ITPU
International Transport
Policy Research Unit

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# *"Liberalization in North East Asian Skies"*

## *- Theory and case study of tri-partite market liberalization -*

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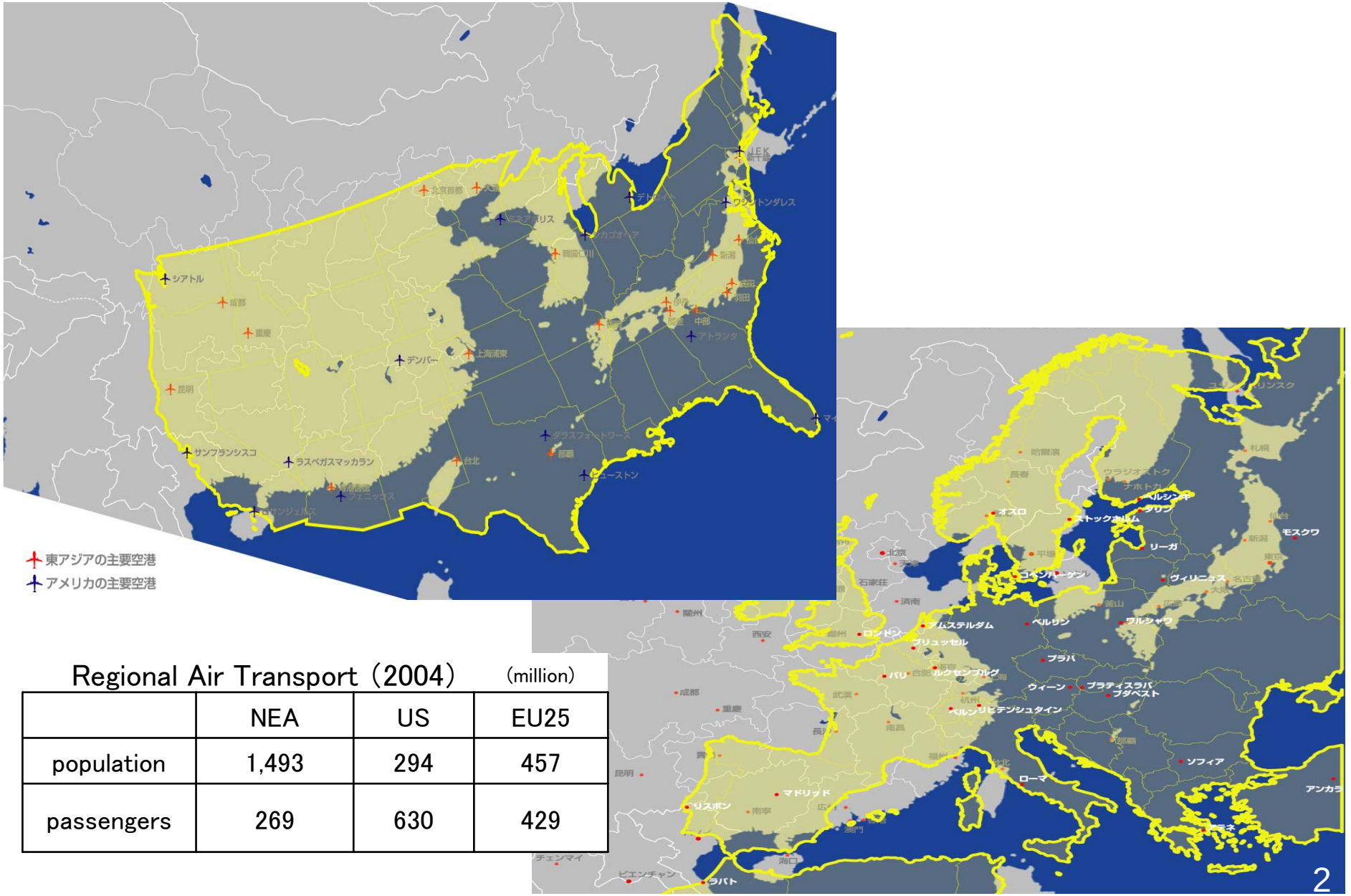
# 1. Introduction

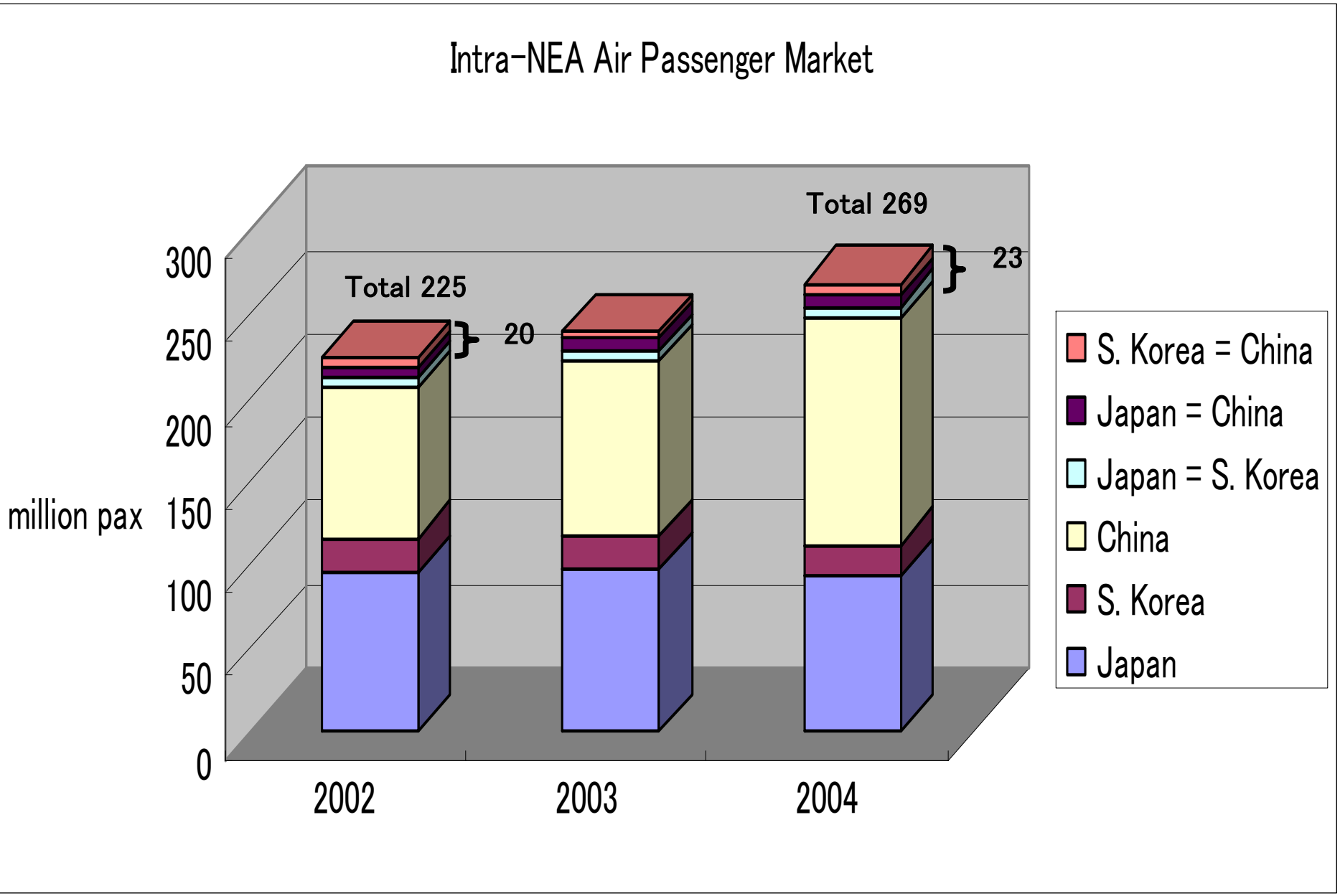
- East Asia has clearly become the third pole in today's global economy.
- As we head for further economic integration, we need better understanding of possible market liberalization in East Asian skies.

# Spatial Dimension of East Asia



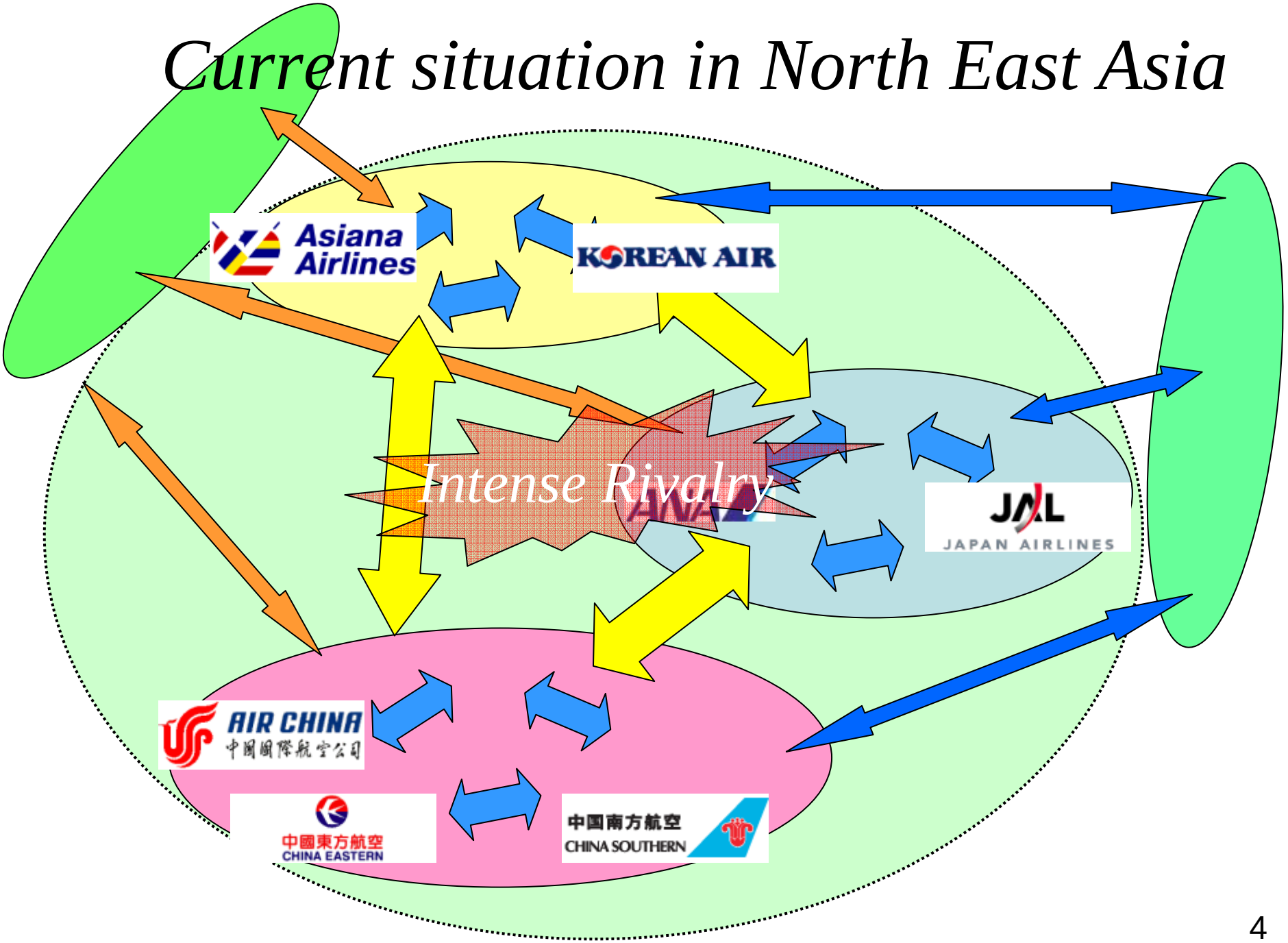

Regional Air Transport（2004） (million)

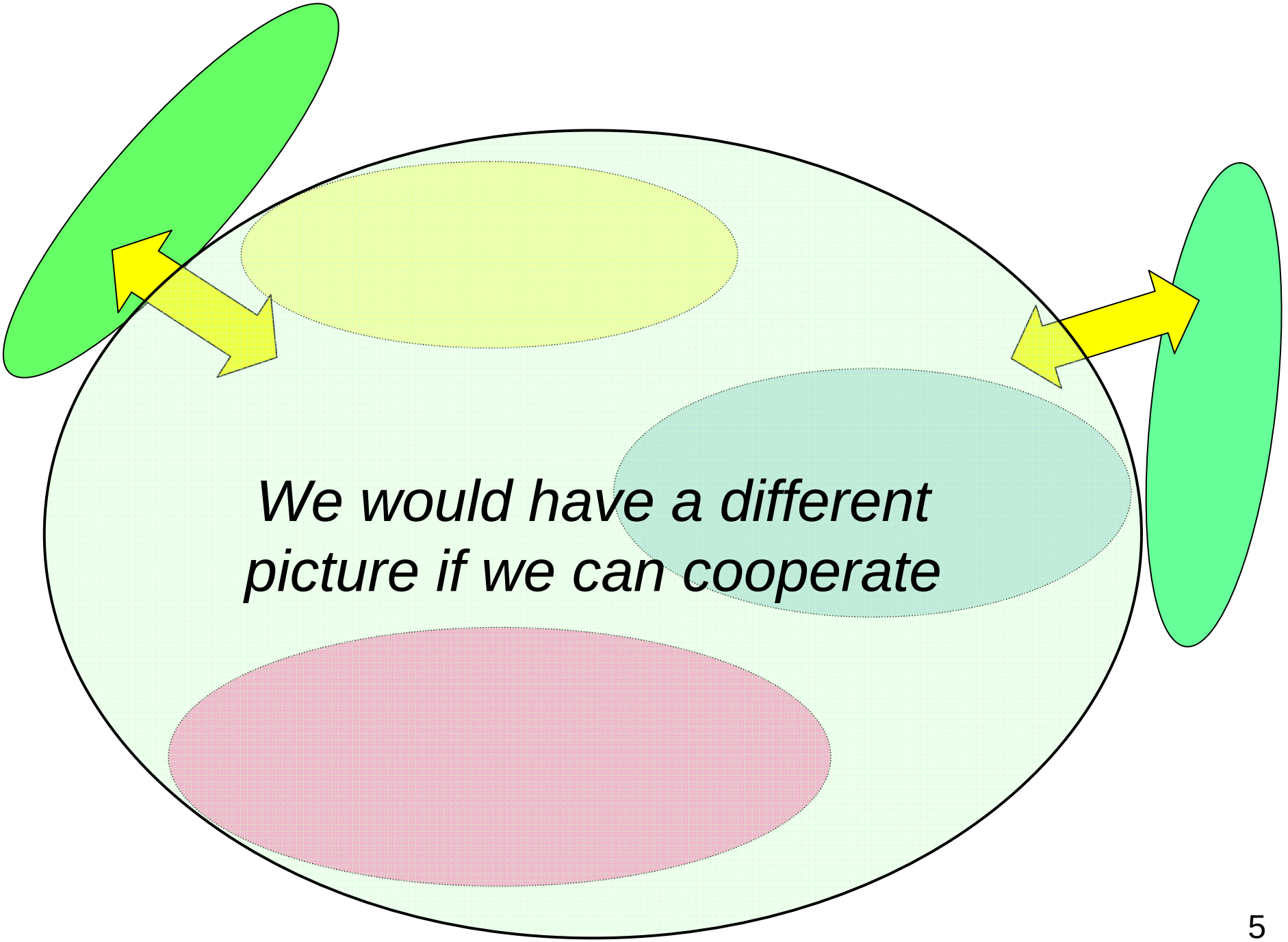
| | NEA | US | EU25 |
|---|---|---|---|
| population | 1,493 | 294 | 457 |
| passengers | 269 | 630 | 429 |



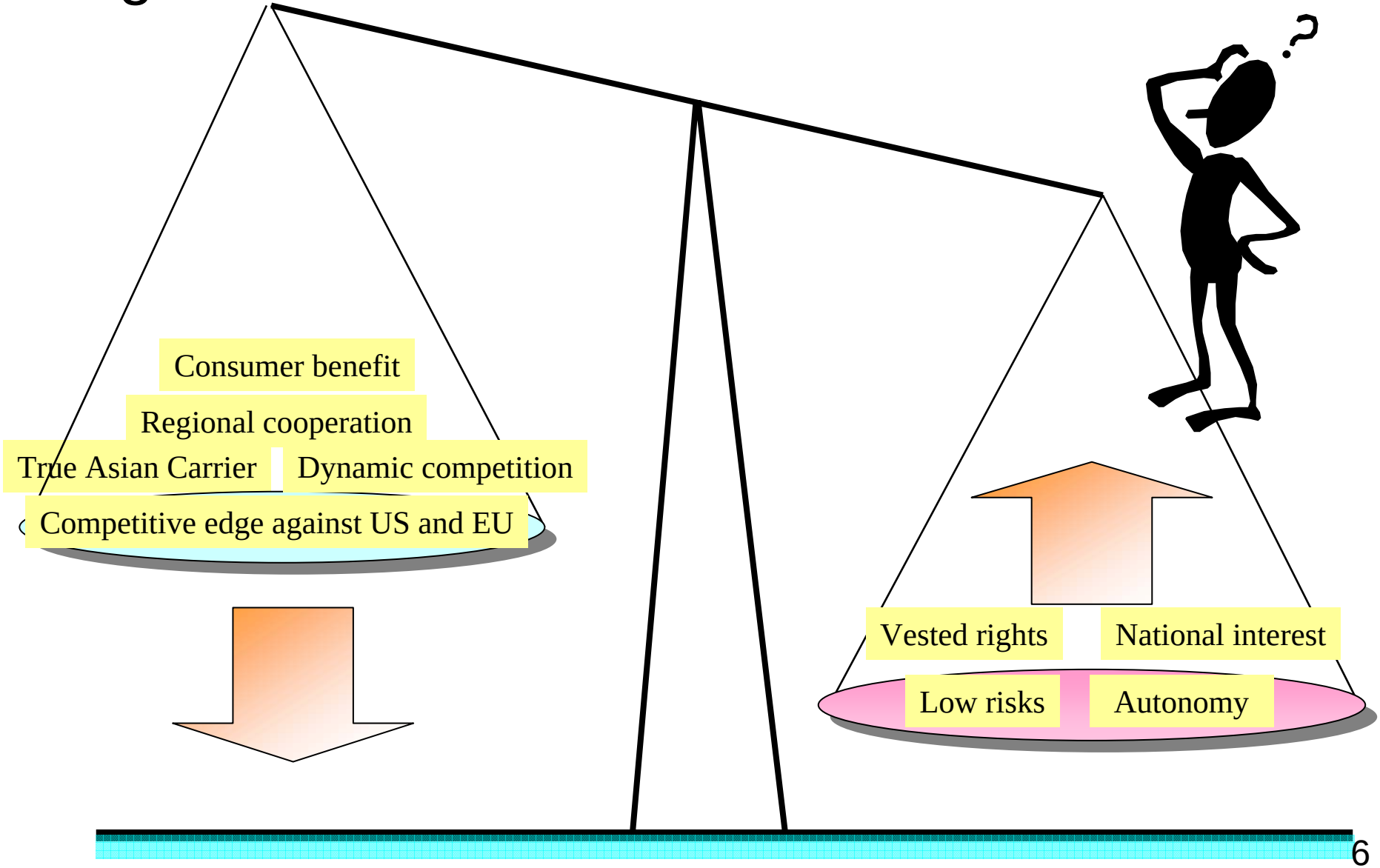

•China includes Hong Kong and Taiwan

# *Current situation in North East Asia*




*We would have a different picture if we can cooperate*

# So how could we cooperate to foster growth of true N.E. Asian Carriers?



# 2. Analysis of Tripartite Liberalization

## 1) Theoretical Model

- Recent work on network formation game applied to merchandise trade points out that “asymmetry of countries is a major obstacle of FTA formation” (Furusawa & Konishi (2006)).
- Indeed, similar situation seems to apply to international air transport.
- As the following analysis shows, without national transfers, we are locked into sub-optimal ASAs even when firms are symmetrical.

# Theoretical Model

- Assume that symmetrical air carriers pursue profit maximization in an oligopoly (Cournot competition).
- Country *i* then maximizes its national interest.
- National interest

  $= CS_i + n_i \bullet$ airline's $\pi$ + airport revenue
- If country *i* (*j*) has the majority share in the market, then country *i* (*j*) does not have an incentive to open it.
- We are locked into a sub-optimal situation.
- Transfer-payment is necessary to liberalize.

# 2) Empirical Model

- We need a model that replicates the current situation and give a new equilibrium when market entry restrictions are lifted. It is also desirable to incorporate airport capacity constraints into the model.
- The model takes the form of Cournot oligopoly with free entry and airport capacity constraints. Product differentiation is introduced to reflect home-market effects in airline preference.
- Services by carriers from third country such as US are held constant.

# Scenario of the simulation

- Inter-capital routes: Tokyo-Seoul, Tokyo-Beijing, Seoul-Beijing

- Entry restriction lifted for the third country:

  <*Common Club Approach*>

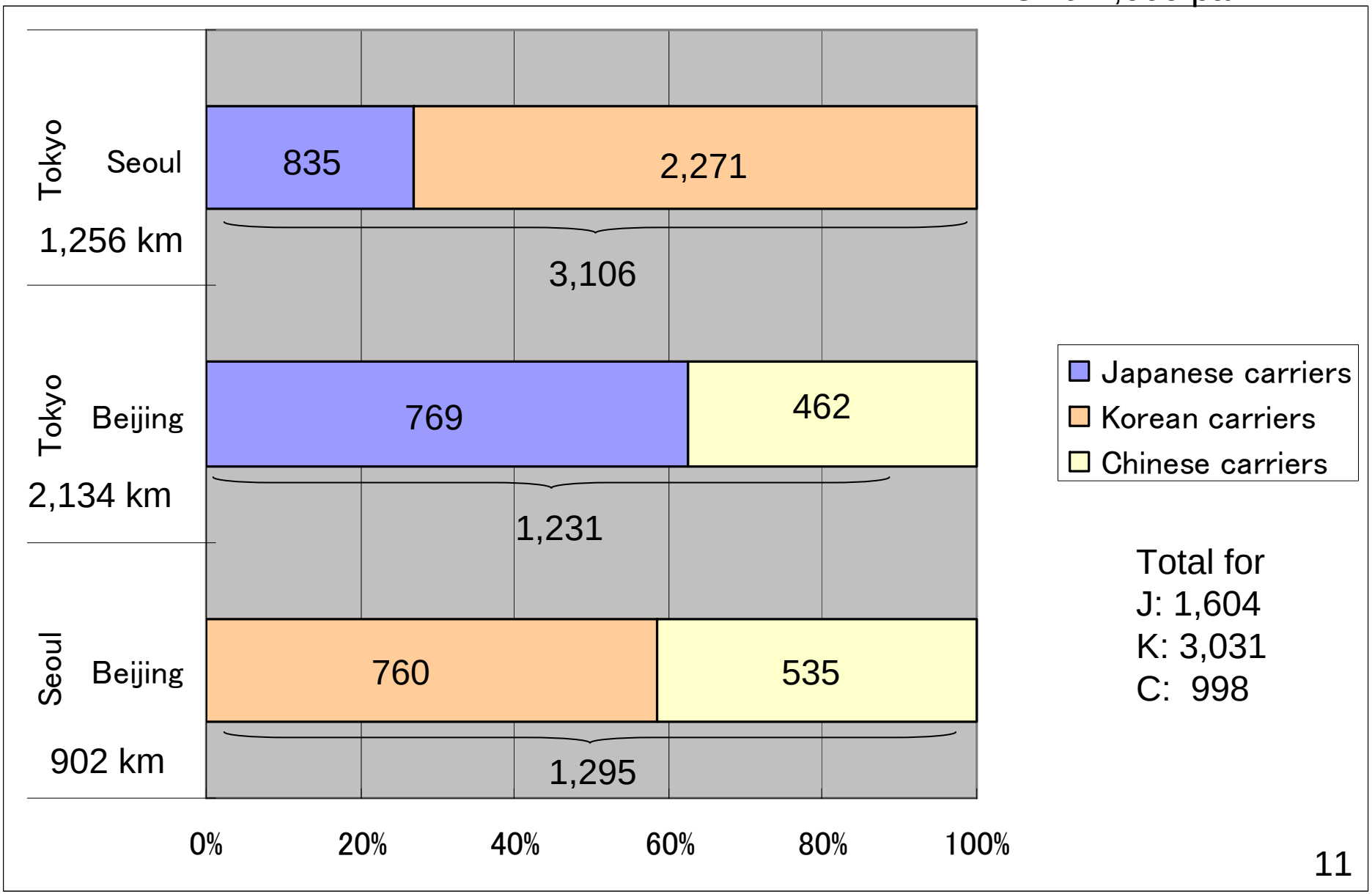
  Tokyo-Seoul → Chinese air carriers

  Tokyo-Beijing → Korean air carriers

  Seoul-Beijing → Japanese air carriers

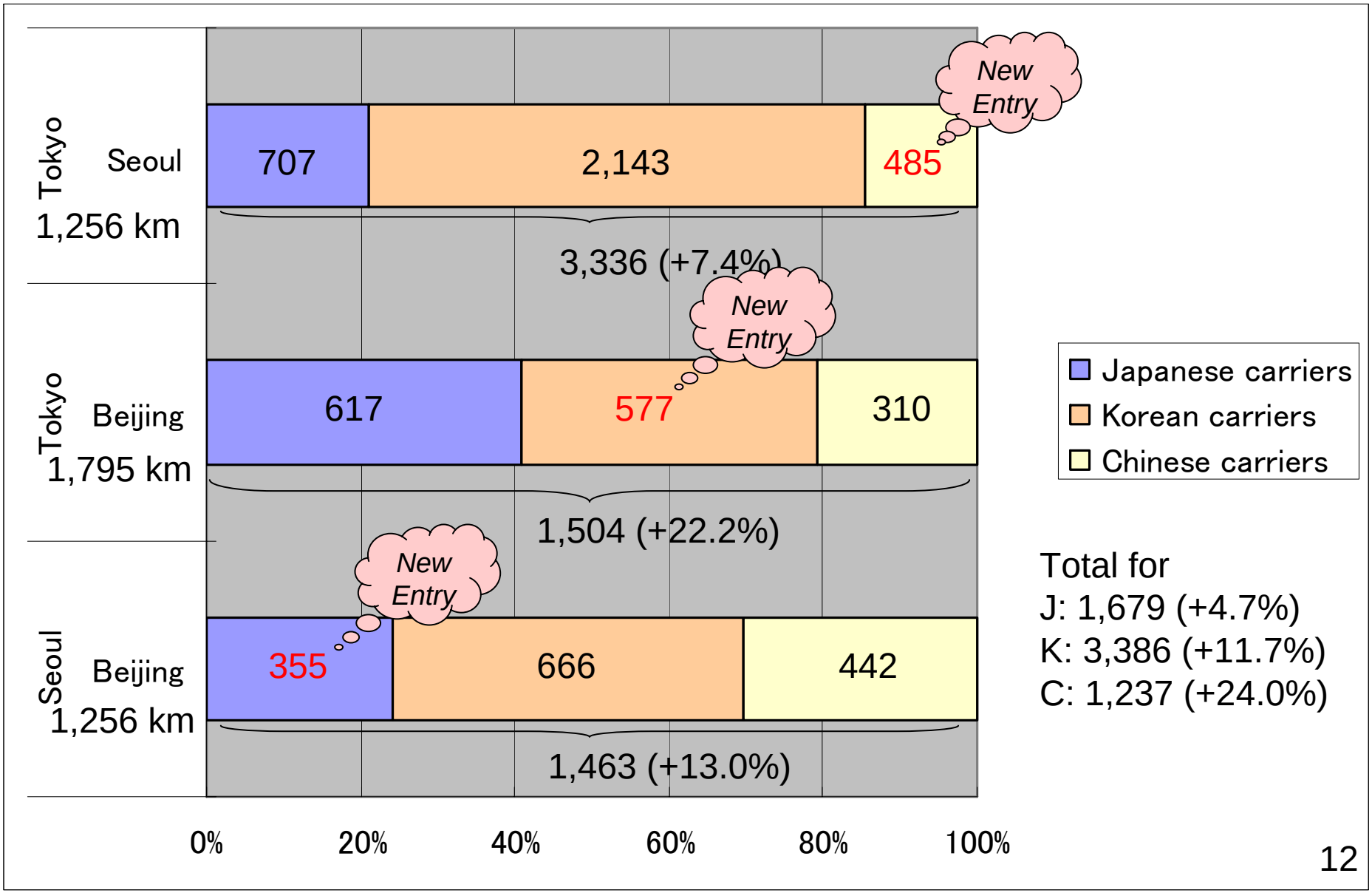
# Current market share and number of passengers (2004)

Unit: 1,000 pax



# Result of the simulation (2004)

(calibrated cost; capacity cap at Tokyo and Beijing)  Unit: 1,000 pax

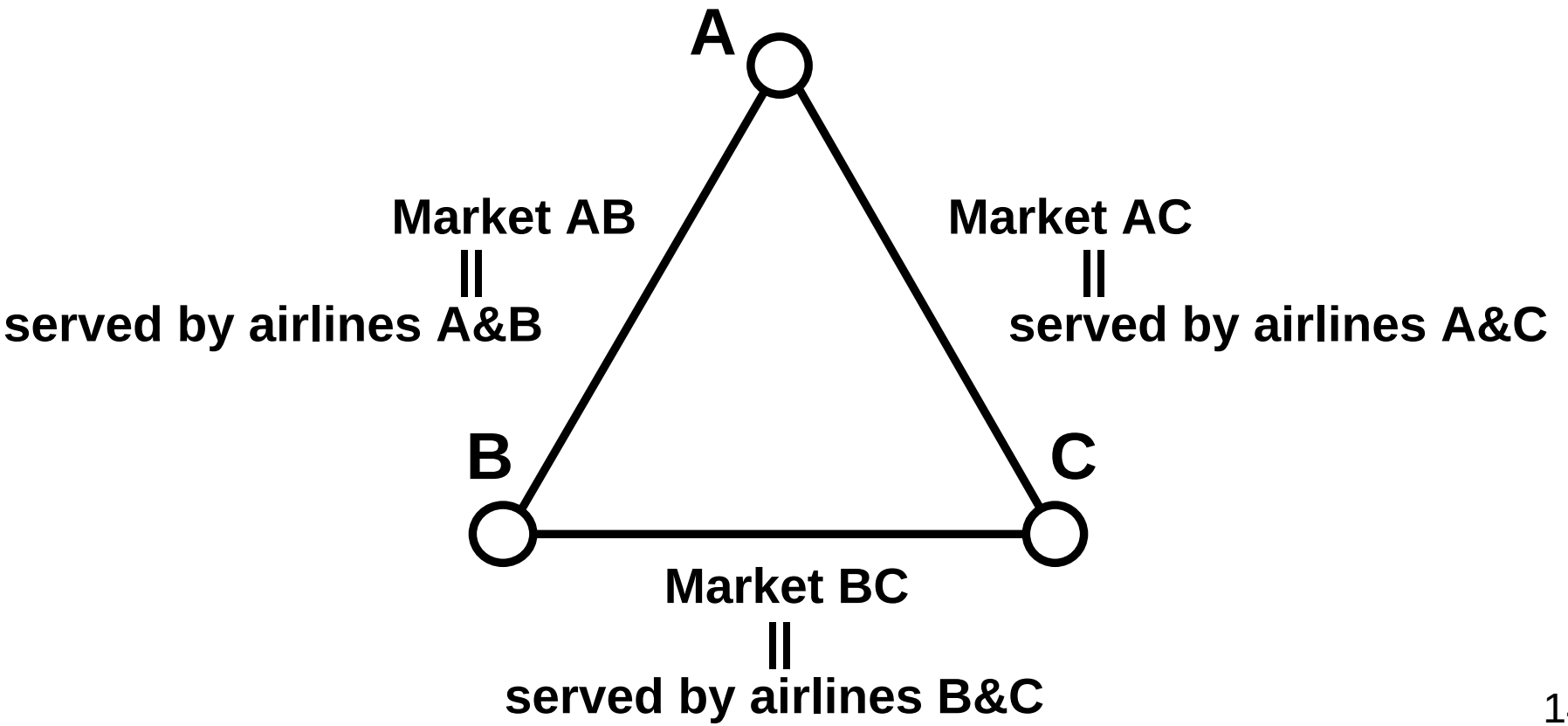


# Effect of liberalization of three inter-capital routes

- Total number of passengers increases by 671,000 even with airport capacity constraints for Tokyo and Beijing.
- Each national carrier enters into new routes and total number of passengers increases for each carrier.
- Consumer surplus increases by 43 million US$. While Japanese and Korean carriers each loose profit by 10-15 million US$, Chinese carriers gain profit by 1 million US$. Net welfare gain is 18 million US$.

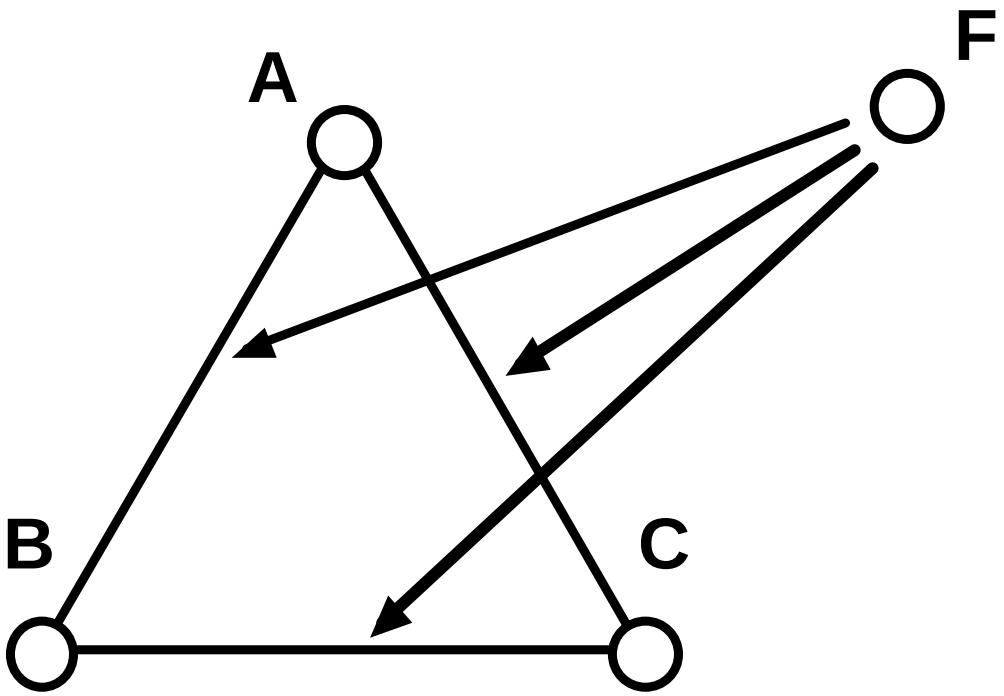
# 3) Theoretical analysis taking foreign airline into account: Three-Country Case

- Three countries and three markets



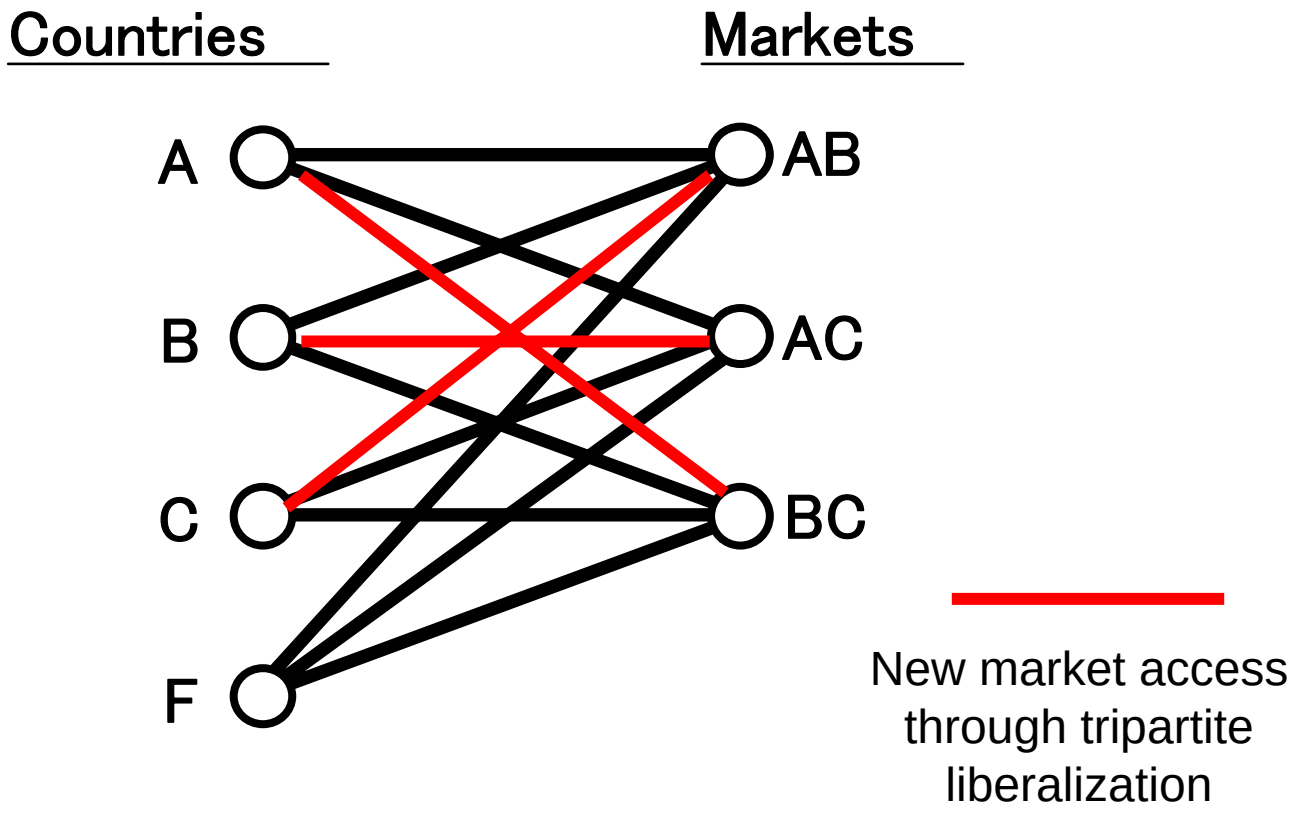
# Existence of a Foreign Airline

- Foreign airline has access to these markets:



# Structure of the Network

- Two-mode-network representation:



# Results and Findings

- No two countries have an incentive to open their market to a third country.
- Numerical model analysis reveals that liberalization of all markets is pareto improving.
- All three countries get better off by total liberalization.
- Leakage of welfare to foreign airline is minimized.

# 3. Conclusion

- This study underpins limitations of bilateral liberalization and looked into tripartite liberalization of inter-capital routes of Japan, Korea and China.
- Analysis shows that overall welfare gains would be achieved from tripartite liberalization.
- Transfer-payment may be necessary for this to happen.
- When we take foreign airlines into account, the three NEA countries could be better off without transfer-payment.

- Furthermore, consequence of liberalization depends on how air carriers perform and change in the market.
- It is important to provide more room for them to evolve into East Asian carriers rather than locking them into fragmented national air carriers.
- By tripartite liberalization NEA airline industry could be led to become more competitive so that they could counter mega-carriers in North America and Europe.

# Appendix

- Description of the models and data

# Theoretical Model: Two-Stage Game

- Consider a market between countries $i$ and $j$: market $ij$
- Price elastic demand: $P^{ij} = P^{ij}(Q^{ij})$ ($Q^{ij}$ = market demand)
- There are $N^{ij}$ airlines of which $n_i$ ($n_j$) is from country $i$ ($j$)
- Airlines are symmetric and compete in a Cournot fashion
- Constant MCs: operating cost = $c$; airport charges = $\mu_i, \mu_j$
- Costs and capacity of airport are ignored: $\pi^{\text{airport}}$ = rev.
- Airline's problem: $\max_q Pq-(\mu+c)q$ where $\mu = \mu_i+\mu_j$
- Solving it gives $P = \mu+c - P'Q/N$ where $Q = N q^*$
- Market demand depends on $\mu$ and $N$: $Q_\mu < 0$ & $Q_N > 0$

# Bilateral Air-Service Agreement

- Country $i$ maximizes its national interest by controlling $\mu_i$
- National interest = $CS_i + n_i \bullet$ airline's $\pi$ + airport revenue
- $v_i^* = \max_{\mu i} \; s_i [ \int_0^Q P(x)dx \; - PQ ] + n_i [Pq^* - (\mu + c)q^*] + \mu_i Q$
- $dv_i^*/dN = [1 - 2n_i/\mathrm{N}]\,\pi$ (and $dv_j^*/dN = [1 - 2n_j/\mathrm{N}]\,\pi$)
- If $n_i > N/2$ ($n_j > N/2$) then $dv_i^*/dN < 0$ ($dv_j^*/dN < 0$)
- That is, if country $i$ ($j$) has a majority share in the market, then country $i$ ($j$) do not have an incentive to open it
- Under an exclusive bilateral ASA, either country has a majority share, and thus ***exclusive bilateral ASA is stable***

# Multilateral Air-Service Agreement

- Super-national entity maximizes net welfare in the market
- $\max_{\mu i,\, \mu j}\ [\ \int_0^Q P(\xi)d\xi\ -\ PQ\ ] + N\,[Pq^*-(\mu+c)q^*] + \mu\, Q$
- FOC implies $P=c$ and $\mu=P'q^* < 0$:
  - Price (user cost) = social marginal cost (operating cost $c$)
  - Airport charge is negative: subsidy to neutralize market power
- Quantity is larger $Q_B < Q_M$; price is lower $P_B > P_M = c$
- Welfare in the market improves by $\int_{QB}^{QM} [P(\xi)-c]d\xi$
- ***If all markets in the region are opened for all member countries, then with some appropriate international transfer-payment scheme, all countries get better off***

# The empirical model:

## Cournot Model with product differentiation

$$\max_{y_a^m} \pi^m = \sum_a \left[ p_a y_a^m - C_a^m y_a^m \right] \qquad (1)$$

$$st. \qquad \sum_a \sum_m \delta_a^m y_a^m \le F_h \qquad (2)$$

$$y_a^m \ge 0 \qquad (3)$$

$$y_a^m \left(1 - \eta_a^m\right) = 0 \qquad (4)$$

where

$$p_a^m = f\left( \sum_m y_a^m, d_a \right) = \alpha d_a + \beta \left( y_a^m + \sigma \sum_{k \ne m} y_a^k \right) + \gamma \qquad (5)$$

$$C_a^m = cc_a^m + ca_a^m + \rho^h \qquad (6)$$

$y_a^m$ : number of passengers of air carrier of country *m* on link *a*

$C_a^m$ : calibrated cost of air carrier of country *m* on link *a*

$cc_a^m$ : cost based on unit cost of air carrier of country *m* on link *a*

$ca_a^m$ : cost adjustment coefficient of air carrier of country *m* on link *a*

$\rho^h$ : airport capacity cost (theoretical)

$p_a^m$ : airfare of air carrier of country *m* on link *a*

$F_h$ : *airport capacity*

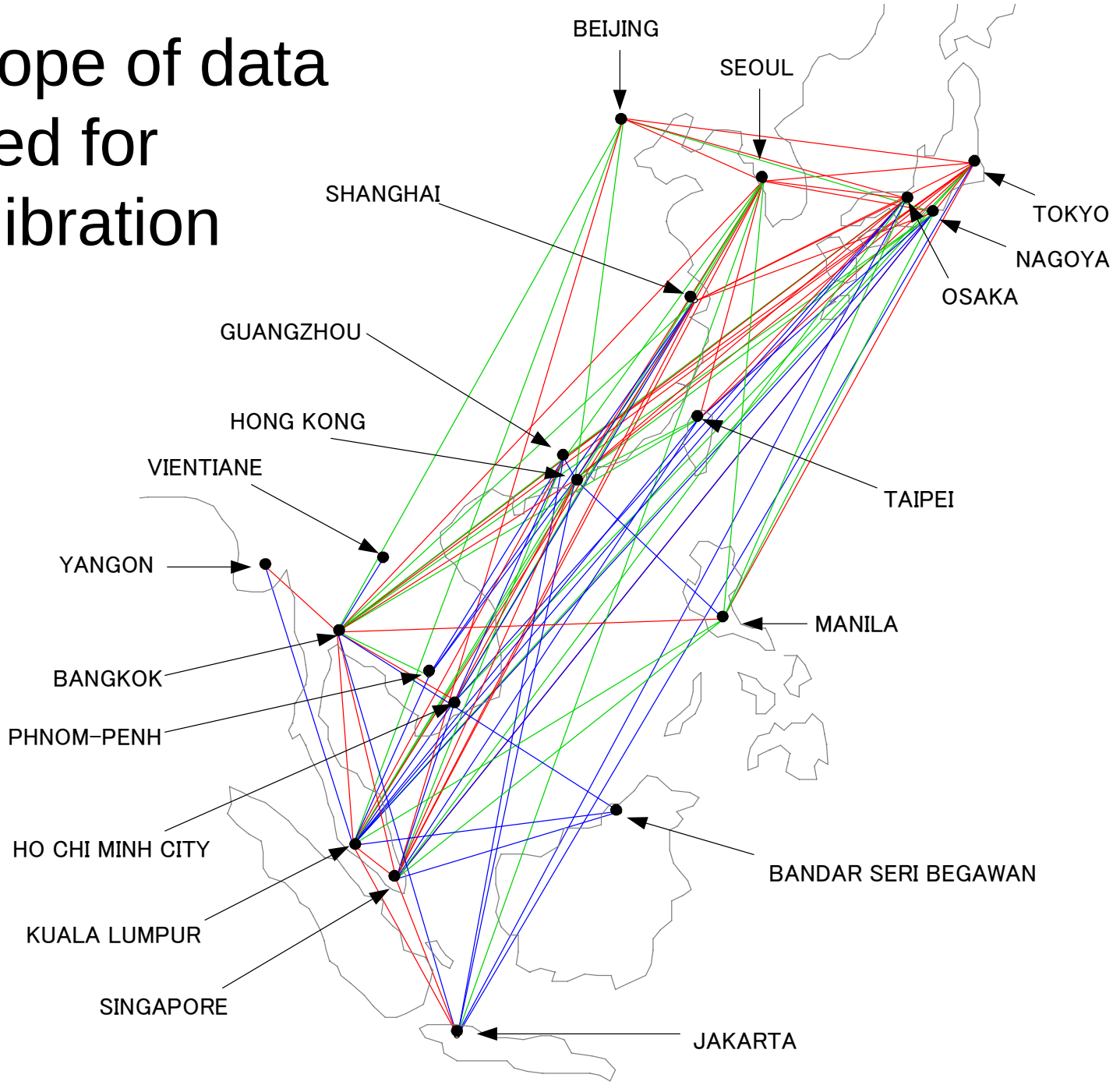
$\delta_a^m$ (delta) : dummy variable; “1” if air carrier of country *m* is operating on link *a,* “0” if not.

$d_a$ : distance of link *a*

$\eta_a^m$ (eta) : dummy variable; “1” if air carrier of country *m* is open to entry on link *a,* “0” if not.

$\sigma$ (sigma) : parameter for level of product differentiation (perfect substitution if “1” and complete differentiation if “0”)

# Scope of data used for calibration



| | Airline Data |
|---|---|
| Japan | JAL、ANA、etc |
| Korea | Korean Air、Asiana Airlines |
| China | Air China、China Eastern、China Southern、Shanghai Airlines, etc |
| Hong Kong | Cathay Pacific |
| Thailand | Thai Airways |
| Malaysia | Malaysian Airlines |
| Singapore | Singapore Airlines |

# *Thank you for your attention*