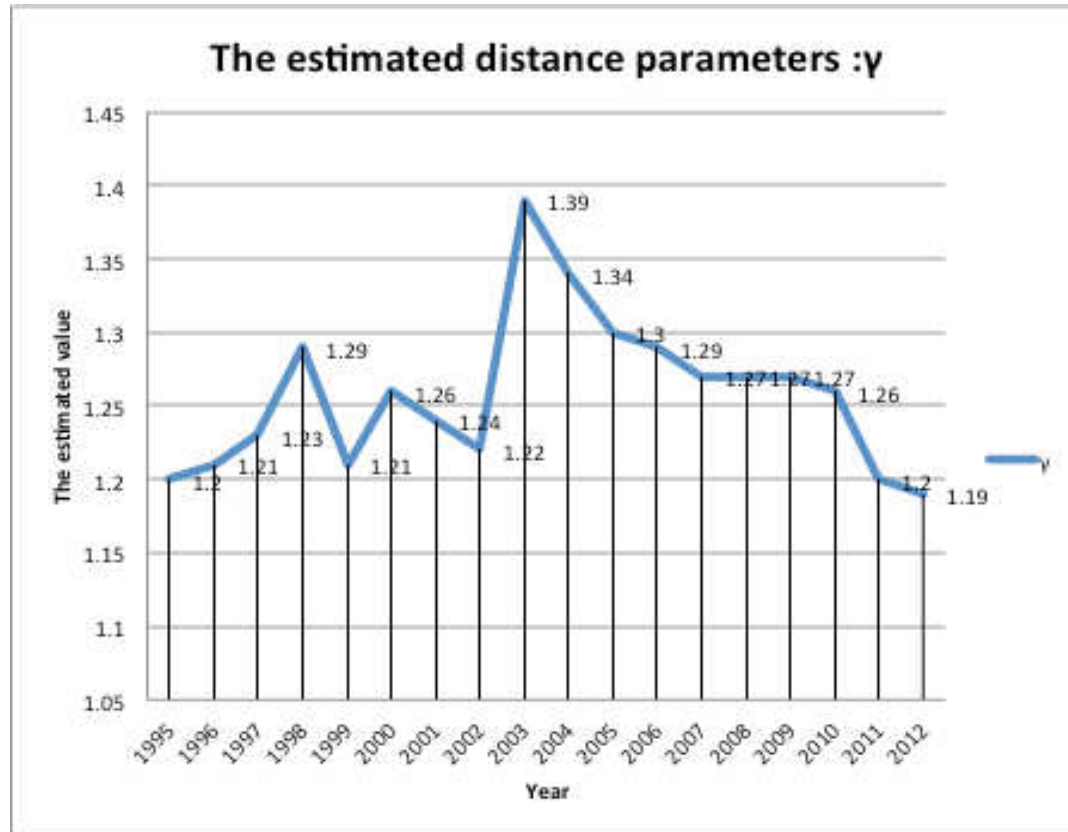
$\gamma$  = Parameter of distance resistance,

$\tilde{P}_{ij}$  = The estimated destination choice probability for ij OD pair,

$P_{ij}$  = The actual destination choice probability for ij OD pair, and

$n$  = Number of countries ( $n=12$ ).

## 5. Discussion: Result of parameter estimates $\gamma$



$\gamma$ : Parameter of distance resistance

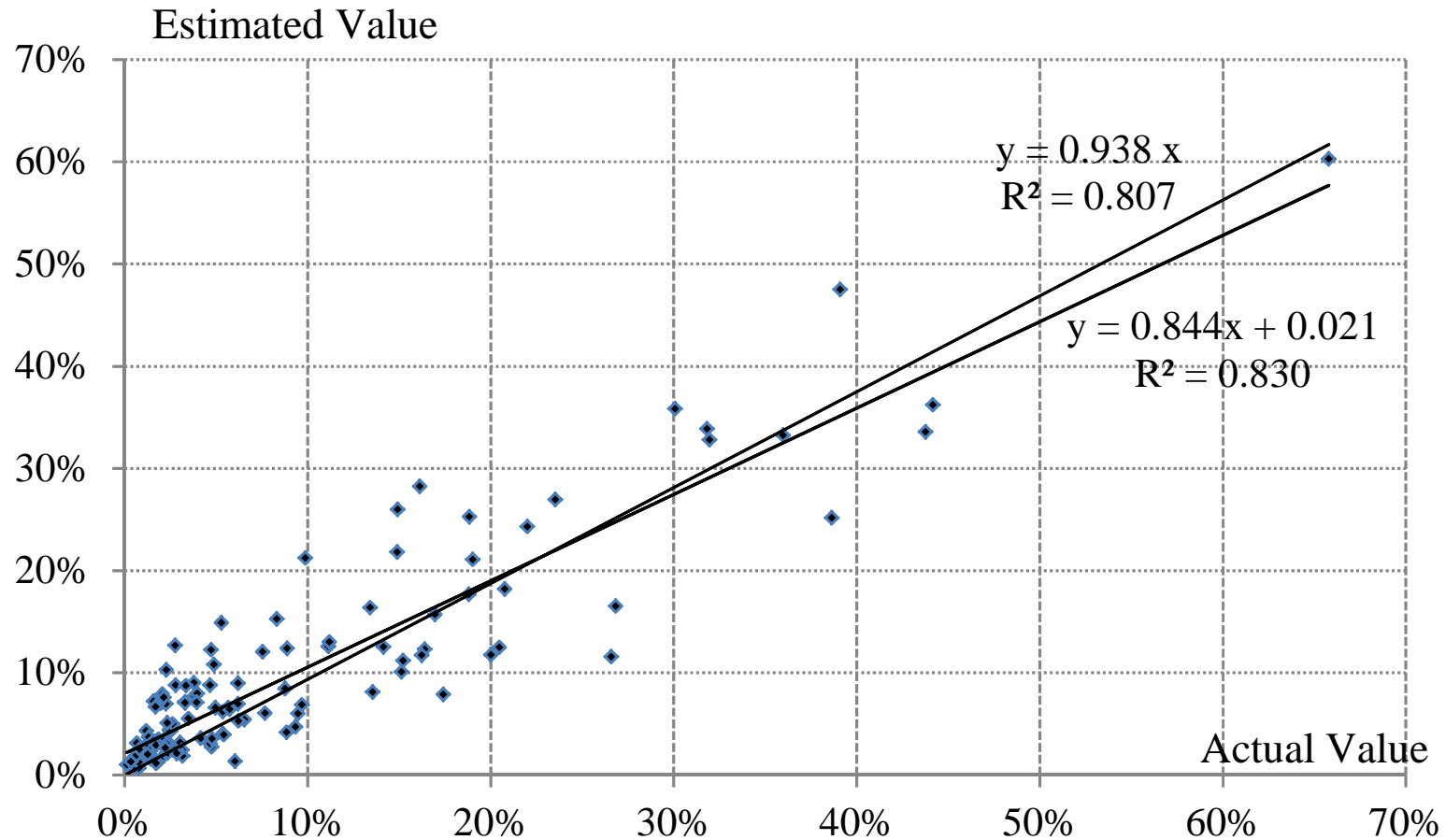
The estimated

$$\gamma = 1.258 \pm 0.051$$

The value of R-square:  
=0.790 ~ 0.859

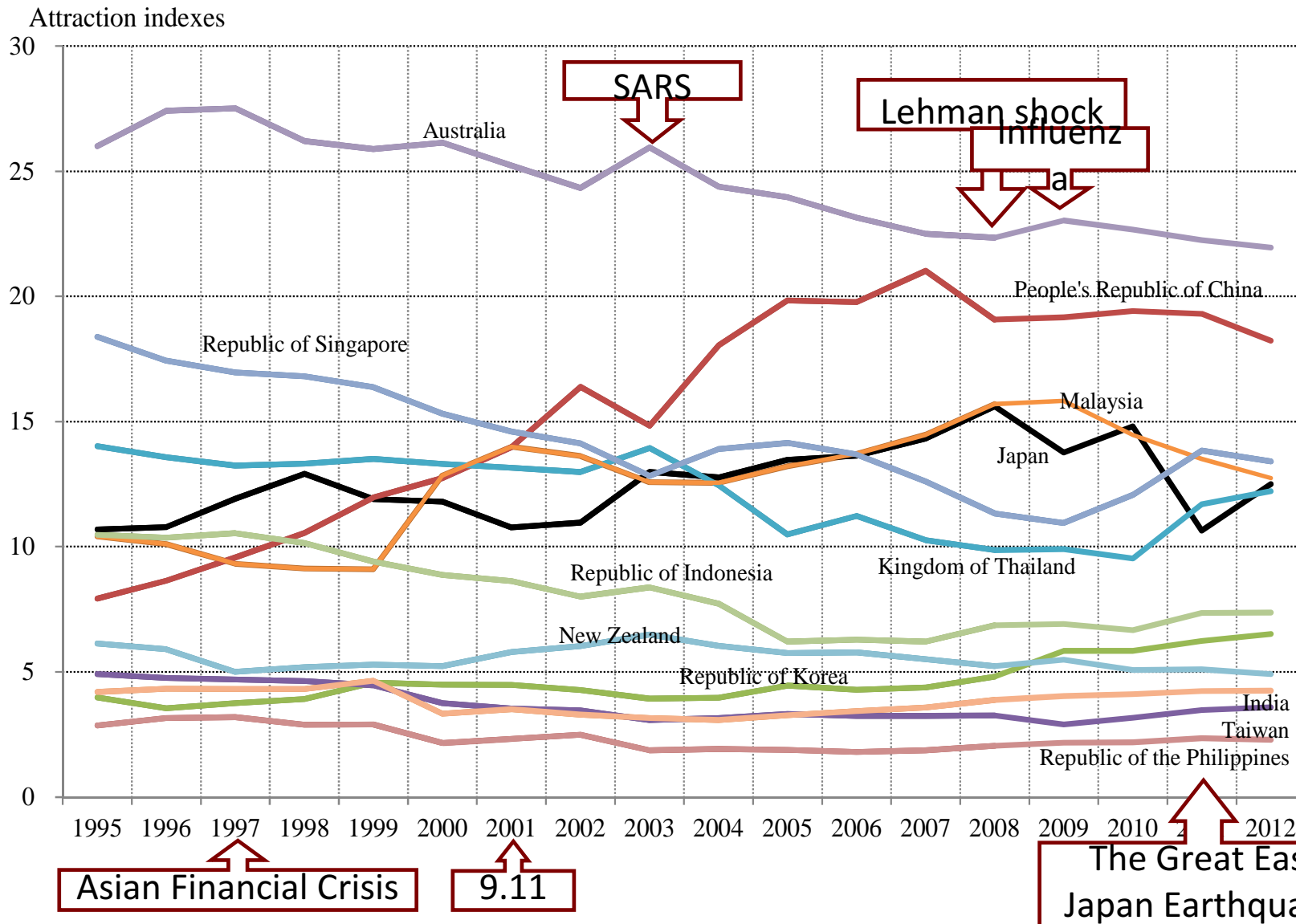
- The developed model has high goodness of fit because the values of R- square count for around 0.8 in observed 18 years over time.
- The accuracy of the gravity typed Huff model(Type 1) is higher than that of the exponential typed model(Type 2).
- The values of the estimated  $\gamma$  are in the range of  $1.258 \pm 0.051$ .

# Distribution of the observed and estimated values of OD probabilities in 2012

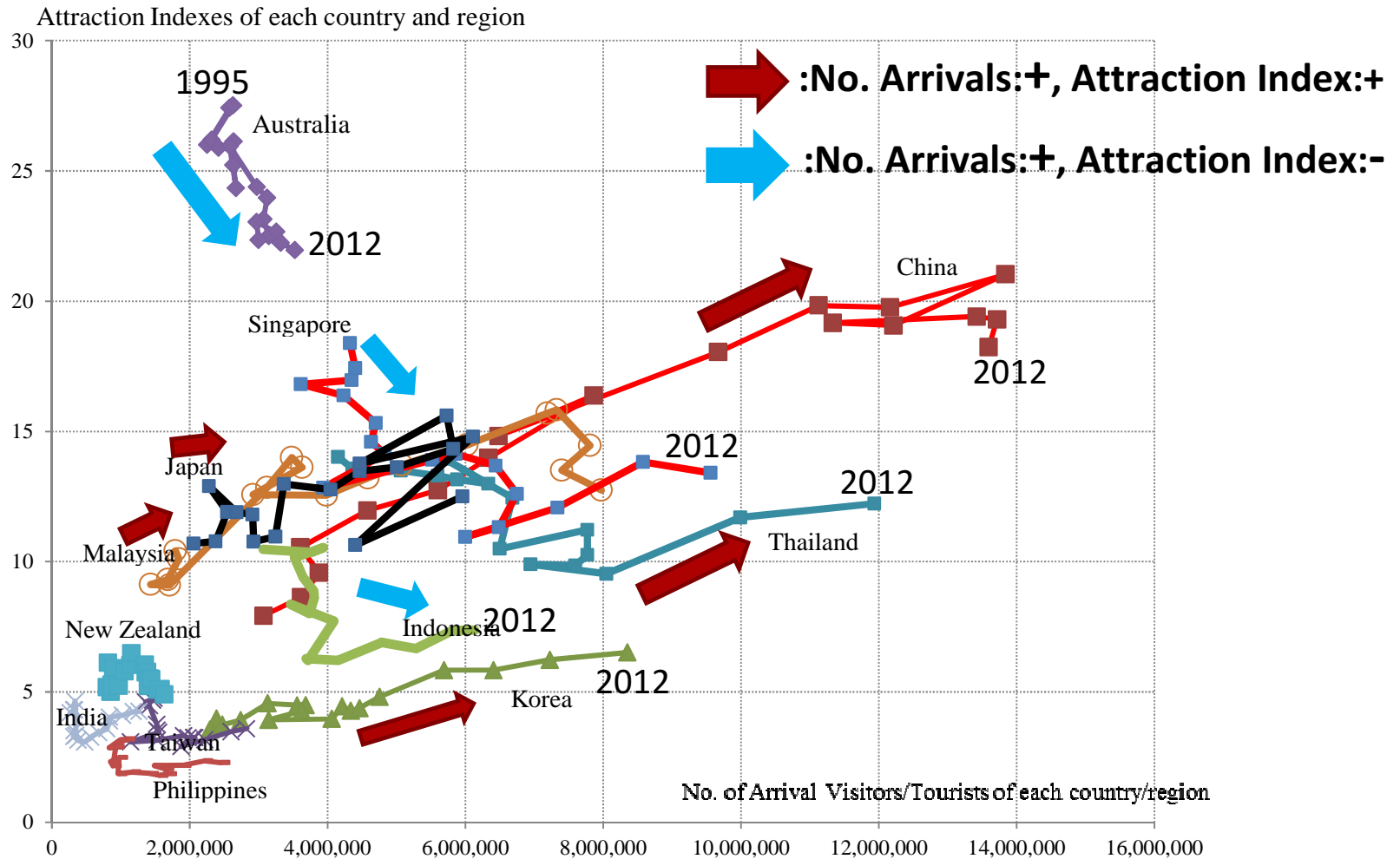


- The developed model has high goodness of fit because the value of R- square is about 0.8 in 2012.

# Results of the estimated attraction index by country



# Relationship between attraction indexes and number of arrivals over the period

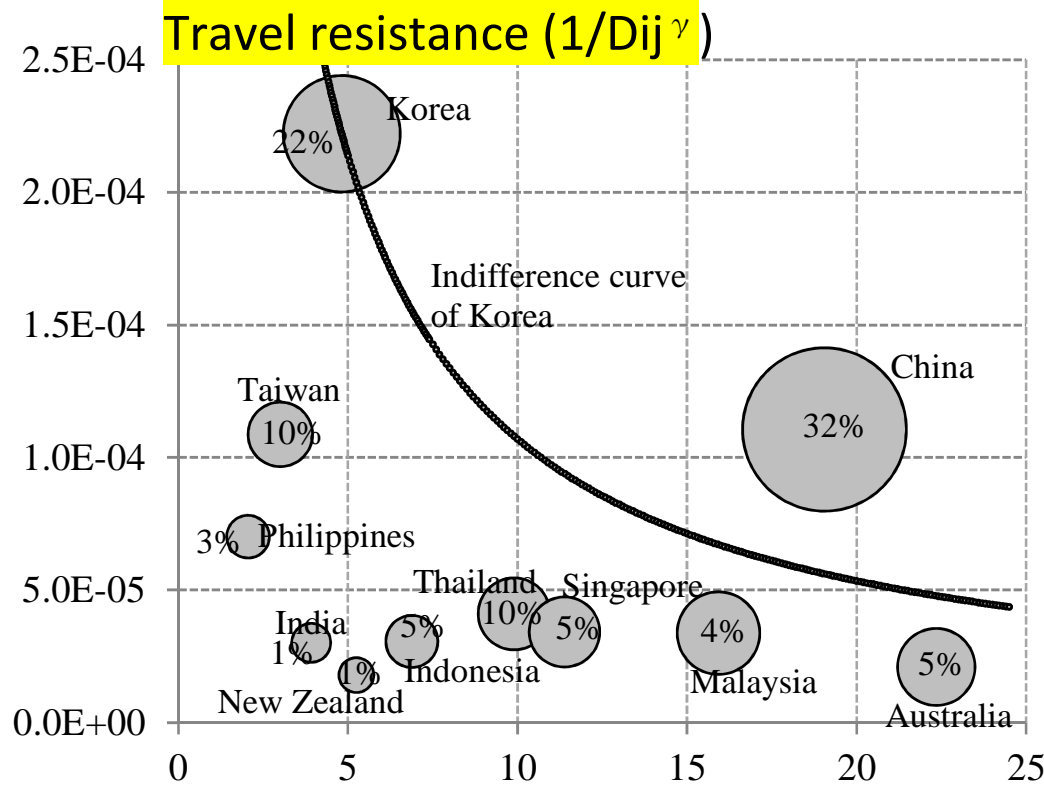




# Relationship between attraction indexes and number of arrivals over the period

- China ,Malaysia, and Japan:
  - Have kept a proportional relationship between the attraction index and the number of inbound tourists during the whole period.
- Thailand and Korea:
  - Have also kept a proportional relationship since the last several years.
- Australia, Singapore and Indonesia:
  - The attraction index have been decreasing in spite of the increase in inbound tourists during the period.
  - This implies that the estimated value of attraction index reflects on weakening of competitiveness in inbound tourist market in these countries.
- New Zealand, India, Philippines, and Taiwan: Not clear tendency

# Positioning of destinations from Japan in travel resistance-attraction index coordinates



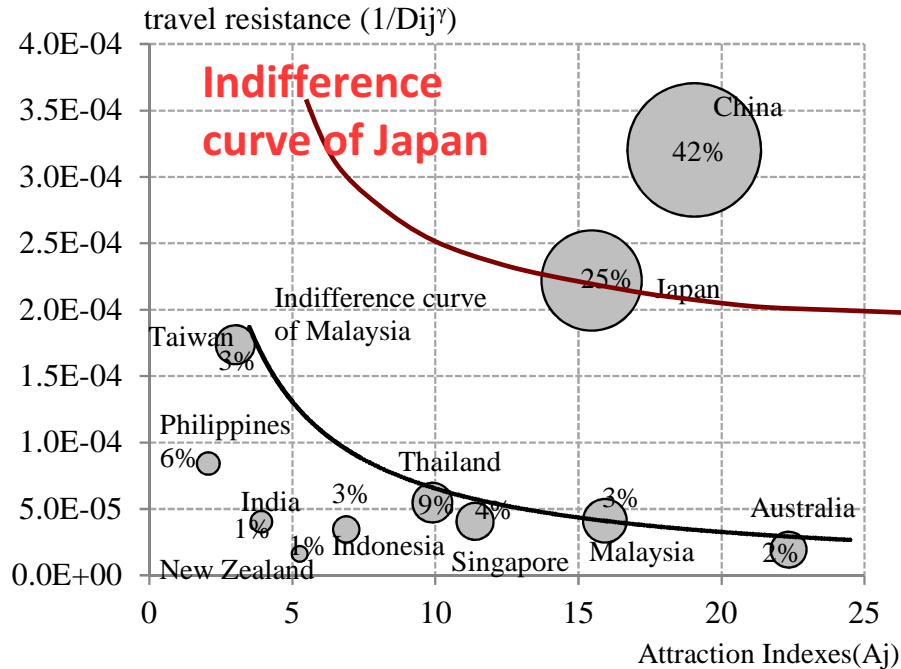
The gray circle presents the position of  $A_j/D_{ij}^\gamma$  for  $i$  : Japan (2008) and  $j$ : destination country

The percent of destination choice probability is shown within the circle by country

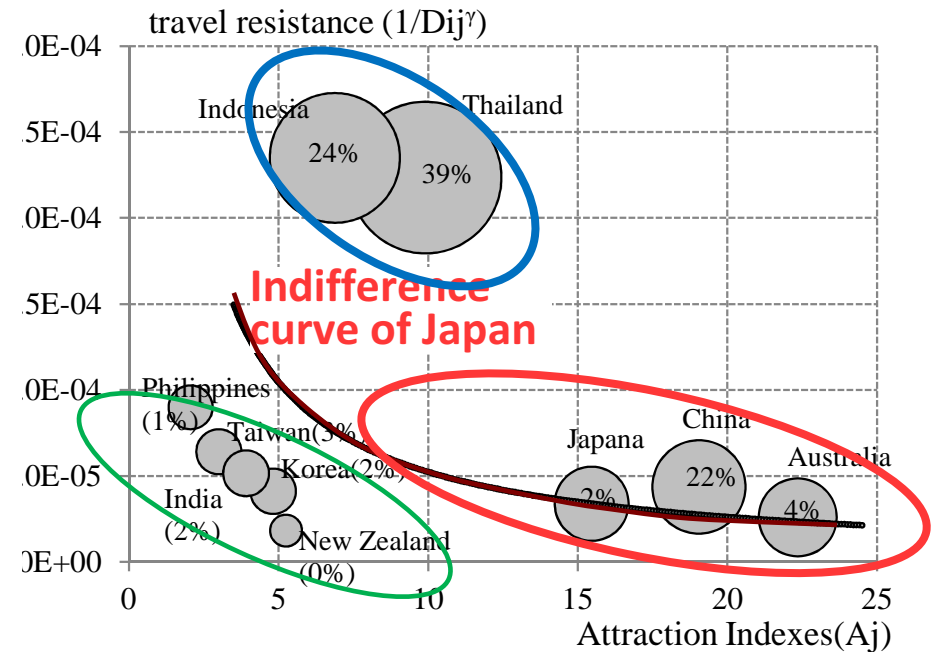
- Such a mapping is evaluated as a useful tool for representing the competitive condition in international tourism.
- Using the indifference curve in mapping, we can discuss how to increase the number of arrivals in the objective country.

# Positioning of destinations for Korea and Malaysia (2008)

## Korea



## Malaysia



### Korea:

➤ The gravitational value of Japan is the second largest. It is due to the fact that both attraction index and travel resistance have an advantage for other countries/region except for China.

## 6. Conclusion

- The attraction indexes of the countries/region from 1995 to 2012 were estimated.
  - —: Australia, +: China, Malaysia and Japan
- The attraction indexes and the number of arrivals are **not** in a **proportional relationship** separating the effect of **total volume of international tourism, distances and population densities**.
- **Some events** such as the Olympic Games, the H1N1 influenza epidemic and economic downturns have **significant effects**.
- The estimated index can **represent positioning** of tourist destination.

Future Issue:

- One of the future issues is to **expand** the analyzed **area**.
- The second is to examine how to set the **level of service (LOS)** in each OD pair.

- 
- Thank you for your kind attention.

### 3.3 The characteristics of international tourism travel flow

Tab.3 Destination choice probabilities on OD matrix in 1995

	Japan	China	Korea	Taiwan	Thailand	Malaysia	Singapore	Philippines	Indonesia	Australia	New Zealand	India	Total
Japan		16%	21%	11%	10%	4%	15%	4%	6%	10%	2%	1%	100%
People's Republic of China	19%		15%		32%	9%	17%	1%	3%	4%	1%	0%	100%
Republic of Korea	30%	18%		5%	16%	2%	12%	4%	4%	6%	4%	0%	100%
Taiwan	21%		5%		17%	10%	20%	7%	13%	5%	2%	0%	100%
Kingdom of Thailand	4%	12%	5%	10%		38%	18%	1%	3%	6%	2%	1%	100%
Malaysia	2%	12%	1%	2%	49%			2%	23%	5%	1%	2%	100%
Republic of Singapore	2%	12%	2%	3%	20%			1%	48%	9%	1%	2%	100%
Republic of the Philippines	8%	24%	18%	10%	7%	5%	13%		10%	3%	0%	1%	100%
Republic of Indonesia	2%	7%	2%	3%	5%	13%	58%	1%		8%	1%	0%	100%
Australia	4%	7%	2%	1%	11%	8%	20%	4%	18%		23%	2%	100%
New Zealand	4%	3%	1%	1%	4%	3%	9%	1%	4%	71%		1%	100%
India	5%	9%	7%	2%	24%	5%	36%	2%	6%	3%	1%		100%
Total	8%	12%	9%	6%	16%	7%	16%	3%	12%	9%	3%	1%	100%

Tab.4 Destination choice probabilities on OD matrix in 2012

	Japan	China	Korea	Taiwan	Thailand	Malaysia	Singapore	Philippines	Indonesia	Australia	New Zealand	India	Total
Japan		28%	28%	11%	11%	4%	6%	3%	4%	3%	1%	2%	100%
People's Republic of China	11%		23%		22%	12%	16%	2%	5%	5%	2%	1%	100%
Republic of Korea	21%	41%		3%	12%	3%	4%	10%	3%	2%	1%	1%	100%
Taiwan	42%		16%		11%	7%	8%	6%	6%	3%	1%	1%	100%
Kingdom of Thailand	7%	18%	11%	3%		36%	14%	1%	4%	2%	0%	3%	100%
Malaysia	2%	19%	3%	5%	40%			2%	21%	4%	0%	3%	100%
Republic of Singapore	3%	21%	3%	7%	20%			3%	32%	7%	1%	3%	100%
Republic of the Philippines	3%	29%	10%	3%	9%	16%	20%		7%	2%	0%	1%	100%
Republic of Indonesia	1%	9%	2%	2%	6%	34%	41%	1%		2%	0%	0%	100%
Australia	3%	13%	2%	1%	15%	8%	17%	3%	16%		19%	3%	100%
New Zealand	2%	7%	2%	1%	6%	4%	7%	1%	3%	67%		2%	100%
India	2%	16%	2%	1%	26%	19%	24%	0%	5%	4%	1%		100%
Total	8%	18%	11%	4%	16%	11%	13%	3%	8%	5%	2%	2%	100%

## 5. Discussion

### 5.1 Verification of the accuracy of the model

Tab.6 Estimated parameter ( $\gamma$ ) and accuracy indexes

Year	$\gamma$	SSE	Std. Error	R square
1995	1.20	0.289	0.0479	0.817
1996	1.21	0.325	0.0508	0.797
1997	1.23	0.321	0.0505	0.800
1998	1.29	0.335	0.0516	0.804
1999	1.21	0.342	0.0521	0.790
2000	1.26	0.318	0.0502	0.808
2001	1.24	0.284	0.0475	0.828
2002	1.22	0.306	0.0493	0.816
2003	1.39	0.325	0.0508	0.829
2004	1.34	0.337	0.0517	0.819
2005	1.30	0.323	0.0506	0.821
2006	1.29	0.318	0.0502	0.822
2007	1.27	0.291	0.0480	0.831
2008	1.27	0.331	0.0513	0.805
2009	1.27	0.281	0.0472	0.859
2010	1.26	0.269	0.0462	0.858
2011	1.20	0.259	0.0454	0.852
2012	1.19	0.282	0.0473	0.830

$\gamma$ : Parameter of  
distance  
resistance  
SSE: Sum of Squared  
Error

## 5.1 Verification of the accuracy of the model

Tab.7 Ratio of  $1/D_{ij}^{\gamma}$  in the case of each travel resistance  
(Korea=1.00)

	Dij (mile for Japan)	$\gamma = 1.39$ (2003)	$\gamma = 1.19$ (2012)
Republic of Korea	758	1.00	1.00
People's Republic of China	1313	0.47	0.52
Taiwan	1330	0.46	0.51
Republic of the Philippines	1880	0.28	0.34
Kingdom of Thailand	2869	0.16	0.21
Republic of Singapore	3312	0.13	0.17
Malaysia	3338	0.13	0.17
Republic of Indonesia	3612	0.11	0.16
India	3656	0.11	0.15
Australia	4863	0.08	0.11
New Zealand	5493	0.06	0.09



## 5.3 Relation between some events/occurrences and attraction indexes

Tab.8 Fluctuation of ratios of attraction index and actual tourist number by major event/occurrence

	Arrival Country	Attraction Index (A <sub>j,t-1</sub> ,①)	Attraction Index (A <sub>j,t</sub> ,②)	(①-②) /①	Increased ratio of number of Arrival Tourist
Asian Financial Crisis('97)	Thai	13.7	13.3	-3%	3%
	Korea	3.6	3.8	6%	10%
	Philippines	3.2	3.3	2%	10%
Winter Olympics in Nagano('98)	Japan	11.9	12.9	8% >	2%
Soccer World Cup in Japan/Korea('02)	Japan	10.7	10.9	2%	26%
	Korea	4.5	4.3	-4%	0%
Visit Japan Campaign('03-)	Japan	10.9	13.0	19%	21%
SARS('03)	China	16.4	14.8	-9%	1%
Sumatra earthquake('05)	Indonesia	7.7	6.2	-20%	-16%
Summer Olympics in Beijing('08)	China	21.0	19.1	-9% >	-11%