Measuring Transfer Passenger Shares at Hub Airports: An Application to Passengers departing from Japan

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Outline of Presentation

- Backgrounds
- Purposes of this Study
- Methodology for Estimation of Route Choice Probabilities and Market Shares
- Results and Future Research

1. Backgrounds

- Hub-and-spoke network configurations in international aviation are more and more developed in Asia

  >>Strategic network development by Korean air carriers, especially to Japanese and Chinese local airports

- In 2007, Japanese and Korean governments reached the open-skies agreements except at the most congested airports in Tokyo and Seoul
- Not a few passengers departing from Japan are estimated to transfer at a foreign hub to go to their final destination.

→ Competitive position of Japanse hub airports vis-à-vis other major hubs?

2. Purpose of this Study

- Estimating the route choice probabilities and the transfer passenger shares at major hub airports with regard to passengers departing from Japan by the NetCost Model

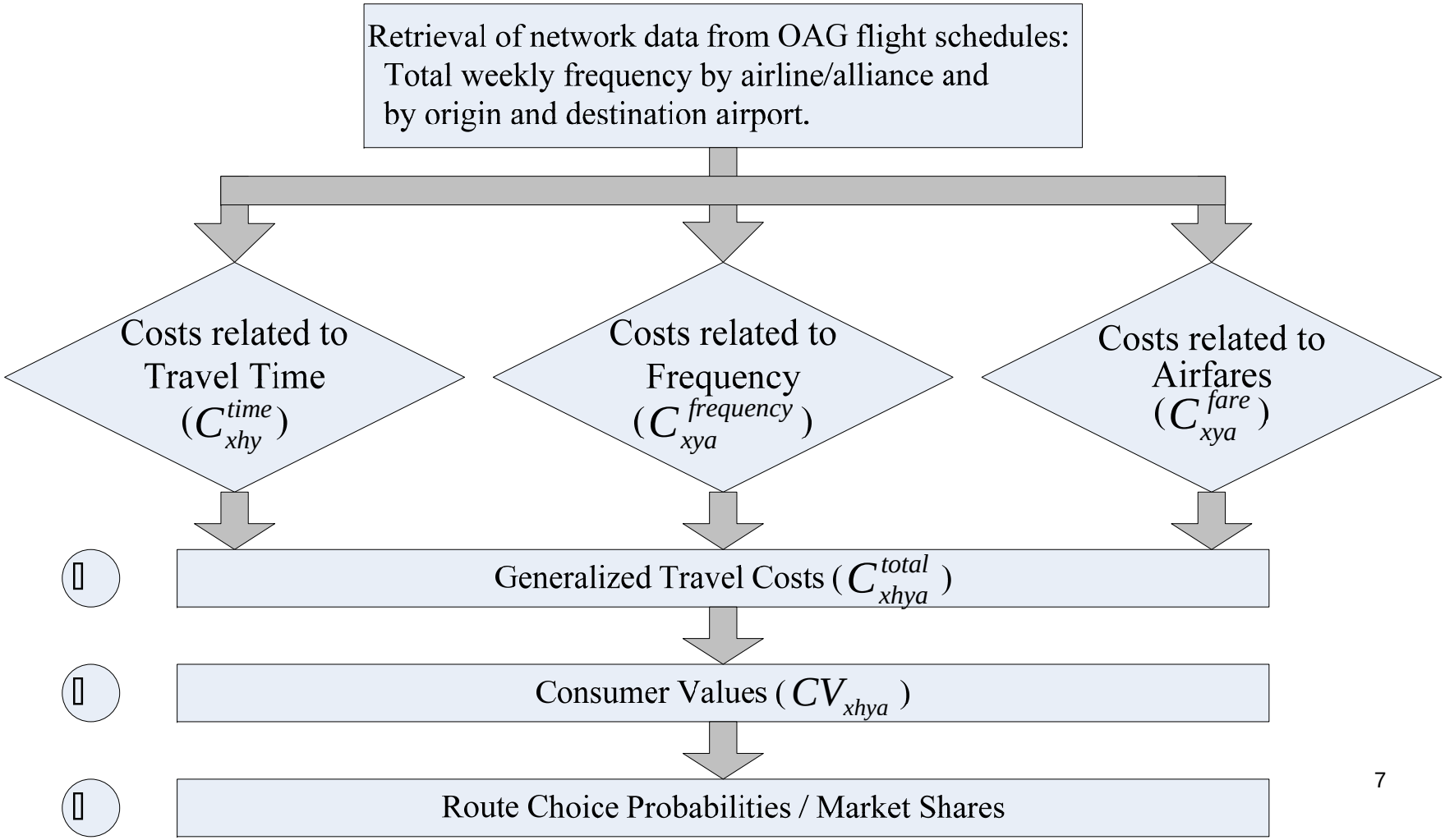
3. Methodology
3.1 NetCost Model

- Translating airline network data (origin, destination, published carrier and number of operations) into indicators expressing the attractiveness of specific routes for passengers.
- Determining the generalized travel costs, related to airfares, travel time and waiting time for each relevant connection, direct as well as indirect.
- Translating these costs into the relevant network indicators: consumer values and route choice probabilities.

3. Methodology
3.2 Previous Research by this Model

- This model was first presented by Heemskerk, L. and Veldhuis, J. (2006a, 2006b) with some application to Seoul-Incheon, and developed by Veldhuis, J. and Lieshout, R. (2009).

3. Methodology
3.3 Scheme of NetCost Model



3. Methodology
3.4 Generalized Travel Costs
3.4.1 Costs related to Travel Time

- Total elapsed travel time has three components: non-stop flight time, circuity time and connecting time.

$$t_{xhy}^{total\ travel\ time} = t_{xy}^{flight} + t_{xhy}^{circuity} + t_{h}^{connecting}$$

- Imposing penalty for circuity time and connecting time, according to the degree of inconvenience, to determine a perceived travel time.

$$t_{xhy}^{perceived\ travel\ time} = t_{xy}^{flight} + \alpha * \mu_{xy} * t_{xhy}^{circuity} + \beta * \mu_{xy} * t_{h}^{connecting}$$

Here, $\mu_{xy} = 3 - 0.075 * t_{xy}^{flight}$ $\alpha = 1, \beta = 1.25$

- Multiplying with Value of Travel Time (VoTT) to obtain the generalized travel costs related to travel time.

$$c_{xhy}^{time} = VoTT * t_{xhy}^{perceived\ travel\ time}$$

3. Methodology

3.4 Generalized Travel Costs

3.4.2 Costs related to Frequency

- Assuming the operational length of the day as 16 hours, the total operational length of the week equals 112 hours.
- The average schedule delay for a flight between airport x and airport y with airline (alliance) a is approximated as;

$$t_{xya}^{schedule\ \ delay} = \frac{0.5 * 112}{f_{xya}^{direct}} = \frac{56}{f_{xya}^{direct}}$$

- For indirect connections, the schedule delays of the two flight components may be added

$$t_{xhya}^{schedule\ \ delay} = \frac{56}{f_{xha}^{direct}} + \frac{56}{f_{hya}^{direct}}$$

- Frequency level is an inverse function of the schedule delay;

$$f_{xhya}^{indirect} = \frac{56}{t_{xhya}^{schedule\,delay}}$$

3. Methodology
3.4 Generalized Travel Costs
3.4.2 Costs related to Frequency (2)

- For the generalized travel costs related to frequency, direct as well as indirect frequencies have to be aggregated. For indirect connections, there may even be distinct routes via more hubs;

$$f_{xya}^{total} = f_{xya}^{direct} + \sum_{h} f_{xhya}^{indirect}$$

- Therefore, the average schedule delay of an airline (alliance) will be;

$$t_{xya}^{schedule\ \ delay} = \frac{56}{f_{xya}^{total}}$$

- To determine the generalized travel costs, the average schedule delay is multiplied by the Value of Waiting Time (VoWT).

$$c_{xya}^{frequency} = VoWT * t_{xya}^{schedule\ \ delay}$$

3. Methodology
3.4 Generalized Travel Costs
3.4.3 Costs related to Airfares

- First, the 'reference fare' is computed from the great circle distance (in hours) between the origin and the destination.
- Next, other systematic factors lead to possible adjustments of the reference fare.
- In the model, the expected airfares depend also on the;
  1) Route types: direct or indirect (adjustment factor:π_r)
  2) Carrier types: network or point-to-point carrier (adjustment factor:π_o)
  3) Airlines or alliances (adjustment factor:π_a)
  4) Passenger travel purposes: business or leisure (adjustment factor:π_p)
  5) Competition levels (adjustment factor:π_c)

3. Methodology
3.4 Generalized Travel Costs
3.4.3 Costs related to Airfares (2)

- Finally, the expected airfares are expressed with all adjustment factors;

$$c_{xya}^{fare} = reference\ \ fare * \pi_r * \pi_o * \pi_a * \pi_p * \pi_c$$

- In summary, total generalized travel costs can now be determined by adding up these three components;

$$c_{xhya}^{total} = c_{xhy}^{time} + c_{xya}^{frequency} + c_{xya}^{fare}$$

3. Methodology
3.5 Consumer Values and Route Choice Probabilities

- Utility is a function of generalized travel costs;

$$U_{xhya} = e^{\rho * c_{xhya}^{total}}$$

- Total consumer values in the market between x and y;

$$CV_{xhya} = f_{xhya} * U_{xhya}$$

- Probabilities the connection (via intermediate hub h) with airline (alliance) a is chosen in the market between x and y;

$$p_{xhya} = \frac{CV_{xhya}}{\sum_{h}\sum_{a} CV_{xhya}} = \frac{CV_{xhya}}{CV_{xy}}$$

4. Result

4.1 Assumptions on Parameters

	Leisure Passengers	Business Passengers	No Distinction
(1) Costs related to travel time Value of travel time per hour (VoTT)	€ 20	€ 50	€ 35
(2) Costs related to frequency Value of waiting time per hour (VoWT)	€ 8	€ 20	€ 14
(3) Costs related to airfares Reference fare	€80 + €40 * flight time		
1) Route types (π_r)	5% higher than reference fare on direct routes (π_r=1.05) 5% lower than reference fare on indirect routes (π_r=0.95)		
2) Carrier types (π_o)	Airfares of point-to-point carriers are 30% lower than those of network carriers		
3) Airlines or alliances (π_a)	An additional adjustment factor for particular airlines or alliances, if necessary		
4) Passenger travel purposes (π_p)	25 % below reference fare (π_p=0.75)	25 % above reference fare (π_p=1.25)	
5) Competition levels (π_c)	25 % lower in case of maximum competition (π_c=0.75)	10 % lower in case of maximum competition (π_c=0.90)	
	25 % higher in case of monopoly (π_c=1.25)	10 % higher in case of monopoly (π_c=1.10)	

4. Result
4.2 Data used and Classification of Study Area

- The airline network data are retrieved from OAG in the third week of September, 2009.
- In this study, only online connections are considered as viable connections.
- The study area consists of eight market segments between Japan and the world; Japan - Asia & Oceania, Japan - Europe, Japan - North America, Japan - Latin America, Japan - Middle East, Japan - Africa, Japan - Japan and Japan - World.

4. Result (before the main results) (1)

The Number of Flight and Destination on European Route at KIX

2001		2002		2003		2004		2005	
AMS	KL (7)	AMS	KL (7)	AMS	KL (7)	AMS	KL (7)	AMS	KL (7)
CDG	AF (7), **JL (4)**	CDG	AF (7), **JL (4)**	CDG	AF (7), **JL (4)**	CDG	AF (7), **JL (4)**	CDG	AF (7)
FRA	LH (7), **JL (3)**	FRA	LH (7)	FCO	AZ (3)	FCO	AZ (1)	FRA	LH (7)
LHR	**JL (7)**	LHR	**JL (7)**	FRA	LH (7)	FRA	LH (7)	HEL	AY (5)
MXP	AZ (3)	MXP	AZ (5)	HEL	AY (3)	HEL	AY (5)	LHR	**JL (7)**
SVO	SU (1)	SVO	SU (1)	LED	SU (1)	LHR	**JL (7)**	MXP	AZ (5)
VIE	OS (6)	VIE	OS (7)	LHR	**JL (7)**	MXP	AZ (2)	VIE	OS (6)
ZRH	SR (7)			SVO	SU (1)	VIE	OS (7)		
				VIE	OS (7)				
52 flights/week		45 flights/week		47 flights/week		47 flights/week		44 flights/week	

2006		2007		2008		2009	
AMS	KL (7)	AMS	KL (7)	AMS	KL (7)	AMS	KL (7)
CDG	AF (7)	CDG	AF (7)	CDG	AF (7)	CDG	AF (7)
FRA	LH (7)	FRA	LH (7)	FCO	AZ (4)	FCO	AZ (4)
HEL	AY (6)	HEL	AY (7)	FRA	LH (7)	FRA	LH (7)
LHR	**JL (7)**	LHR	**JL (7)**	HEL	AY (7)	HEL	AY (7)
MXP	AZ (4)	MXP	AZ (5)	LHR	**JL (7)**		
38 flights/week		40 flights/week		39 flights/week		32 flights/week	

4. Result (before the main results) (2)

The Number of Flight and Destination on North American Route at KIX

2001		2002		2003		2004		2005	
DFW	AA (7)	DTW	NW (7)	DTW	NW (7)	DTW	NW (7)	BOS	UA (7)
DTW	NW (7)	LAX	**JL (7)**, TG (3)	LAX	**JL (7)**, TG (3)	LAX	**JL (7)**, TG (4)	DTW	NW (7)
LAX	**JL (7)**, NW (7)	ORD	UA (7)	ORD	UA (7)		UA (7)	LAX	**JL (7)**, TG (4)
	TG (3)	SFO	UA (7)	SFO	UA (7)	LGA	UA (7)		UA (7)
LGA	AA (7), NW (7)	YVR	AC (7)	YVR	AC (7)	ORD	UA (7)	ORD	UA (7)
MEM	NW (7)					SFO	UA (7)	SFO	UA (7)
MSY	NW (7)					YVR	AC (14)	YVR	AC (14)
ORD	**JL (4)**, UA (7)								
SEA	NW (7)								
SFO	UA (7)								
YVR	AC (7)								
YYZ	AC (4)								
95 flights/week		38 flights/week		38 flights/week		60 flights/week		60 flights/week	

2006		2007		2008		2009	
BOS	UA (7)	DTW	NW (7)	DTW	NW (7)	LAX	BR (3)
DFW	AA (7)	LAX	UA (7)	LAX	BR (3), UA (7)	ORD	UA (7)
DTW	NW (7)	SFO	UA (7)	SFO	UA (7)	SFO	UA (7)
LAX	**JL (7)**, UA (7)	YVR	AC (7)	YVR	AC (7)		
ORD	UA (7)						
SFO	UA (7)						
YVR	AC (14)						
63 flights/week		28 flights/week		31 flights/week		17 flights/week	

4. Result (before the main results) (3)
Route Choice Probabilities from KIX to Paris/London

①KIX-Paris

Rank	Hub	Destination	Airline	Alliance	Leisure	Business
1	ICN	CDG	KE	SkyTeam	4.55%	3.98%
			OZ	Star Alliance	1.42%	1.24%
			Code-share with JL and KE		1.92%	1.69%
		Sub-total			7.89%	6.91%
2	PVG	CDG	FM	Star Alliance	1.45%	1.27%
			MU	Non-alliance	1.03%	0.90%
			Code-share with JL and MU		1.71%	1.50%
			Code-share with AF and MU		1.03%	0.90%
		Sub-total			5.22%	4.57%
3	AMS	CDG	KL	SkyTeam	4.52%	3.96%
4	FRA	CDG	LH	Star Alliance	3.97%	3.47%
5	NRT	CDG	JL	Oneworld	1.36%	1.19%
			Code-share with JL and AF		1.73%	1.52%
		Sub-total			3.10%	2.71%
6	HEL	CDG	AY	Oneworld	2.60%	2.27%
7	PEK	CDG	CA	Star Alliance	2.53%	2.21%
8	FCO	CDG	AZ	SkyTeam	0.85%	0.74%
9	HKG	CDG	CX	Oneworld	0.48%	0.42%
10	IST	CDG	TK	Star Alliance	0.38%	0.33%
11	CAN	CDG	CZ	SkyTeam	0.21%	0.18%
			Code-share with JL and CZ		0.10%	0.09%
		Sub-total			0.30%	0.27%
12	TPE	CDG	BR	Non-alliance	0.19%	0.17%
13	CAI	CDG	MS	Star Alliance	0.05%	0.05%
14	DEL	CDG	AI	Non-alliance	0.04%	0.04%
Direct		CDG	AF	SkyTeam	67.88%	71.87%
Total					100%	100%

②KIX-London

Rank	Hub	Destination	Airline	Alliance	Leisure	Business
1	ICN	LHR	KE	SkyTeam	9.46%	8.94%
			OZ	Star Alliance	6.04%	5.71%
			Code-share with JL and KE		6.96%	6.58%
		Sub-total			22.46%	21.23%
2	AMS	LHR	KL	SkyTeam	14.30%	13.52%
3	CDG	LHR	AF	SkyTeam	10.72%	10.13%
		LCY	AF	SkyTeam	2.15%	4.35%
		Sub-total			12.87%	14.48%
4	FRA	LHR	LH	Star Alliance	9.95%	9.41%
		LCY	LH	Star Alliance	2.72%	5.51%
		Sub-total			12.68%	14.92%
5	HEL	LHR	AY	Oneworld	10.88%	10.28%
6	NRT	LHR	JL	Oneworld	8.70%	8.22%
7	PEK	LHR	CA	Star Alliance	6.31%	5.96%
8	PVG	LHR	MU	Non-alliance	2.26%	2.13%
			Code-share with JL and MU		2.26%	2.13%
		Sub-total			4.52%	4.27%
9	HKG	LHR	CX	Oneworld	3.59%	3.40%
10	FCO	LHR	AZ	SkyTeam	1.73%	1.63%
11	TPE	LHR	BR	Non-alliance	1.09%	1.03%
12	IST	LHR	TK	Star Alliance	0.86%	0.81%
		STN	TK	Star Alliance	0.03%	0.25%
		Sub-total			0.89%	1.06%
Total					100%	100%

4. Result (before the main results) (4)

Route Choice Probabilities from KIX to Los Angeles/New York

①KIX-Los Angeles

Rank	Hub	Destination	Airline	Alliance	Leisure	Business
1	ICN	LAX	OZ	Star Alliance	5.36%	4.76%
			KE	SkyTeam	5.33%	4.74%
			Code-share with JL and KE		4.04%	3.59%
		Sub-total			14.73%	13.09%
2	SFO	LAX	UA	Star Alliance	11.57%	10.28%
3	NRT	LAX	JL	Oneworld	5.97%	5.31%
4	PVG	LAX	FM	Star Alliance	1.93%	1.71%
			MU	Non-alliance	0.90%	0.80%
			Code-share with JL and MU		0.90%	0.80%
		Sub-total			3.73%	3.31%
5	PEK	LAX	CA	Star Alliance	1.34%	1.19%
6	TPE	LAX	BR	Non-alliance	0.44%	0.40%
			CI	Non-alliance	0.29%	0.26%
		Sub-total			0.74%	0.66%
Direct		LAX	BR	Non-alliance	61.93%	66.17%
Total					100%	100%

②KIX-New York

Rank	Hub	Destination	Airline	Alliance	Leisure	Business
1	ICN	JFK	OZ	Star Alliance	25.07%	21.21%
			KE	SkyTeam	19.66%	16.63%
			Code-share with JL and KE		16.13%	13.65%
		Sub-total			60.85%	51.49%
2	NRT	JFK	JL	Oneworld	20.11%	17.02%
3	PVG	JFK	MU	Non-alliance	3.08%	2.61%
		LGA	FM	Star Alliance	0.18%	1.73%
		JFK	Code-share with JL and MU		3.08%	2.61%
		Sub-total			6.34%	6.94%
4	PEK	JFK	CA	Star Alliance	6.20%	5.25%
5	SFO	JFK	TK	Star Alliance	3.81%	3.23%
		EWR	TK	Star Alliance	0.18%	1.27%
		Sub-total			3.99%	4.50%
6	ORD	EWR	AF	Star Alliance	1.01%	7.18%
		LGA	AF	Star Alliance	0.70%	6.72%
		小　計			1.72%	13.91%
7	TPE	JFK	CI	Non-alliance	0.75%	0.63%
		EWR	BR	Non-alliance	0.04%	0.27%
		Sub-total			0.79%	0.90%
Total					100%	100%

4. Result
4.3 Market Shares of Direct and Indirect

Market Segment	Direct Connections		Indirect Connections	
	Leisure Passengers	Business Passengers	Leisure Passengers	Business Passengers
(1) Japan - Asia&Oceania	97.00%	96.62%	3.00%	3.38%
(2) Japan - Europe	48.90%	50.47%	51.10%	49.53%
(3) Japan - North America	67.12%	66.05%	32.88%	33.95%
(4) Japan - Latin America	32.25%	40.77%	67.75%	59.23%
(5) Japan - Middle East	56.03%	58.43%	43.97%	41.57%
(6) Japan - Africa	42.73%	42.01%	57.27%	57.99%
(7) Japan - Japan	99.46%	99.32%	0.54%	0.68%
(8) Japan - World	99.34%	99.17%	0.66%	0.83%

4. Result

4.4 Market Shares on Indirect Connections (1)

(1) Japan - Asia&Oceania

Airport	Leisure	Business
ICN	**38.87%**	**37.24%**
PVG	12.63%	13.00%
KIX	**10.64%**	**9.56%**
PUS	7.34%	6.05%
FUK	5.93%	5.95%
NGO	**3.93%**	**3.77%**
PEK	3.63%	5.31%
TPE	3.28%	3.59%
CAN	2.54%	2.60%
HND	2.33%	2.64%
NRT	**2.03%**	**2.27%**
MNL	1.49%	2.23%
HKG	0.90%	0.96%
DLC	0.84%	0.79%
HIJ	0.81%	0.73%
SHA	0.71%	0.75%
BKK	0.43%	0.59%
GMP	0.31%	0.25%
SDJ	0.29%	0.25%
Others	1.09%	1.50%
Total	100%	100%

(2) Japan - Europe

Airport	Leisure	Business
FRA	13.49%	14.51%
CDG	12.73%	13.20%
ICN	**10.59%**	**10.25%**
HEL	10.05%	10.34%
AMS	6.65%	6.95%
LHR	5.96%	5.26%
PEK	4.83%	4.33%
MUC	4.79%	4.85%
SVO	4.72%	3.88%
CPH	4.28%	4.11%
NRT	**4.24%**	**4.41%**
VIE	3.81%	3.96%
FCO	3.50%	3.66%
ZRH	2.95%	2.74%
PVG	2.83%	2.57%
IST	1.78%	1.70%
NGO	**0.81%**	**1.02%**
KIX	**0.46%**	**0.82%**
Others	1.55%	1.44%
Total	100%	100%

(3) Japan - North America

Airport	Leisure	Business
ORD	14.74%	13.95%
SFO	9.69%	12.52%
NRT	**9.56%**	**8.75%**
ICN	**7.39%**	**6.19%**
LAX	7.10%	8.12%
DTW	6.98%	7.89%
TPE	5.72%	3.19%
MSP	5.19%	5.09%
DFW	4.65%	4.72%
DEN	4.21%	3.90%
ATL	3.73%	4.15%
SLC	3.35%	3.32%
YVR	3.24%	4.06%
IAD	3.20%	3.24%
YYZ	2.08%	2.12%
IAH	2.03%	2.11%
CVG	1.92%	1.76%
EWR	1.90%	1.88%
JFK	1.21%	1.13%
PVG	0.89%	0.62%
PEK	0.55%	0.44%
KIX	**0.44%**	**0.71%**
Others	0.22%	0.17%
Total	100%	100%

(4) Japan - Latin America

Airport	Leisure	Business
DFW	26.04%	23.78%
LAX	22.73%	13.34%
IAH	19.10%	24.06%
ATL	7.55%	9.61%
MEX	5.95%	10.82%
ORD	3.86%	2.99%
SFO	2.85%	2.19%
SLC	2.77%	2.03%
YYZ	1.92%	2.78%
EWR	1.66%	2.40%
DEN	1.35%	0.85%
DTW	1.25%	1.19%
NRT	**0.83%**	**1.70%**
JFK	0.77%	1.07%
Others	1.36%	1.20%
Total	100%	100%

4. Result

4.4 Market Shares on Indirect Connections (2)

(5) Japan - Middle East

Airport	Leisure	Business
ICN	**37.25%**	**35.16%**
HKG	10.52%	7.99%
PEK	9.36%	8.34%
DOH	8.86%	8.33%
DXB	8.50%	8.91%
BKK	6.34%	4.25%
CAN	3.51%	2.12%
DEL	2.87%	2.09%
IST	2.17%	8.23%
BOM	1.71%	1.38%
ISB	1.36%	1.38%
MNL	1.19%	0.93%
CAI	1.06%	1.60%
LHE	0.86%	0.88%
KHI	0.82%	0.83%
PVG	0.78%	1.61%
SVO	0.62%	1.07%
NRT	**0.42%**	**1.19%**
KIX	**0.36%**	**1.22%**
Others	1.44%	2.50%
Total	100%	100%

(6) Japan - Africa

Airport	Leisure	Business
CDG	16.40%	15.61%
ICN	**16.23%**	**15.35%**
FCO	12.72%	10.32%
FRA	7.80%	7.39%
IST	7.44%	6.38%
PEK	7.32%	6.62%
DOH	5.93%	4.67%
CAI	5.65%	11.33%
DXB	5.48%	4.56%
NRT	**3.40%**	**4.29%**
KIX	**2.73%**	**5.56%**
LHR	1.78%	1.35%
MXP	1.61%	1.27%
BKK	1.29%	0.99%
AMS	1.16%	0.98%
VIE	1.13%	0.99%
HKG	0.56%	0.81%
Others	1.36%	1.53%
Total	100%	100%

(7) Japan - Japan

Airport	Leisure	Business
HND	45.44%	46.73%
ITM	20.78%	20.15%
NGO	**9.26%**	**9.34%**
FUK	7.01%	7.03%
KIX	**4.91%**	**4.22%**
OKA	3.50%	4.20%
CTS	3.08%	3.23%
SDJ	2.21%	1.82%
KOJ	1.42%	1.30%
KMQ	0.87%	0.65%
KIJ	0.80%	0.68%
NRT	**0.48%**	**0.43%**
HIJ	0.23%	0.22%
Total	100%	100%

(8) Japan - World

Airport	Leisure	Business
HND	35.97%	37.04%
ITM	16.22%	15.73%
ICN	**8.50%**	**8.10%**
NGO	**8.09%**	**8.11%**
FUK	6.80%	6.82%
KIX	**6.16%**	**5.37%**
PVG	2.76%	2.83%
OKA	2.75%	3.30%
CTS	2.43%	2.57%
SDJ	1.78%	1.47%
PUS	1.62%	1.33%
KOJ	1.11%	1.01%
NRT	**0.82%**	**0.84%**
PEK	0.79%	1.16%
TPE	0.72%	0.78%
KMQ	0.68%	0.51%
KIJ	0.63%	0.53%
Others	2.17%	2.51%
Total	100%	100%

4. Result

4.5 Market Shares excluding Direct Connections without Indirect Alternatives (1)

(1) Japan - Asia&Oceania

Airport	Leisure	Business
ICN	**1.54%**	**1.68%**
PVG	0.50%	0.59%
KIX	**0.42%**	**0.43%**
PUS	0.29%	0.27%
FUK	0.23%	0.27%
NGO	**0.16%**	**0.17%**
PEK	0.14%	0.24%
TPE	0.13%	0.16%
CAN	0.10%	0.12%
HND	0.09%	0.12%
NRT	**0.08%**	**0.10%**
MNL	0.06%	0.10%
HKG	0.04%	0.04%
DLC	0.03%	0.04%
HIJ	0.03%	0.03%
SHA	0.03%	0.03%
BKK	0.02%	0.03%
GMP	0.01%	0.01%
SDJ	0.01%	0.01%
Others	0.04%	0.07%
Direct	96.05%	95.48%
Total	100%	100%

(2) Japan - Europe

Airport	Leisure	Business
FRA	6.89%	7.18%
CDG	6.50%	6.54%
ICN	**5.41%**	**5.08%**
HEL	5.14%	5.12%
AMS	3.40%	3.44%
LHR	3.04%	2.61%
PEK	2.47%	2.14%
MUC	2.45%	2.40%
SVO	2.41%	1.92%
CPH	2.19%	2.04%
NRT	**2.17%**	**2.18%**
VIE	1.95%	1.96%
FCO	1.79%	1.81%
ZRH	1.51%	1.36%
PVG	1.44%	1.27%
IST	0.91%	0.84%
NGO	0.41%	0.51%
KIX	**0.24%**	**0.41%**
Others	0.79%	0.71%
Direct	48.90%	50.47%
Total	100%	100%

(3) Japan - North America

Airport	Leisure	Business
ORD	4.96%	5.01%
SFO	3.26%	4.50%
NRT	**3.22%**	**3.14%**
ICN	**2.48%**	**2.22%**
LAX	2.39%	2.91%
DTW	2.35%	2.83%
TPE	1.92%	1.14%
MSP	1.74%	1.83%
DFW	1.56%	1.69%
DEN	1.42%	1.40%
ATL	1.26%	1.49%
SLC	1.13%	1.19%
YVR	1.09%	1.46%
IAD	1.08%	1.16%
YYZ	0.70%	0.76%
IAH	0.68%	0.76%
CVG	0.65%	0.63%
EWR	0.64%	0.67%
JFK	0.41%	0.41%
PVG	0.30%	0.22%
PEK	0.19%	0.16%
KIX	**0.15%**	**0.25%**
Others	0.07%	0.06%
Direct	66.37%	64.10%
Total	100%	100%

(4) Japan - Latin America

Airport	Leisure	Business
DFW	18.62%	17.81%
LAX	16.26%	9.99%
IAH	13.66%	18.02%
ATL	5.40%	7.20%
MEX	4.26%	8.10%
ORD	2.76%	2.24%
SFO	2.04%	1.64%
SLC	1.98%	1.52%
YYZ	1.37%	2.08%
EWR	1.19%	1.80%
DEN	0.97%	0.64%
DTW	0.89%	0.89%
NRT	**0.59%**	**1.28%**
JFK	0.55%	0.80%
Others	0.97%	0.90%
Direct	28.49%	25.11%
Total	100%	100%

4. Result

4.5 Market Shares excluding Direct Connections without Indirect Alternatives (2)

(5) Japan - Middle East

Airport	Leisure	Business
ICN	**16.50%**	**15.39%**
HKG	4.66%	3.50%
PEK	4.14%	3.65%
DOH	3.93%	3.65%
DXB	3.77%	3.90%
BKK	2.81%	1.86%
CAN	1.56%	0.93%
DEL	1.27%	0.91%
IST	0.96%	3.60%
BOM	0.76%	0.60%
ISB	0.60%	0.60%
MNL	0.53%	0.41%
CAI	0.47%	0.70%
LHE	0.38%	0.39%
KHI	0.36%	0.36%
PVG	0.34%	0.70%
SVO	0.27%	0.47%
NRT	**0.19%**	**0.52%**
KIX	**0.16%**	**0.53%**
Others	0.64%	1.10%
Direct	55.71%	56.24%
Total	100%	100%

(6) Japan - Africa

Airport	Leisure	Business
CDG	9.39%	9.05%
ICN	**9.29%**	**8.90%**
FCO	7.28%	5.99%
FRA	4.47%	4.28%
IST	4.26%	3.70%
PEK	4.19%	3.84%
DOH	3.39%	2.71%
CAI	3.24%	6.57%
DXB	3.14%	2.65%
NRT	**1.95%**	**2.49%**
KIX	**1.56%**	**3.22%**
LHR	1.02%	0.78%
MXP	0.92%	0.74%
BKK	0.74%	0.57%
AMS	0.67%	0.57%
VIE	0.65%	0.58%
HKG	0.32%	0.47%
Others	0.78%	0.89%
Direct	42.73%	42.01%
Total	100%	100%

(7) Japan - Japan

Airport	Leisure	Business
HND	1.25%	1.57%
ITM	0.57%	0.68%
NGO	**0.25%**	**0.31%**
FUK	0.19%	0.24%
KIX	**0.13%**	**0.14%**
OKA	0.10%	0.14%
CTS	0.08%	0.11%
SDJ	0.06%	0.06%
KOJ	0.04%	0.04%
KMQ	0.02%	0.02%
KIJ	0.02%	0.02%
NRT	**0.01%**	**0.01%**
HIJ	0.01%	0.01%
Direct	97.26%	96.65%
Total	100%	100%

(8) Japan - World

Airport	Leisure	Business
HND	1.06%	1.32%
ITM	0.48%	0.56%
ICN	**0.25%**	**0.29%**
NGO	**0.24%**	**0.29%**
FUK	0.20%	0.24%
KIX	**0.18%**	**0.19%**
PVG	0.08%	0.10%
OKA	0.08%	0.12%
CTS	0.07%	0.09%
SDJ	0.05%	0.05%
PUS	0.05%	0.05%
KOJ	0.03%	0.04%
NRT	**0.02%**	**0.03%**
PEK	0.02%	0.04%
TPE	0.02%	0.03%
KMQ	0.02%	0.02%
KIJ	0.02%	0.02%
Others	0.06%	0.09%
Direct	97.06%	96.44%
Total	100%	100%

4. Result
4.6 Summary (1)

- The route choice probabilities were the highest for direct connections with regard to passengers departing from Japan.
- Tokyo-Haneda, the largest domestic hub, was also the largest in the market shares, even after taking into account all indirect connections between Japan and the world, followed by other main domestic hubs, such as Osaka-Itami, Nagoya-Chubu, Fukuoka and Osaka-Kansai.

4. Result
4.6 Summary (2)

- Seoul-Incheon was a dominant hub in all markets except between Japan and Latin America (and between Japan and Japan), because of the strategic and well-developed hub-and spoke networks by Korean air carriers to Japan.
- The NetCost model will be useful for airports or airlines in the assessment of their network performance and their particular market shares, as well as for benchmarking their competitive position vis-à-vis other airports or airlines.

Thank you for your kind attention!