“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)

<table>
<thead>
<tr>
<th></th>
<th>NEA</th>
<th>US</th>
<th>EU25</th>
</tr>
</thead>
<tbody>
<tr>
<td>population</td>
<td>1,493</td>
<td>294</td>
<td>457</td>
</tr>
<tr>
<td>passengers</td>
<td>269</td>
<td>630</td>
<td>429</td>
</tr>
</tbody>
</table>
Intra-NEA Air Passenger Market

- China includes Hong Kong and Taiwan

In 2002:
- Total 225
  - S. Korea = China
  - Japan = China
  - Japan = S. Korea
  - China

In 2003:
- Total 269

In 2004:
- Total 269

- S. Korea = China
- Japan = China
- Japan = S. Korea
- China
- Japan
Current situation in North East Asia

Intense Rivalry
We would have a different picture if we can cooperate
So how could we cooperate to foster growth of true N.E. Asian Carriers?

- Consumer benefit
- Regional cooperation
- True Asian Carrier
- Dynamic competition
- Competitive edge against US and EU

- Vested rights
- National interest
- Low risks
- Autonomy
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
  \[ \text{National interest} = C\pi_S_i + n_i \cdot \text{airline’s } \pi + \text{airport revenue} \]
- 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

<table>
<thead>
<tr>
<th>Route</th>
<th>Japanese carriers</th>
<th>Korean carriers</th>
<th>Chinese carriers</th>
<th>Total for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tokyo</td>
<td>835</td>
<td>2,271</td>
<td></td>
<td>3,106</td>
</tr>
<tr>
<td>Seoul</td>
<td>769</td>
<td>462</td>
<td></td>
<td>1,231</td>
</tr>
<tr>
<td>Beijing</td>
<td>760</td>
<td>535</td>
<td></td>
<td>1,295</td>
</tr>
<tr>
<td>Total</td>
<td>J: 1,604</td>
<td>K: 3,031</td>
<td>C: 998</td>
<td></td>
</tr>
</tbody>
</table>

Distance:
- Tokyo to Seoul: 1,256 km
- Tokyo to Beijing: 2,134 km
- Seoul to Beijing: 902 km
Result of the simulation (2004)
(calibrated cost; capacity cap at Tokyo and Beijing) Unit: 1,000 pax

<table>
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<tr>
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<th>Korean carriers</th>
<th>Chinese carriers</th>
<th>Total for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tokyo → Seoul</td>
<td>707</td>
<td>2,143</td>
<td>485</td>
<td>3,136 (+7.4%)</td>
</tr>
<tr>
<td>Tokyo → Beijing</td>
<td>617</td>
<td>577</td>
<td>310</td>
<td>1,504 (+22.2%)</td>
</tr>
<tr>
<td>Seoul → Beijing</td>
<td>355</td>
<td>666</td>
<td>442</td>
<td>1,463 (+13.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>1,679 (+4.7%)</td>
<td>3,386 (+11.7%)</td>
<td>1,237 (+24.0%)</td>
<td></td>
</tr>
</tbody>
</table>
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.
3) Theoretical analysis taking foreign airline into account: Three-Country Case

- Three countries and three markets

![Diagram showing three countries and three markets with airlines A&B, A&C, and B&C serving different markets.](image)
Existence of a Foreign Airline

- Foreign airline has access to these markets:
Structure of the Network

• Two-mode-network representation:

Countries

Markets

A -- AB
B -- AC
C -- BC
F

New market access through tripartite liberalization
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: $\pi_{\text{airport}} = \text{rev.}$
- 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 $Q = Nq^*$
- 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 = $CS_i + n_i \cdot \text{airline's } \pi + \text{airport revenue}$
- $v_i^* = \max_{\mu_i} s_i \left[ \int_0^Q P(x)dx - PQ \right] + n_i \left[ Pq^* - (\mu+c)q^* \right] + \mu_i Q$
- $dv_i^*/dN = [1 - 2n_i/N] \pi$ (and $dv_j^*/dN = [1 - 2n_j/N] \pi$)
- 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

\[ \max_{\mu_i, \mu_j} \left[ \int_0^Q P(\xi) d\xi - PQ \right] + N \left[ Pq^* - (\mu + c)q^* \right] + \mu Q \]

- 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 \( \int_{Q_B}^{Q_M} [P(\xi) - c] d\xi \)

- 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

\[ \max \pi^m_a = \sum_a \left[ p_a y_a^m - C_a y_a^m \right] \]  \hspace{1cm} (1)

\[ \text{st.} \quad \sum_a \sum_m \delta_a^m y_a^m \leq F_h \]  \hspace{1cm} (2)

\[ y_a^m \geq 0 \]  \hspace{1cm} (3)

\[ y_a^m \left( 1 - \eta_a^m \right) = 0 \]  \hspace{1cm} (4)

where

\[ p_a^m = f \left( \sum_m y_a^m, d_a \right) = \alpha d_a + \beta \left( y_a^m + \sigma \sum_{k \neq m} y_a^k \right) + \gamma \]  \hspace{1cm} (5)

\[ C_a^m = cc_a^m + ca_a^m + \rho^h \]  \hspace{1cm} (6)
\( y^m_a \): number of passengers of air carrier of country \( m \) on link \( a \)

\( C^m_a \): calibrated cost of air carrier of country \( m \) on link \( a \)

\( cC^m_a \): cost based on unit cost of air carrier of country \( m \) on link \( a \)

\( ca^m_a \): cost adjustment coefficient of air carrier of country \( m \) on link \( a \)

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

\( P^m_a \): airfare of air carrier of country \( m \) on link \( a \)

\( F_h \): airport capacity

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

\( d_a \): distance of link \( a \)

\( \eta^m_{\text{etta}} \): dummy variable; “1” if air carrier of country \( m \) is open to entry on link \( a \), “0” if not.

\( \sigma \): parameter for level of product differentiation (perfect substitution if “1” and complete differentiation if “0”)
Scope of data used for calibration
<table>
<thead>
<tr>
<th>Country</th>
<th>Airline Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>JAL、ANA、etc</td>
</tr>
<tr>
<td>Korea</td>
<td>Korean Air、Asiana Airlines</td>
</tr>
<tr>
<td>China</td>
<td>Air China、China Eastern、China Southern、Shanghai Airlines, etc</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Cathay Pacific</td>
</tr>
<tr>
<td>Thailand</td>
<td>Thai Airways</td>
</tr>
<tr>
<td>Malaysia</td>
<td>Malaysian Airlines</td>
</tr>
<tr>
<td>Singapore</td>
<td>Singapore Airlines</td>
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</table>
Thank you for your attention