Challenges and Opportunities of Hong Kong's Aviation Industry

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September 20, 2016
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Outline

I. Hong Kong's aviation industry

II. O-D traffic vs. connecting traffic under capacity constraints

- Implications for "hub competition" and airport charges

III. PRD airport competition

IV. Connectivity with mainland China

V. Conclusion

Importance of the industry

1. Total value added by HK's aviation sector

- 8%

2. Employment in HK's aviation sector

- 7%

3. Hong Kong: A global hub

One of the world's busiest airports

		Total passengers (2015)
1.	Dubai International Airport	77,453,466
2.	London Heathrow Airport	69,816,491
3.	**Hong Kong International Airport**	**68,139,897**
4.	Paris-Charles de Gaulle Airport	60,369,798
5.	Amsterdam Airport Schiphol	58,245,545
6.	Singapore **Changi** Airport	54,835,000
7.	Frankfurt Airport	53,994,154
8.	**Incheon** International Airport	48,720,319
9.	Suvarnabhumi Airport	43,251,807
10.	Atatürk International Airport	42,302,859

… in air cargo

International cargo				Domestic and international cargo			
Rank (2015)	Rank (2014)	Airport	Throughput (tonnes)	Rank (2015)	Rank (2014)	Airport	Throughput (tonnes)
1	1	**Hong Kong, HK (HKG)**	4,380,139	1	1	**Hong Kong, HK (HKG)**	4,460,065
2	3	**Dubai, AE (DXB)**	2,505,507	2	2	Memphis, US (MEM)	4,290,638
3	2	Incheon, KR (ICN)	2,489,539	3	3	**Shanghai, CN (PVG)**	3,273,732
4	4	**Shanghai, CN (PVG)**	2,379,322	4	5	Anchorage AK, US (ANC)	2,630,701
5	6	Tokyo Narita, JP (NRT)	2,035,968	5	4	Incheon, KR (ICN)	2,595,677
6	5	Taipei, TW (TPE)	2,005,277	6	6	Dubai, AE (DXB)	2,505,507
7	10	Anchorage AK, US (ANC)	1,956,776	7	7	Louisville, US (SDF)	2,350,656
8	7	Frankfurt, DE (FRA)	1,950,726	8	8	Tokyo Narita, JP (NRT)	2,122,314
9	8	Paris, FR (CDG)	1,861,311	9	11	Paris, FR (CDG)	2,090,795
10	9	Singapore, SG (SIN)	1,853,100	10	9	Frankfurt, DE (FRA)	2,076,734
11	11	Miami FL, US (MIA)	1,737,618	11	10	**Taipei, TW (TPE)**	2,021,865
12	12	Amsterdam, NL (AMS)	1,620,970	12	12	Miami FL, US (MIA)	2,005,174
13	13	London, GB (LHR)	1,494,886	13	15	Los Angeles CA, US (LAX)	1,938,624
14	17	Doha, QA (DOH)	1,443,532	14	14	Beijing, CN (PEK)	1,889,829
15	14	Bangkok, TH (BKK)	1,189,105	15	13	Singapore, SG (SIN)	1,887,000
16	18	Chicago IL, US (ORD)	1,176,906	16	16	Amsterdam, NL (AMS)	1,655,354
17	15	Los Angeles CA, US (LAX)	1,141,981	17	19	Chicago, US (ORD)	1,592,826
18	16	New York NY, US (JFK)	993,312	18	17	London, GB (LHR)	1,591,637
19	19	Lelpzig, DE (LEJ)	915,308	19	18	**Guangzhou, CN (CAN)**	1,537,759
20	21	Dubai, AE (DWC)	890,883	20	24	Doha, QA (DOH)	1,454,952

Source: Airport Council International

Hub: Location, Location, Location!

- **Centrality:** Centrality metrics of a node: “degree”, “closeness”, “betweenness”
- **Large “catchment” area**

Three traffic sources of a hub

1. **Local market**
   - within the city where the hub airport is located
2. **Gateway**
   - nearby cities
3. **Connecting** (transfer / transit)
   - a much larger region, via “air to air” connection
   - called “transshipment” for cargo

- **Large “catchment” area:**

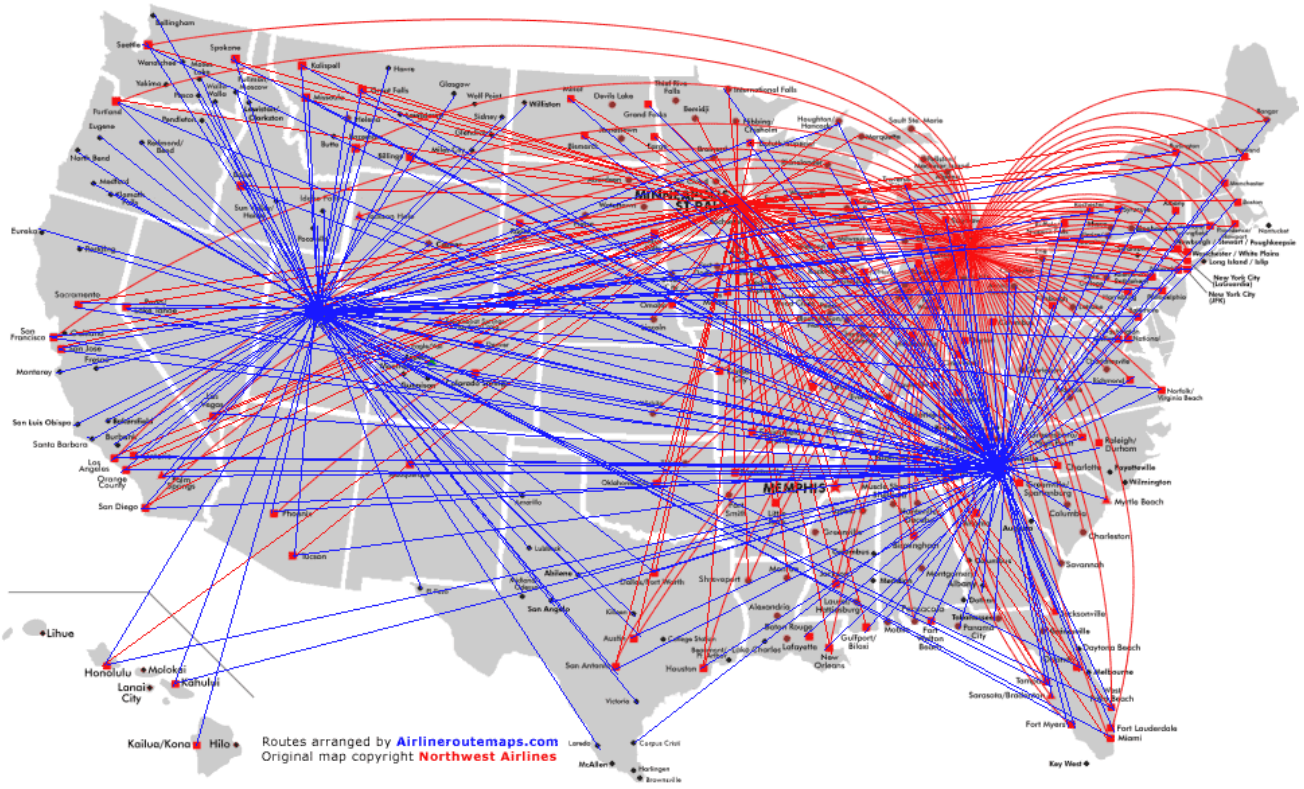
  Local market + Gateway = “O-D” Traffic

- **Centrality: Connecting**

  Connecting = Hub?

  - This is related to term “hub and spoke” network, or “hubbing”

Hub-spoke network: Delta, Northwest, 2010



Source: Airlineroutemaps.com

Table 1A. Top-10 connecting-passengers airports in the US

Airport Code	Airport Name	Percentage
CVG	Cincinnati / Northern Kentucky Int'l Airport	0.73
CLT	Charlotte Douglas Int'l Airport	0.72
MEM	Memphis Int'l Airport	0.66
ATL	Hartsfield–Jackson Atlanta Int'l Airport	0.64
DFW	Dallas/Fort Worth Int'l Airport	0.56
IAH	George Bush Intercontinental Airport	0.54
MSP	Minneapolis–Saint Paul Int'l Airport	0.52
SLC	Salt Lake City Int'l Airport	0.51
ORD	Chicago O'Hare Int'l Airport	0.50
DTW	Detroit Metro Airport	0.50
Source: U.S. DOT, Databank 1B, 2008		

Table 1B. Share of connecting passengers at non-US "hubs"

Airport Code	Airport Name	Percentage (Year)	Sources
FRA	Frankfurt	0.54 (2007)	Civil Aviation Authority, Nov. 2008
CDG	Paris Charles de Gaulle	0.52 (2011)	Global Business With Reuters, March 29, 2012
DXB	Dubai Int'l	approximately 0.52 (current)	Dubai airport, official report
AMS	Amsterdam Schiphol	0.42 (2013)	Schiphol group Annual report 2013
MUC	Munich, Franz Josef Strauss Int'l	0.39 (2012, 2013)	Munich airport, Annual Traffic Report 2013
LHR	London Heathrow	0.37 (2012, 2013)	CAA 2013 Air Passenger Survey
SIN	Singapore Changi Int'l	0.30 (2013)	Changi airport, official Website
HKG	Hong Kong Int'l	0.26 (2013)	ICF report 2013
CPH	Copenhagen Kastrup	0.21 (2014)	Airport Region Mediation Competence Center
ICN	Incheon Int'l	0.19 (2013)	http://www.flightglobal.com/
NRT	Narita Int'l	0.19 (2013)	Narita Int'l airport, official Website

Hubbing improves “connectivity”

Connectivity improvements

1) reduce travel costs for consumers and businesses

2) stimulate foreign direct investment, R&D, labour productivity, trade and tourism

Specifically,

- 10% growth in connectivity = 0.5% growth in GDP per capita (InterVISTAS, 2014)

- 10% growth in intercontinental destinations = 4% growth in headquarters (Bel and Fageda, 2008)

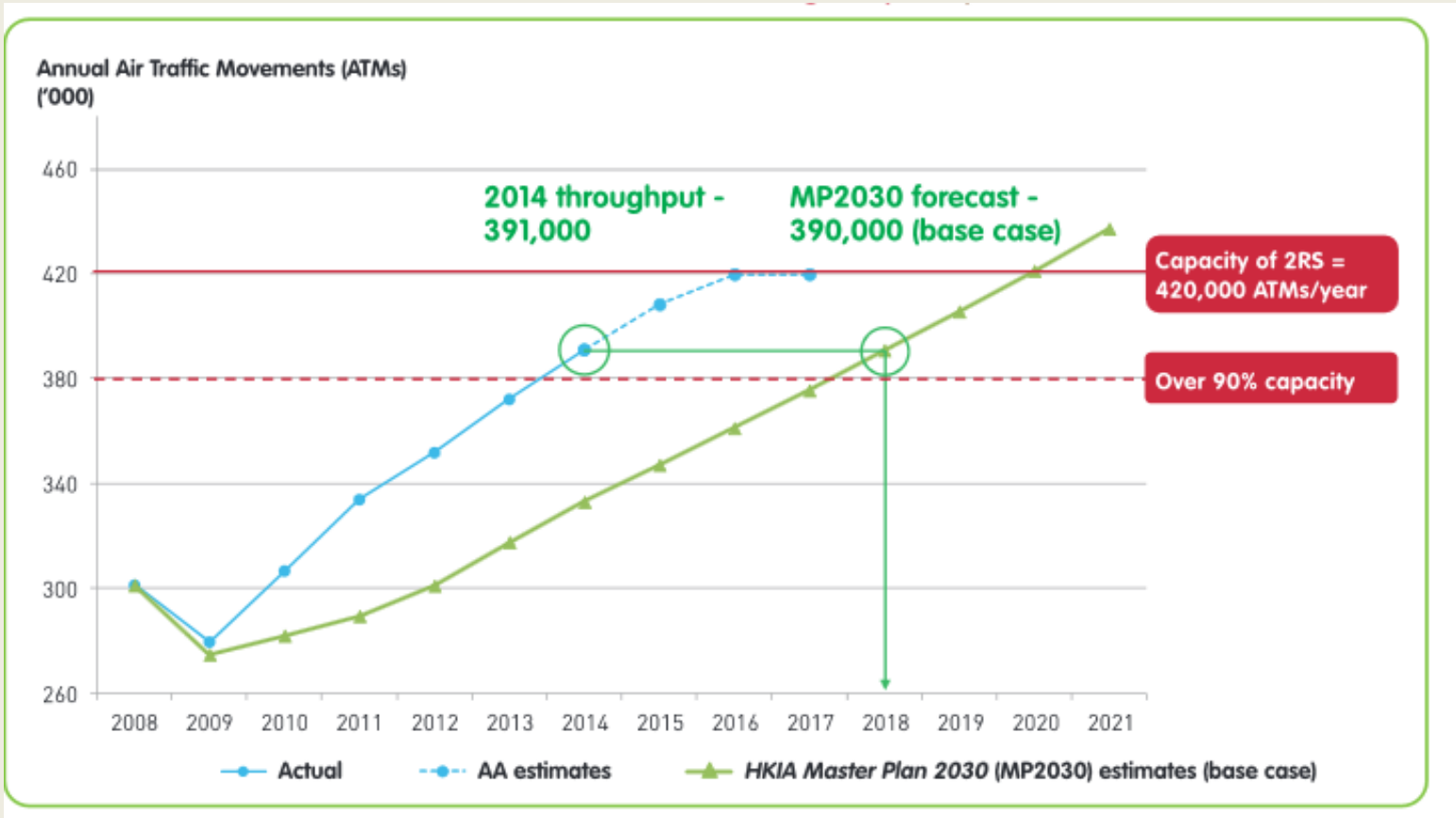
- “Eigenvector centrality” of airports almost perfectly correlates with “global cities” (Cheung et al., 2016)

Developing connecting traffic (hubbing) is important!

What if the airport is capacity constrained?

- Which traffic type should the airport focus on: O-D traffic, or connecting traffic?

Capacity constraint at HKIA



O-D traffic vs. connecting traffic

- **O-D traffic** is more profitable for airport:

  - O-D traffic uses more airport services than connecting traffic

- **Connecting flights** contribute to runway (and air space) congestion twice vs. O-D traffic:

  - one landing, plus one take-off

- Yet, connecting passengers have been charged less (see next pages)

Airport charges in practice

Passenger-based charges, interesting facts:

While US major airports charge a uniform PFC (Passenger facility charge) per passenger (Zhang 2012, Ch.13, Table 13.4),

A number of hub airports in Canada (Toronto, Vancouver), Europe and Asia impose discriminatory charges on local and connecting passengers,

and connecting passengers are charged less.

Table 2A. Per-passenger charges in Europe

London Heathrow (Majority private)		
Departing passengers	**Final Proposed 2012/13 £ GBP**	**Proposed 2013/14 £ GBP**
Europe - Destination	**24.55**	**28.30**
Other - Destination	**34.49**	**39.75**
Europe – Transfer/Transit	**18.41**	**21.23**
Other - Transfer	**25.87**	**29.82**

Source: Consultation Document Prepared by Heathrow Airport Limited, Chapter 7 – Proposed Airport Charges Tariffs for 2013/14. Date: October 26, 2012

Table 2A. Per-passenger charges in Europe

Copenhagen Kastrup (Majority private), effective from October 1, 2009 to March 31, 2015		
	Passenger Service Charge (PSC)	Passenger Security Service Charge (PSSC)
Domestic departing passengers	DKK 28.81	DKK 32.43
Transfer to domestic airport	DKK 23.81	DKK 21.41
International departing passengers	DKK 103.75	DKK 32.43
Transfer to international airport	DKK 41.65	DKK 21.41
Source: CHARGES REGULATIONS applying to Copenhagen, Approved by SLV		

Table 2B. Per-passenger charges in Asia

Narita International Airport (Authority/Public corporation), effective from December 10, 2014, Japanese Yen		
Passengers/Terminals	**Passenger Service Charge (PSC)**	**Passenger Security Service Charge (PSSC)**
Departing passengers at Terminals 1 and 2	**2,090 (Adult)** **1,050 (Child)**	**520**
Departing transfer and transit passengers at Terminals 1 and 2	**1,050 (Adult)** **520 (Child)**	**520**
Departing passengers at Terminal 3	**1,020 (Adult)** **510 (Child)**	**520**
Departing transfer and transit passengers at Terminal 3	**510 (Adult)** **250 (Child)**	**520**

Table 2B. Per-passenger charges in Asia

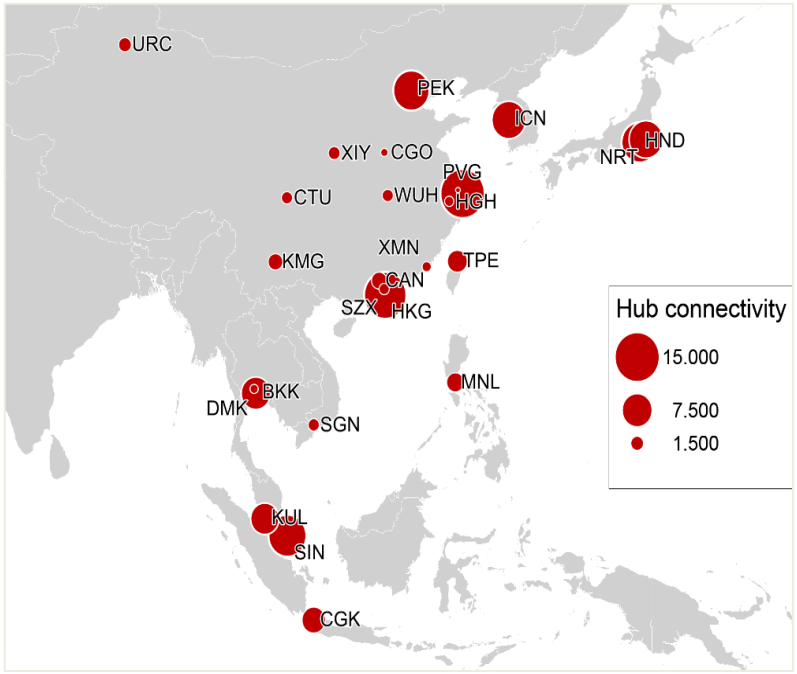
Incheon International Airport (Public corporation), Current		
Int'l departing passengers	KRW 28,000	
Int'l transfer passengers	KRW 10,000	
Hong Kong International Airport (Authority)		
	Air Passenger Departure Tax (APDT), current	Passenger security charge, from June 1, 2014
Departing passengers	HK$120.00	HK$45.00
Departing transit passengers	*Exemption*	HK$45.00
Source: Official Website of Narita, Incheon and Hong Kong Int'l airports		

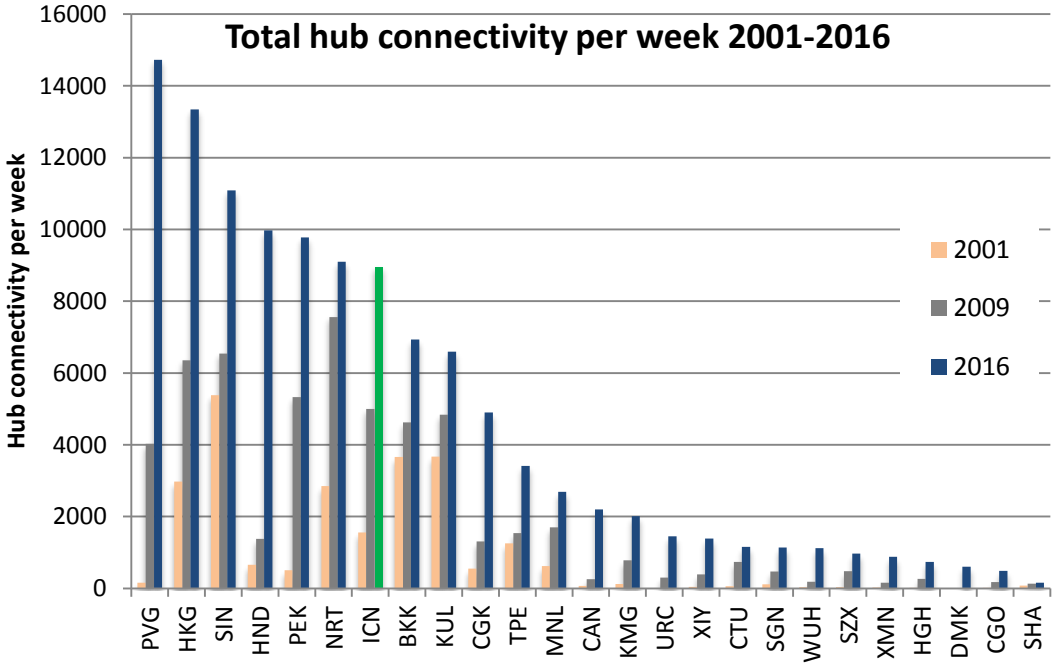
Table 2B. Per-passenger charges in Asia

Changi International Airport (Government corporation), effective from April 1, 2013		
Passengers/Terminals	**Passenger Service Charge (PSC)**	**Passenger Security Service Charge (PSSC)**
Departing passengers at Terminals 1, 2, and 3	**S$19.90**	**S$8.00**
Departing transfer and transit passengers	**S$9.00**	**S$3.00**
Source: List of Fees and Charges Applicable at Changi Airport (updated as at October, 14 2014) by Changi Airport Group		

- That connecting passengers have been charged less is due to **strong hub competition** for connecting traffic

25 largest East-Asian hubs in 2016 (left figure)
Competition in “connecting market” intensified: 2001-2016





Source: SEO NetScan connectivity model

Note: hub connectivity denotes the number of connections with a transfer at each hub, weighted for the quality of those connections

Implications for “hub competition”

- **Hong Kong is a (connecting) hub mainly for mainland China and SE Asia**
- As such, HK competes with: Seoul Incheon, Singapore, Guangzhou, Shanghai, Shenzhen
- As these airports are undertaking major capacity expansions, it will be a major challenge for HK to maintain its current share of connecting traffic prior to the 3rd runway

Capacity at these competing airports

Airport	Expansion Plan (year of completion)	Passenger Traffic Capacity (year)	Cargo Traffic Capacity (year)	Remarks
Seoul Incheon	Will construct a fourth (2020) and fifth runway, and a second terminal (2017)	62 million (2020)	5.8 million tonnes (2020)	
Singapore Changi	Will convert a military runway into a third runway (2020); and will construct a fourth (2017) and fifth terminal (2025)	135 million (2025)		
Guangzhou Baiyun	Will construct a fourth (2020) and fifth runway, and a second terminal (2018)	80 million (2020)	2.5 million tonnes (2020)	Third runway commissioned in February 2015
Shanghai Pudong	Will construct a fifth runway (2017)	80 million (2020)	4.7 million tonnes (2020)	Fourth runway commissioned in March 2015
Shenzhen Bao'an	Will construct a third runway (2018) and a fourth terminal (2025)	45 million (2020)	2.4 million tonnes (2020)	

Things can be done for connecting traffic

- Maintain connectivity:
  - Direct connectivity (No. of routes) and frequency
  - Indirect connectivity and quality of connections
- Connecting time at the airport: MCT (“minimum connecting time”)
- “Productivity” of airport dwell time:
  - For passengers
  - For airport (maximize terminal concession revenues)
- Airport capacity:
  - runway, ATC, terminals
  - “shopping” areas

O-D traffic vs. connecting traffic (cont.)

- **With capacity constraints,**

  - tough choice between serving O-D and serving connecting traffic needs to be made

  - Hub = Local market + Gateway + Connecting

- Beijing, Shanghai, Narita, and Incheon have seen decline in connecting-traffic share last few years, due in part to capacity shortage

Implications for airport charges

- With capacity constraints (prior to the 3rd runway),

  - increase per-passenger charges for connecting (the recent "Airport construction fee" imposes almost same amount between local and connecting passengers)

  - If charges are raised to reduce airport congestion, the added toll revenue should be "earmarked" for capacity expansion to relief congestion

- Once the new capacity is in place, airport charges should be reduced to encourage its usage (incl. connectivity / hubbing)

PRD airport competition

- **PRD airport competition is critical to Hong Kong**

- HK + PRD form the O-D traffic for Hong Kong

- Becky Loo (2008), "Passengers' airport choice within multi-airport regions (MARs): some insights from a stated-preference survey at HKIA," Journal of Transport Geography, 2008.

Five major airports in PRD

Landsat-7 Satellite Image provided by Geocarto

Source: HKAA (2011)

	Passenger throughput								
Airport	2011	2015	2016	Growth 2015	Pure growth 2015	Shift 2015	**Growth 2016**	**Pure growth 2016**	**Shift 2016**
HKG	4,140,751	5,292,582	5,867,000	28%	40%	-12%	**42%**	**48%**	**-6%**
MFM	329,399	502,644	542,051	53%	40%	13%	**65%**	**48%**	**17%**
SZX	2,000,445	3,135,580	3,330,000	57%	40%	17%	**66%**	**48%**	**19%**
CAN	3,116,280	4,287,026	4,227,806	38%	40%	-2%	**36%**	**48%**	**-12%**
ZUH	114,615	324,750	383,205	183%	40%	144%	**234%**	**48%**	**186%**
Total	9,701,490	13,542,582	14,350,062						

Note: The 2016 data for Zhuhai is estimated. The 1st half year (Jan-June) passenger throughput is 2725000, about 18% growth of 1st half year traffic in 2015. So the June 2016 data is approximated by assuming a 18% growth over June 2015

Things can be done for O-D passengers

Local market + Gateway

- Airport (ground) accessibility: bus, metro, taxi, car
- Connectivity and its quality
- Cross-border: Hong Kong / Pearl River Delta

Case study on HK air cargo

A tale of two industries in Hong Kong

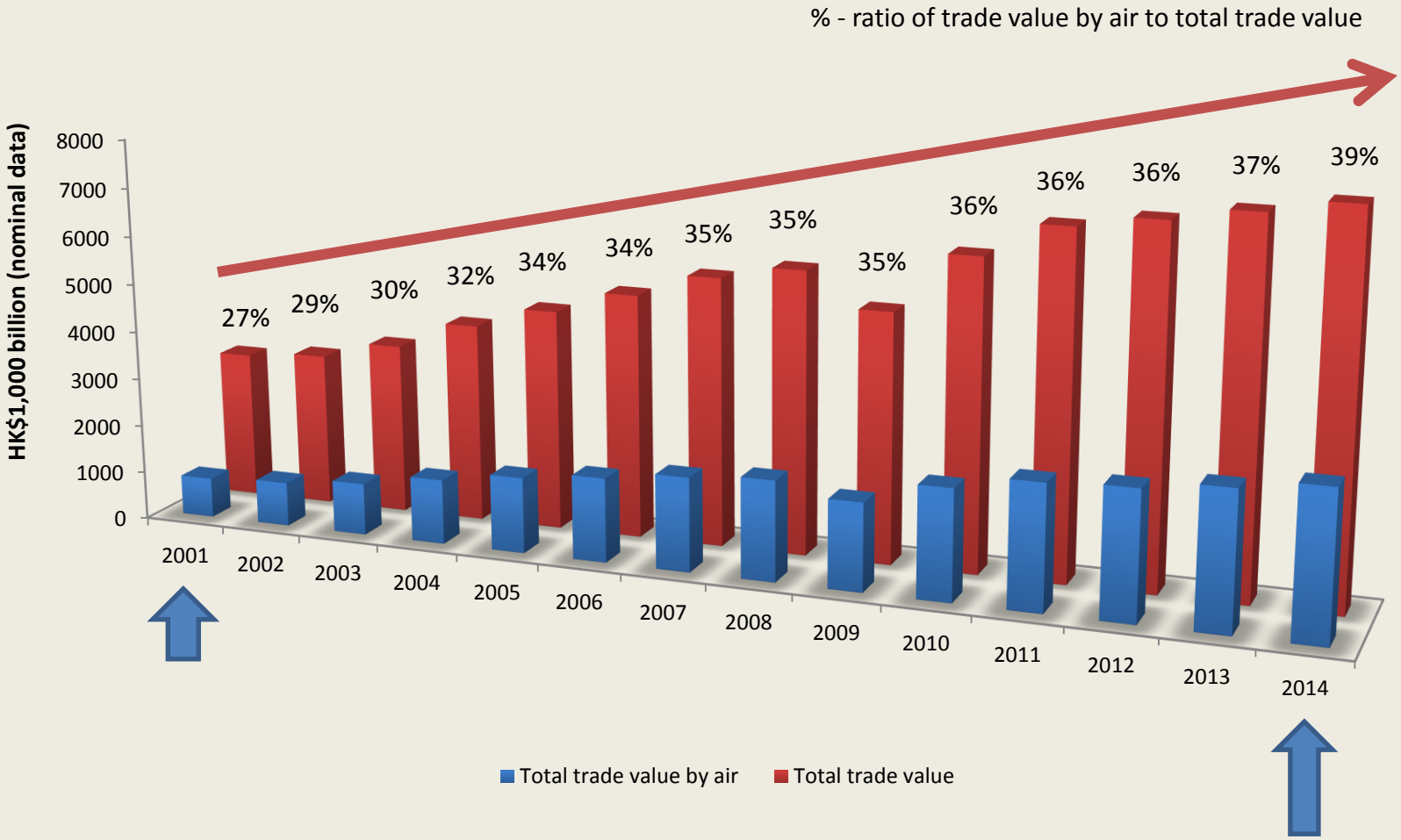
1994

- HK container volume: No. 1 in the world
- HK air cargo: No. 7

2015

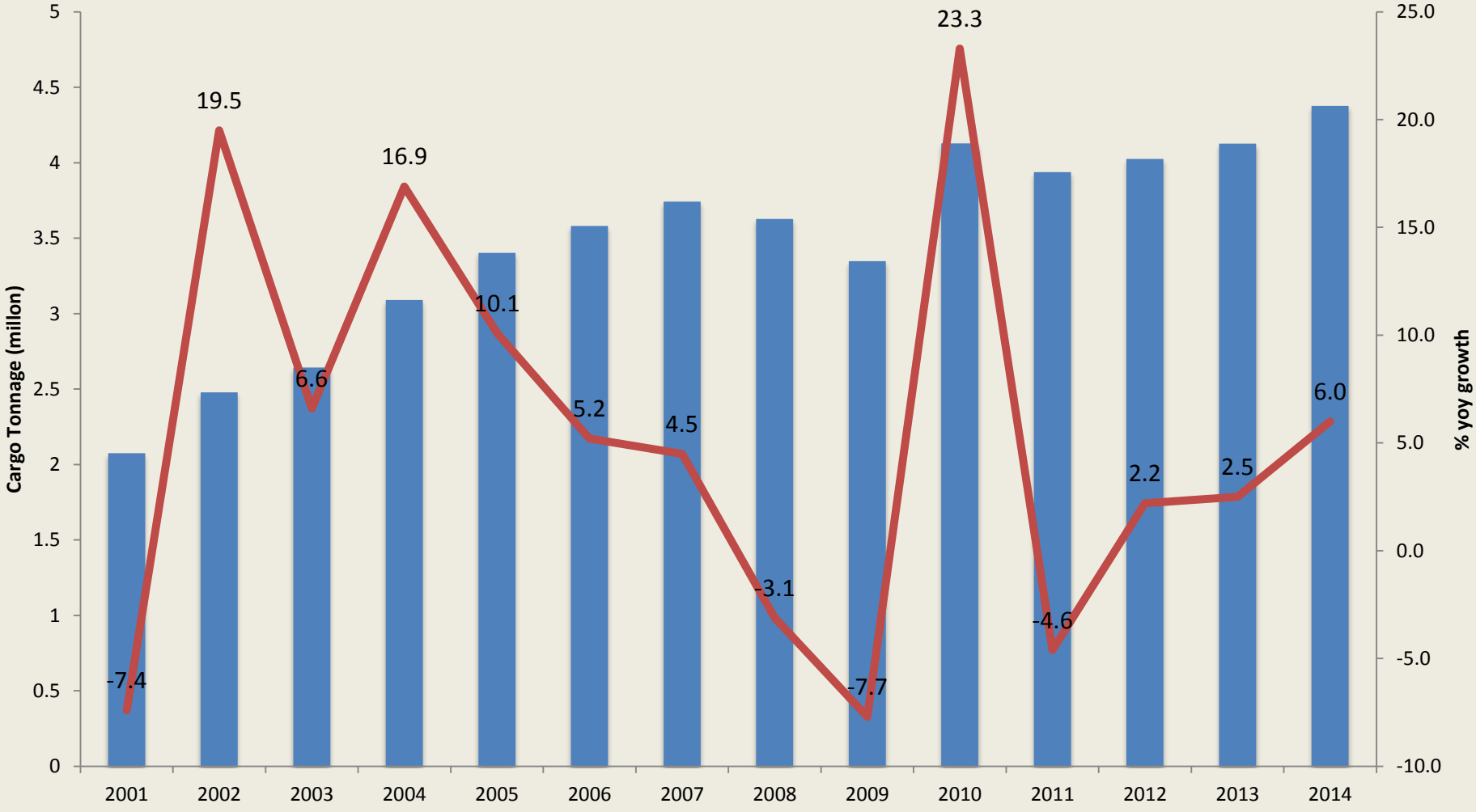
- HK container volume: No. 5
- HK air cargo: No. 1

Trade value of Hong Kong



Source: Census and Statistics Department, Hong Kong

Cargo tonnage of HKIA, 2001–2014



Source: Airport Authority Hong Kong

Hong Kong as air cargo hub (Zhang, 2003)

1. Local market

2. Gateway:

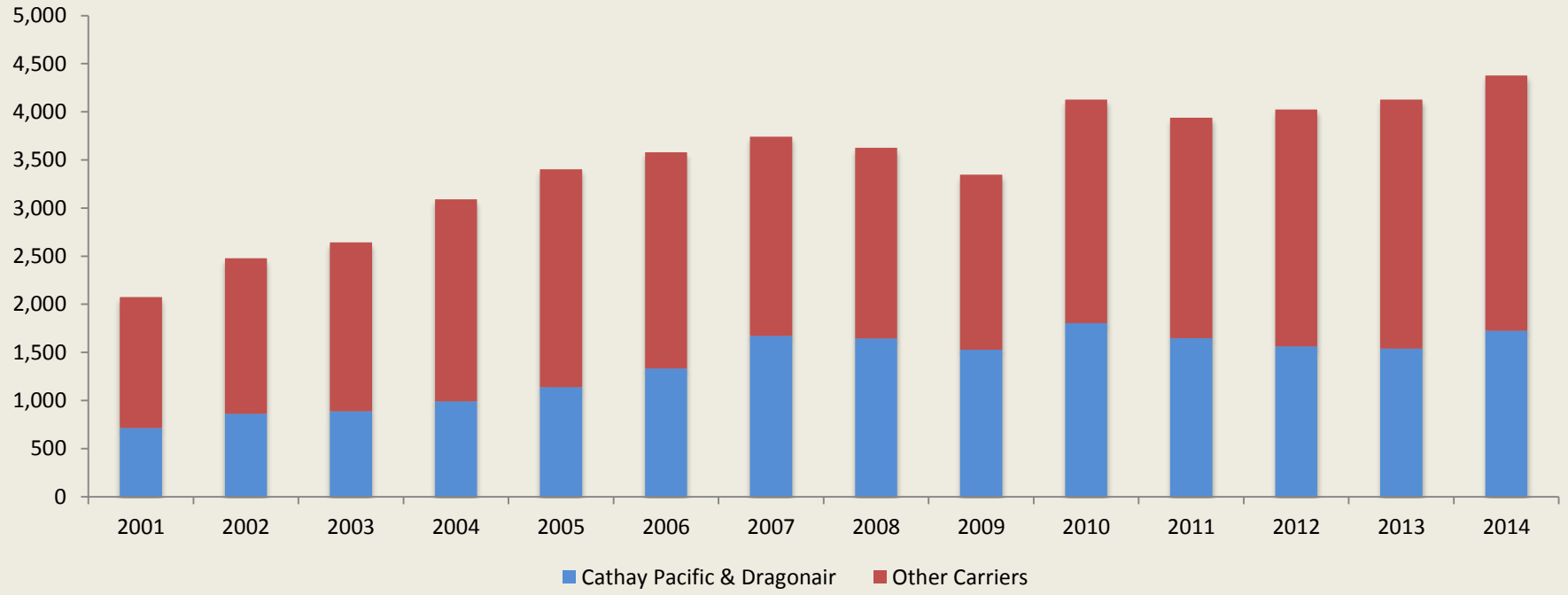
Pearl river delta (PRD)

Processing trade (re-exports)

3. Hub:

Transshipment: “air to air” traffic

Cargo tonnage of CX/KA, 2001–2014 ('000)



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
% share of cargo tonnage of CX/ KA in HKIA	34.4%	34.8%	33.6%	32.0%	33.5%	37.3%	44.7%	45.4%	45.6%	43.7%	41.9%	38.8%	37.3%	39.4%

Source: Cathay Pacific and Airport Authority Hong Kong

Air cargo demand elasticities

- For air cargo demand elasticities: Only a few papers (Hard to get data!)
- These papers estimated a demand function

1) Potential "endogeneity problem":

Price -> Quantity (Demand function)

Quantity -> Cost -> Price (Supply function)

2) No studies on Hong Kong air cargo demand

3) No studies on pre- vs. post-2008 comparison

→ Winnie Lo, Yulai Wan and Anming Zhang (2015), "Empirical estimation of price and income elasticities of air cargo demand: The case of Hong Kong," Transportation Research, Part A: Policy and Practice.

Demand function

Regression results with monthly and yearly dummies

N=150; DV=ln*Q*	OLS		2SLS		3SLS	
Lag ln*Q*		0.4735** (0.0747)		0.4212** (0.0819)		0.6295** (0.0671)
ln*P*	**-0.4320** (0.0774)**	**-0.3534** (0.0727)**	**-0.7392** (0.1392)**	**-0.6141** (0.1415)**	**-0.5626** (0.1246)**	**-0.2854** (0.1126)**
ln*GDP*	**0.7314** (0.0818)**	**0.4369** (0.0859)**	**0.8891** (0.1041)**	**0.5759** (0.1102)**	**0.7712** (0.0966)**	**0.3143** (0.0921)**
ln*Internet*	0.0818** (0.0075)	0.0467** (0.0094)	0.0913** (0.0087)	0.0613** (0.0119)	0.0882** (0.0072)	0.0336** (0.0083)
D2001Q23	-0.0936** (0.0278)	-0.0486** (0.0264)	-0.0752** (0.0302)	-0.0318 (0.0287)	-0.0654** (0.0216)	-0.0246 (0.0212)
D2009	-0.1192** (0.0165)	-0.0517** (0.0181)	-0.1202** (0.0174)	-0.0610** (0.0194)	-0.1195** (0.0164)	-0.0283* (0.0171)
Constant	8.7024** (0.9365)	5.5561** (1.0432)	10.7643** (1.2460)	7.8301** (1.5104)	9.8761** (1.0824)	4.2773** (1.0854)
F	174.11	202.47	155.70	184.26		
Chi^2					2768.12	3534.49
R-squared	0.9544	0.9633	0.9490	0.9597	0.9532	0.9619
Durbin-Watson d-statistics	1.1516	2.1541	1.3213	2.0712	1.2113	2.4303

The brackets show standard errors. * Significant at $\alpha = 0.1$; ** Significant at $\alpha = 0.05$.
Coefficient estimation for monthly dummy variables which are used to capture seasonality is omitted due to space limit.

Supply function

Regression results with monthly and yearly dummies

N=150; DV = ln*Q*	OLS		2SLS		3SLS	
Lag ln*Q*		0.3220**		0.3262**		0.6082**
		(0.0812)		(0.0852)		(0.0607)
ln*P*	-0.2759**	-0.2612**	-0.4001	-0.5351	-0.9819**	-0.4751*
	(0.0832)	(0.0804)	(0.3858)	(0.3904)	(0.2659)	(0.2519)
ln*P_fuel*	0.2671**	0.2022**	0.2592**	0.1813**	0.1003**	0.0322
	(0.0360)	(0.0386)	(0.0437)	(0.0498)	(0.0290)	(0.0286)
ln*Wage*	1.2824**	0.9038**	1.2268**	0.7970*	0.5495*	0.1867
	(0.7299)	(0.4159)	(0.4652)	(0.4601)	(0.2982)	(0.2081)
Constant	10.8652**	8.2127**	12.7676**	12.2652**	23.4271**	10.4591**
	(2.4767)	(2.4253)	(6.2849)	(6.1855)	(4.2245)	(3.7789)
F	136.81	140.79	134.00	128.17		
Chi^2					4180.72	4216.56
R-squared	0.9666	0.9692	0.9660	0.9662	0.9422	0.9612
Durbin-Watson d-statistics	1.5782	2.1014	1.5962	2.1033	1.5889	2.3922

The brackets show standard errors. * Significant at $\alpha = 0.1$; ** Significant at $\alpha = 0.05$.
Coefficient estimation for monthly and yearly dummy variables which are used to capture seasonality and fixed effect are omitted due to space limit.

Price and income elasticities: pre- vs. post-2008

Models		Price elasticity		Income elasticity	
Method	Inclusion of Lag ln*Q*	Pre-2008	Post-2008	Pre-2008	Post-2008
OLS	N	-0.3545**	-0.6990**	0.7478**	2.9493**
OLS	Y	-0.3075**	-0.6056**	0.4281**	2.4702**
2SLS	N	-0.7671**	-1.0969**	1.0083**	3.5126**
2SLS	Y	-0.8118**	-1.3715**	0.7304**	4.5423**
3SLS	N	**-0.5738****	**-0.9443****	**0.8202****	**2.3146****
3SLS	Y	**-0.3600****	**-1.4786****	**0.2909****	**4.9822****

* Significant at α = 0.1; ** Significant at α = 0.05.

Empirical results of Lo et al. (2015)

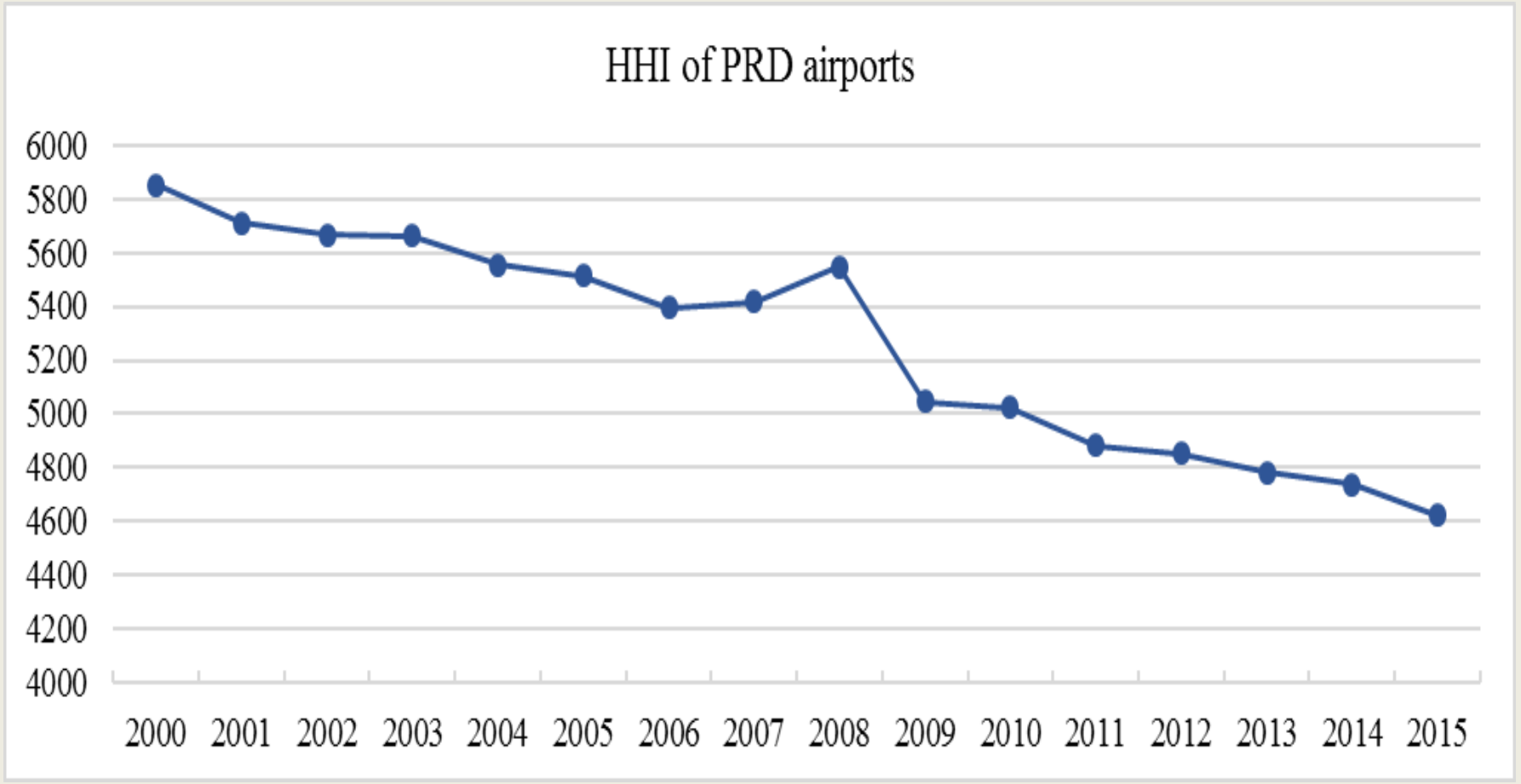
1. HK air cargo demand is not very price sensitive: HKIA ships high-end cargo relative to competitors

2. A pro-cyclical pattern of HK air cargo traffic

3. **Increased sensitivity** to both price and GDP post-2008

→ Challenges in managing more volatile cargo business post-2008 for airlines and airport, as well as the shift of industries away from PRD

De-concentration: PRD airports (2000-2015)



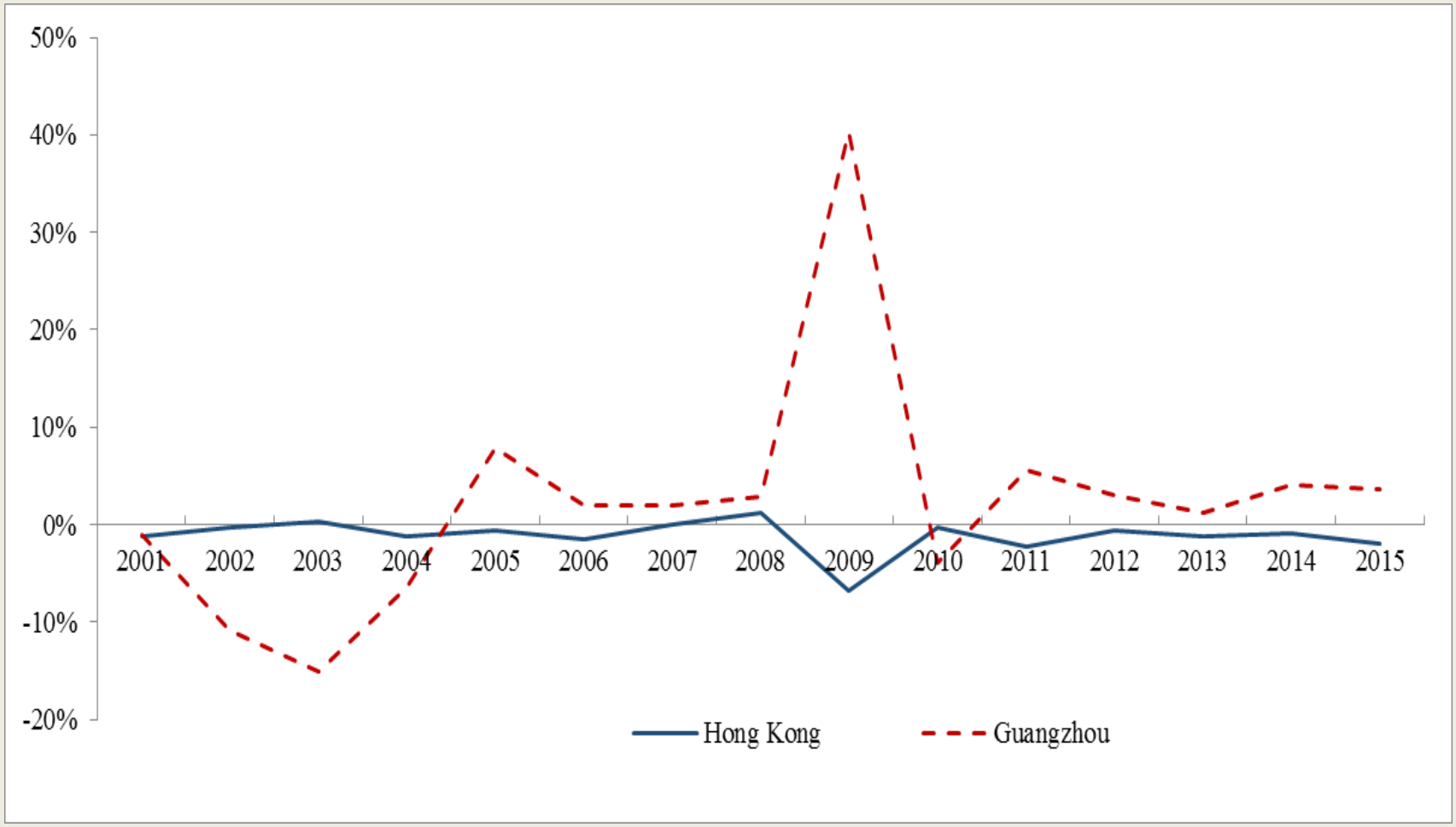
Market shifts among PRD airports (2001-2015)

	2001	2002	2003	2004	2005	2006	2007	2008
Hong Kong	-1.24%	-0.24%	0.25%	-1.14%	-0.61%	-1.52%	0.08%	1.16%
Macau	17.92%	26.52%	20.65%	38.05%	-7.67%	-9.68%	-22.41%	-40.07%
Shenzhen	10.53%	16.70%	16.16%	1.46%	-0.36%	13.13%	5.74%	1.29%
Guangzhou	-1.06%	-10.84%	-15.02%	-6.51%	7.90%	2.01%	1.96%	2.91%
Zhuhai	-5.68%	-14.92%	-13.89%	10.76%	-28.56%	4.42%	16.72%	7.86%
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	
Hong Kong	-6.75%	-0.34%	-2.19%	-0.62%	-1.14%	-0.93%	-1.99%	
Macau	-46.96%	-24.24%	-21.82%	-32.51%	-8.46%	1.74%	2.40%	
Shenzhen	2.22%	9.97%	4.80%	0.37%	3.18%	-1.44%	3.08%	
Guangzhou	40.25%	-3.87%	5.52%	3.00%	1.21%	4.06%	3.67%	
Zhuhai	24.50%	4.09%	-2.19%	-5.80%	35.64%	-9.34%	14.64%	

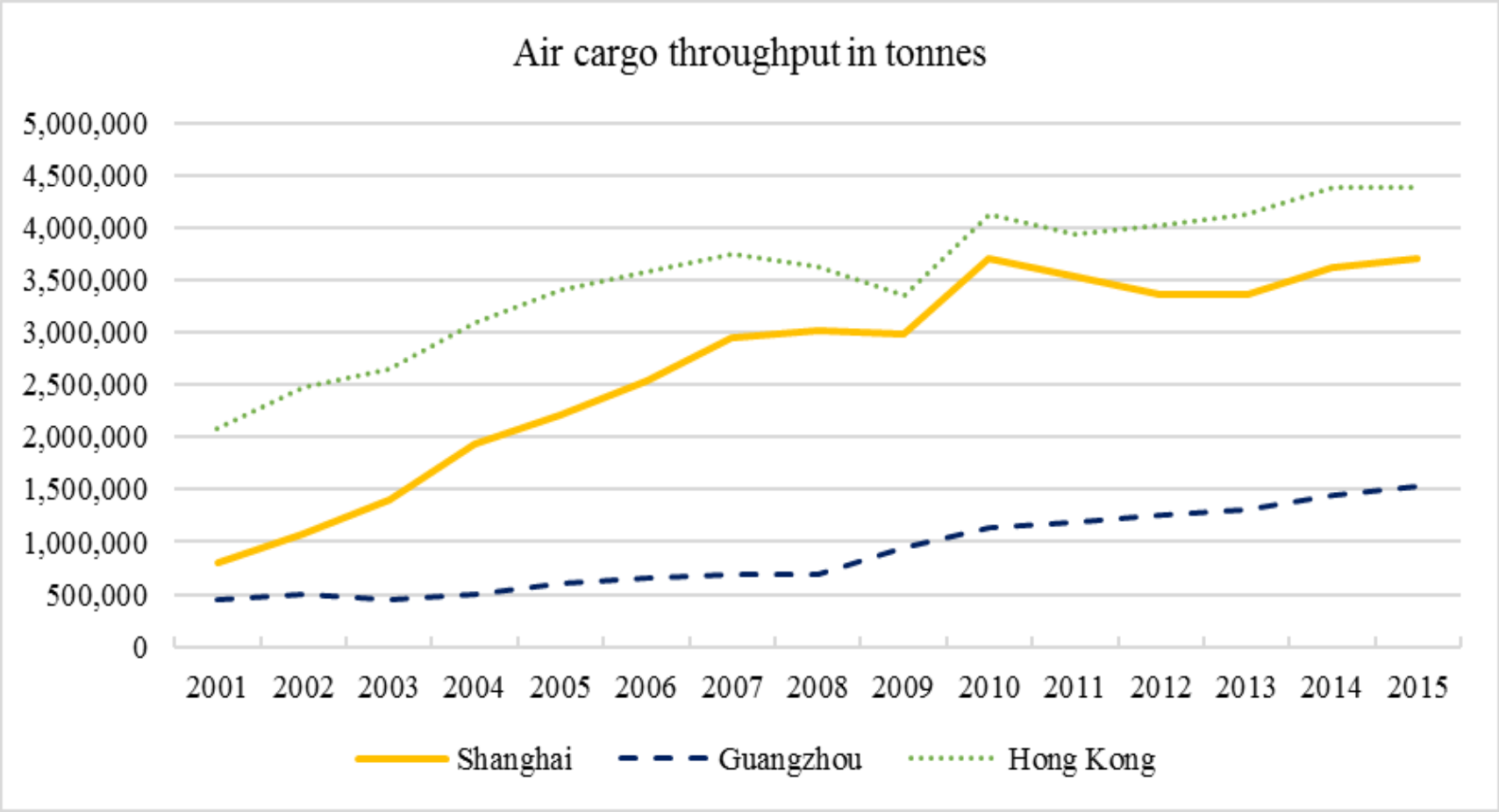
Market shift correlation among PRD airports

	Hong Kong	Macau	Shenzhen	Guangzhou	Zhuhai
Hong Kong	1.0000				
Macau	0.2854	1.0000			
Shenzhen	0.1985	0.4016	1.0000		
Guangzhou	-0.8328	-0.6676	-0.5073	1.0000	
Zhuhai	-0.3853	-0.3276	-0.2216	0.3712	1.0000

Market shifts of Hong Kong and Guangzhou airports over time



Air cargo throughput of Shanghai (PVG+SHA), Guangzhou and Hong Kong



Source: data from Civil Aviation Administration of China and Civil Aviation Department of Hong Kong

Implications for HKIA (cargo)

1. While HK is competing with Guangzhou, HK does not appear to compete directly with Shanghai:

   - HK serves PRD; Shanghai YRD (Yangtze River Delta)

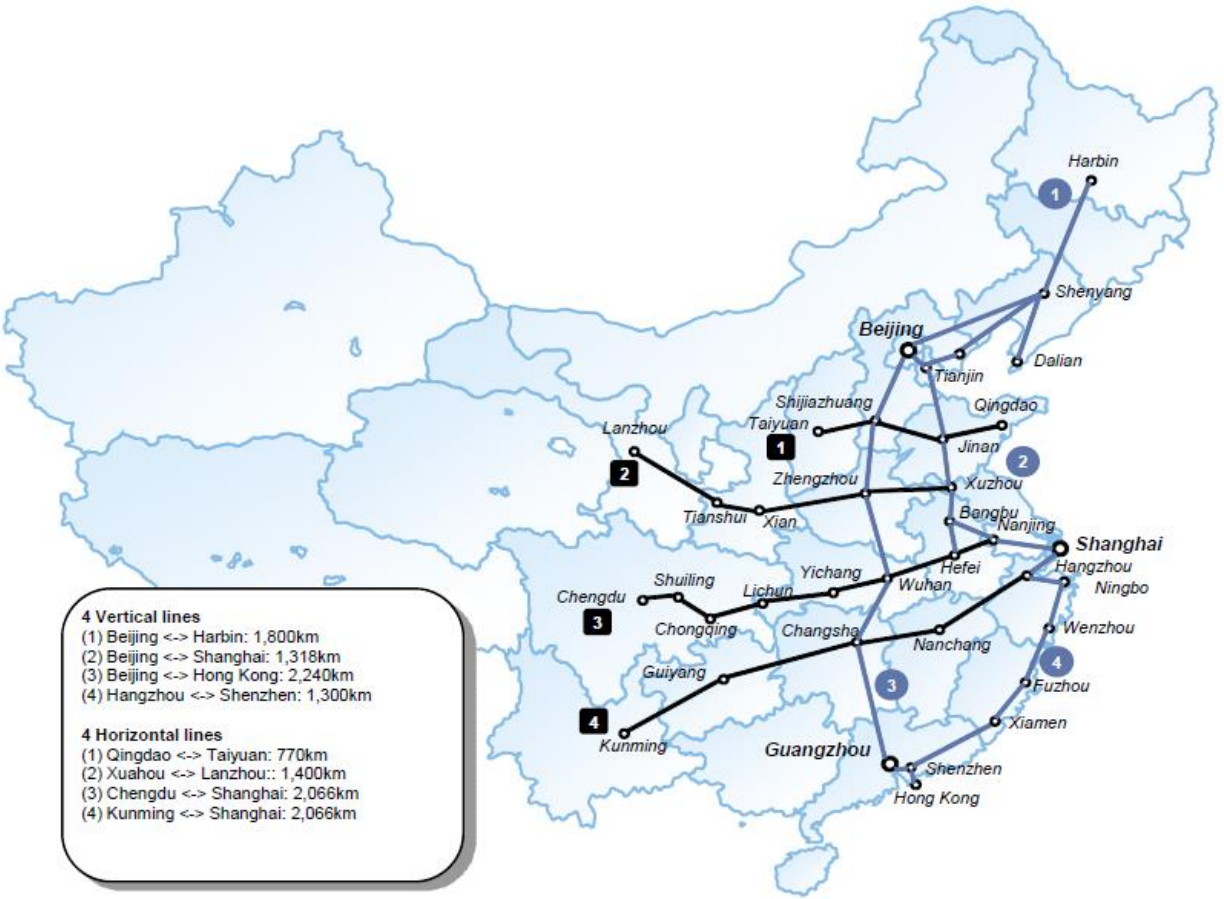
2. Well connected to mainland China is critical

World's top-20 airports in domestic cargo (2014)

Rank	Airport	Throughput (tonnes)	% Change
1	Memphis, US (MEM)	3,995,160	3.4
2	Louisville, US (SDF)	1,792,088	4.3
3	**Beijing, CN (PEK)**	1,049,984	-0.1
4	Indianapolis, US (IND)	1,034,770	-1.1
5	**Shanghai, CN (PVG)**	767,846	10.2
6	Tokyo Narita, JP (NRT)	765,288	3.4
7	**Shenzhen, CN (SZX)**	758,076	5.3
8	Anchorage, US (ANC)	705,467	-5.3
9	Los Angeles CA, US (LAX)	698,995	1.0
10	**Guangzhou, CN (CAN)**	657,592	5.4
11	**Chengdu, CN (CTU)**	467,805	7.6
12	Oakland, US (OAK)	465,533	1.6
13	Cincinnati, US (CVG)	426,384	8.7
14	**Shanghai, CN (SHA)**	395,201	-0.3
15	Newark, US (EWR)	376,476	-1.2
16	Ontario, US (ONT)	374,853	3.1
17	**Hangzhou, CN (HGH)**	363,131	6.5
18	Chicago, US (ORD)	335,668	0.7
19	Jakarta, Indonesia (CGK)	310,782	-2.4
20	Dallas/Fort Worth, US (DFW)	299,881	5.3

Source: Woods (2015).

High-speed rail (HSR) in China



Source: Ministry of Railways and Goldman Sachs

- First HSR line: Beijing – Tianjin, Aug 2008
- About 14,000 km HSR in operation (end of 2015): 200-350km/hour
- This gives China the world's largest HSR network:
  - Japan (1964) 2,500 km
  - Europe (France's TGV, 1981; Spain, 1992) 5,764 km
  - Korea (2004) Seoul-Daejeon 155 km, -Busan 330 km (2009)
  - Taiwan (2007) Taipei-Kaohsiung 340 km
- … and greater than the rest of world combined

Medium- / Long-term HSR Plan, 2016

1) by 2020: 30,000 km HSR network in China
2) by 2025: 38,000 km
3) by 2030: 45,000 km, with 8 vertical lines and 8 horizontal lines, connecting all the Provincial capitals with cities of 0.5 million (or more) people

China's HSR development strategy and impact

1) **"Big bang"**: program started only in 2004 (revised 2008)

2) **Network approach** (vs. piecemeal, or corridor, approach)
→ build up ridership quickly

As a result, it has had a significant impact on domestic inter-city transport:

- Cities at the intersections of vertical and horizontal lines become prominent

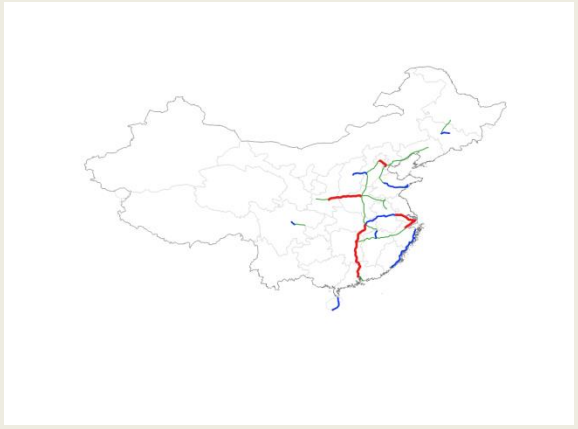
Air/HSR cooperation and integration: HSR as feeder

China’s HSR development （2004-2010）

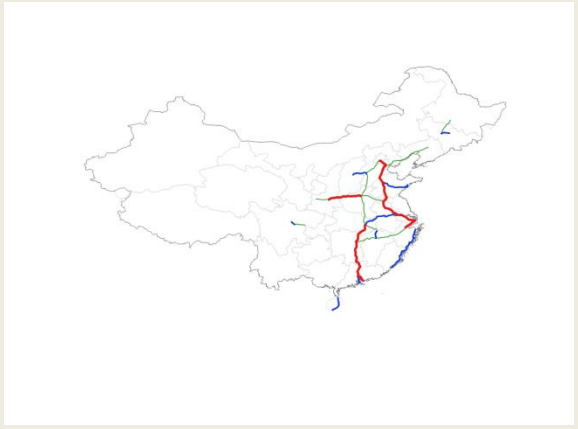
2004

2007

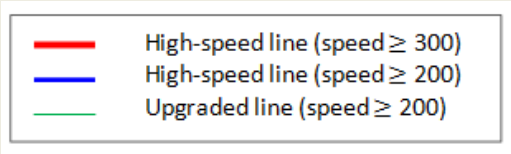
2008



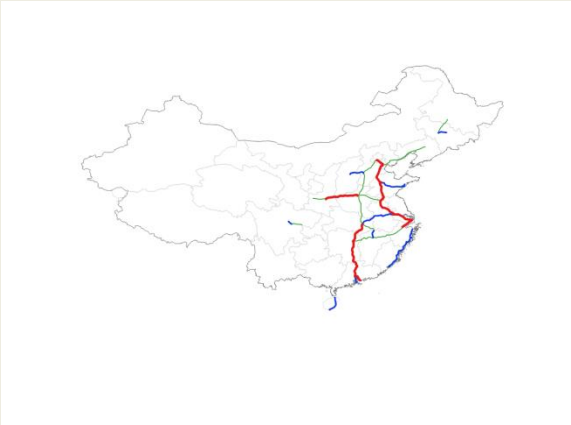
2009



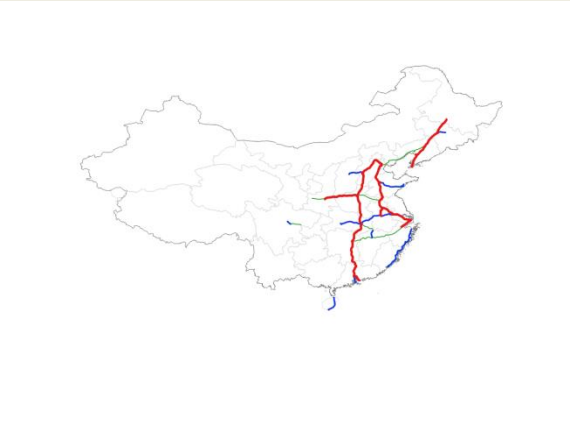
2010



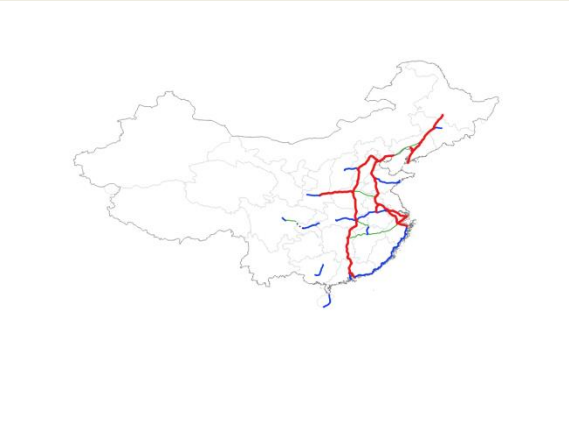
China's HSR development （2011-2015）



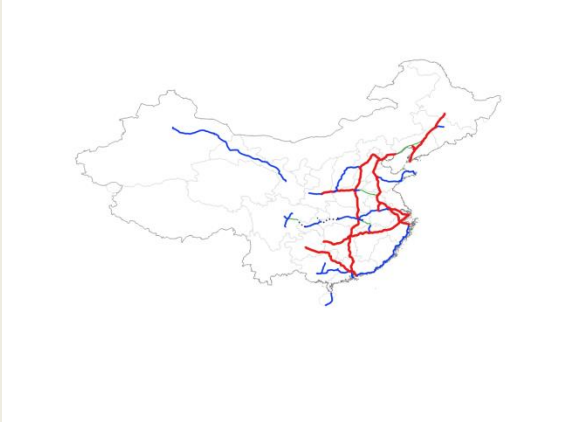
2011



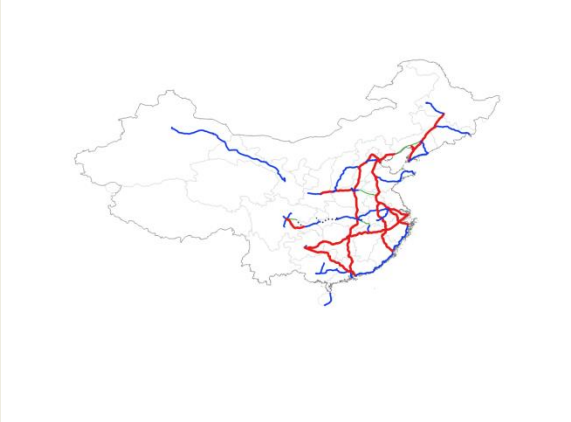
2012



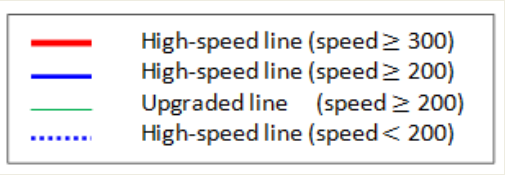
2013

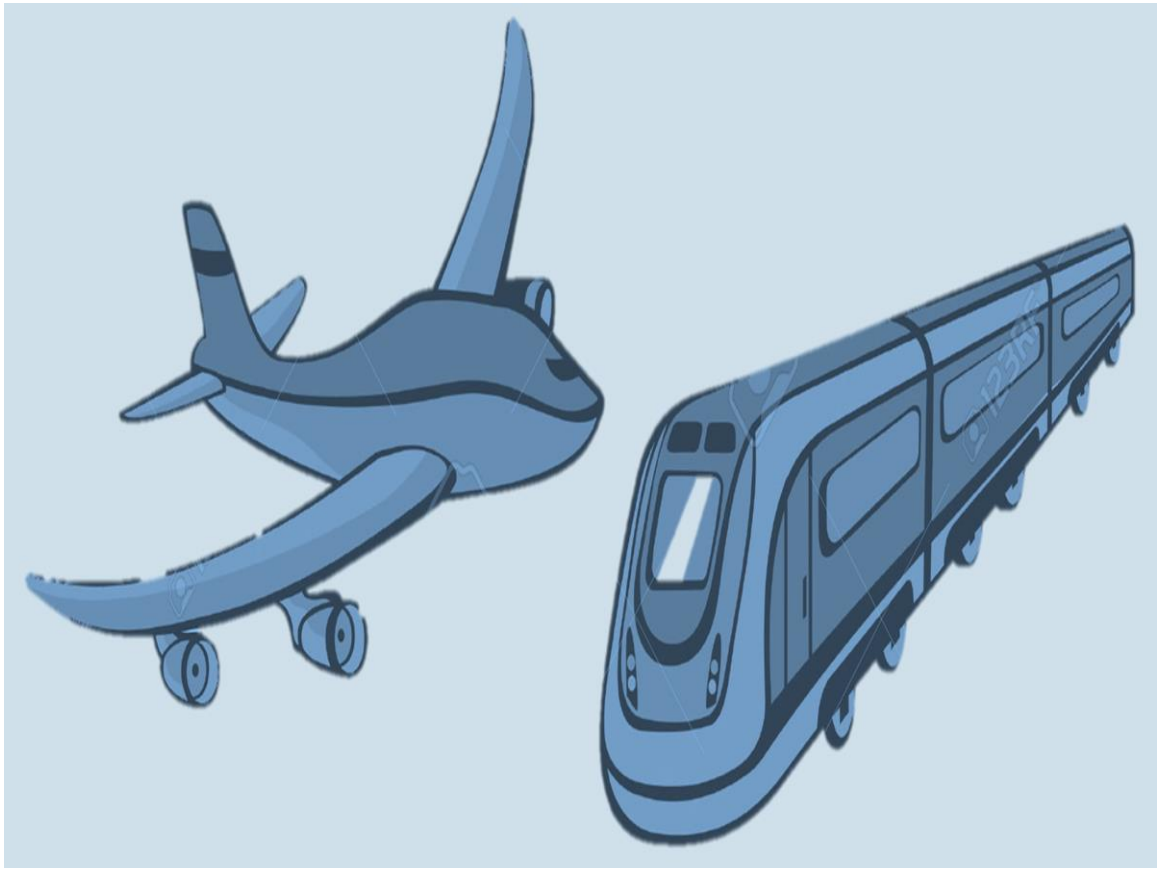


2014



2015





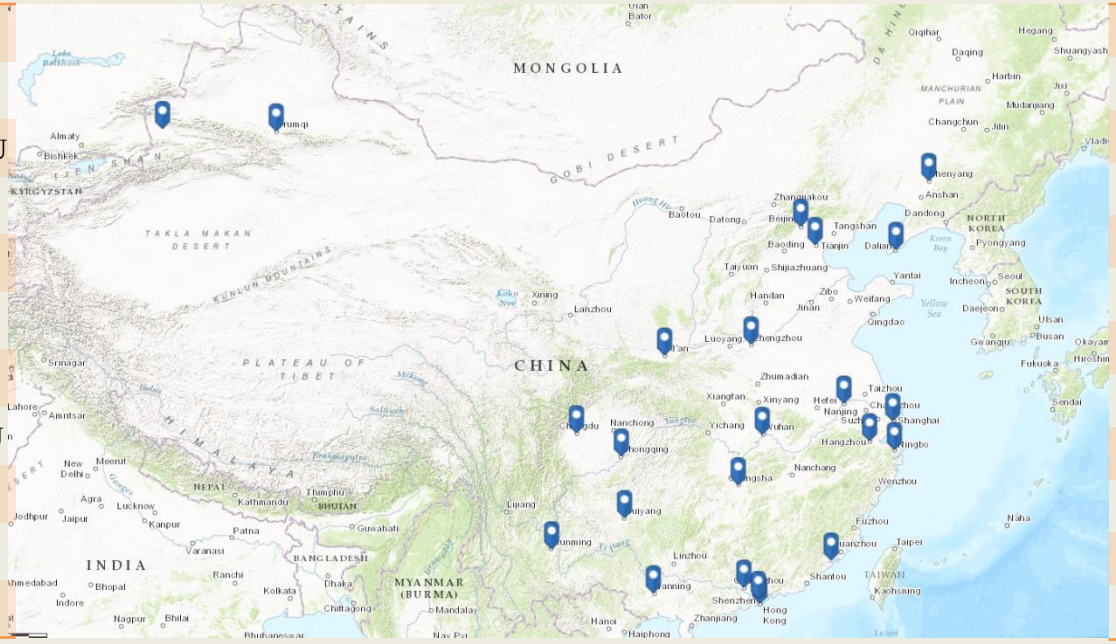
Hong Kong's connectivity with mainland China: Air + HSR

- Passenger traffic

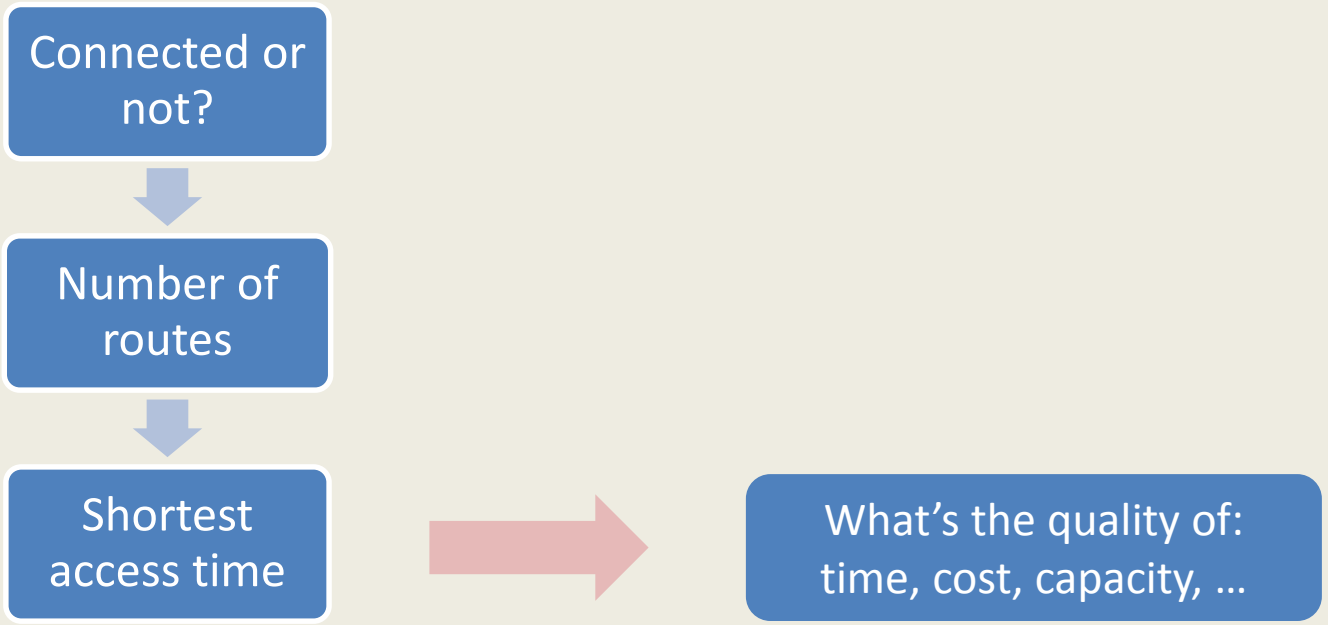
Hong Kong and key domestic cities in China's network

The 22 listed cities (except for HK) account for 31.5% of the national GDP and 17.2% of population in 2014

1	BEIJING
2	SHANGHAI
3	GUANGZHOU
4	SHENZHEN
5	SHENYANG
6	DALIAN
7	TIANJIN
8	ZHENGZHOU
9	WUHAN
10	CHANGSHA
11	NANJING



12	HANGZHOU
13	NINGBO
14	URUMQI
15	XI'AN
16	CHENGDU
17	CHONGQING
18	GUIYANG
19	KUNMING
20	NANNING
21	XIAMEN
22	YINING
23	**HONG KONG**

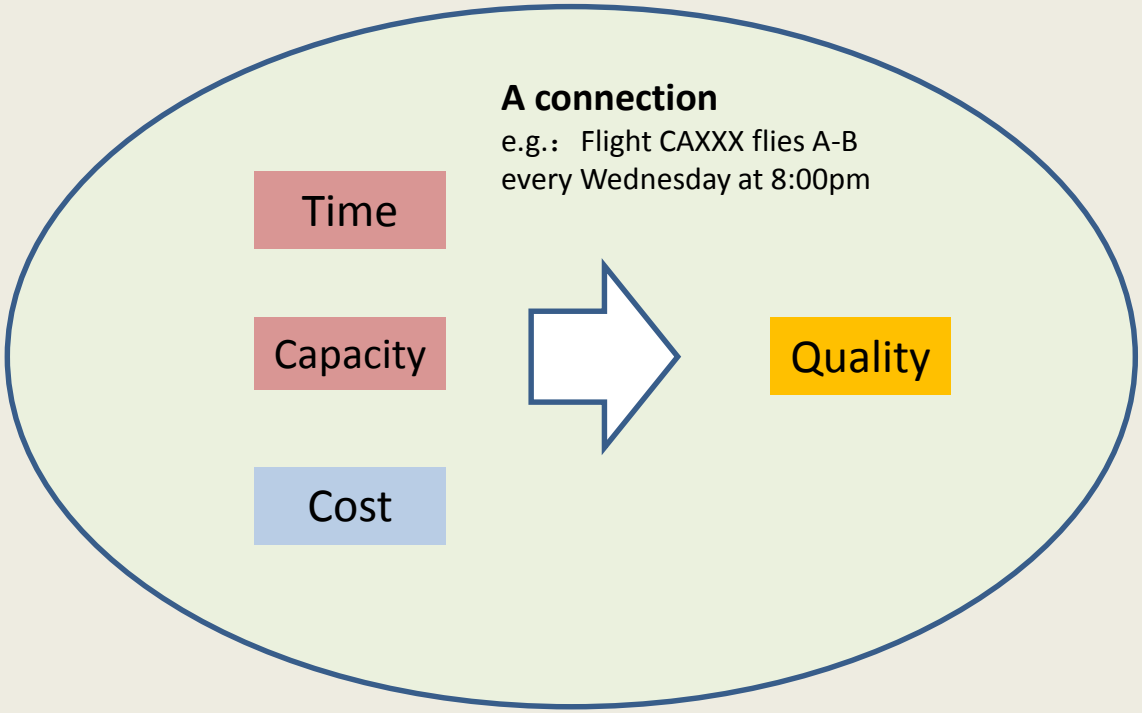

Connected or not?
Number of routes
Shortest access time
What's the quality of: time, cost, capacity, …

Connectivity model

Connectivity
=

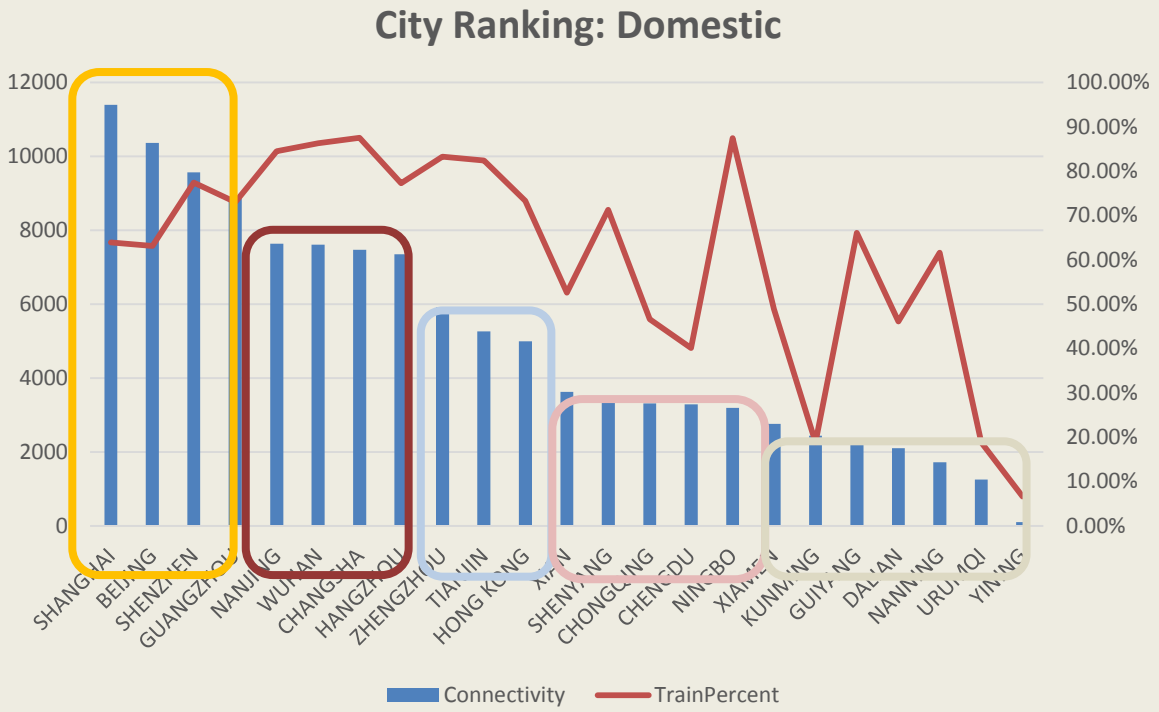
$$\sum$$

All
connections



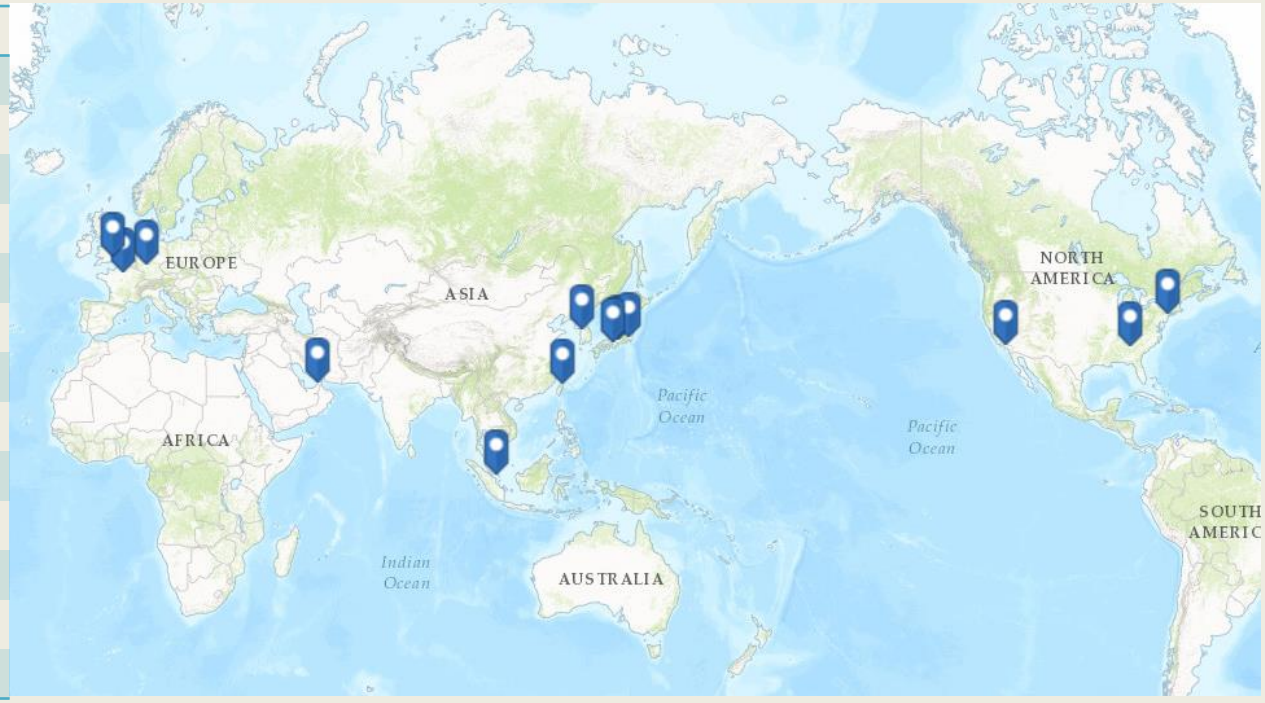
City ranking: Domestic network

Rank	City	Connectivity	Air Percent	Rail Percent
1	SHANGHAI	11394.49	36.06%	63.94%
2	BEIJING	10363.79	36.85%	63.15%
3	SHENZHEN	9566.667	22.61%	77.39%
4	GUANGZHOU	8862.888	26.98%	73.02%
5	NANJING	7636.838	15.54%	84.46%
6	WUHAN	7610.258	13.74%	86.26%
7	CHANGSHA	7473.24	12.51%	87.49%
8	HANGZHOU	7348.781	22.70%	77.30%
9	ZHENGZHOU	5912.863	16.73%	83.27%
10	TIANJIN	5257.907	17.58%	82.42%
11	Hong Kong	4991.065	26.72%	73.28%
12	XI'AN	3627.736	47.40%	52.60%
13	SHENYANG	3439.609	28.73%	71.27%
14	CHONGQING	3311.486	53.43%	46.57%
15	CHENGDU	3287.706	59.89%	40.11%
16	NINGBO	3191.678	12.58%	87.42%
17	XIAMEN	2760.059	51.08%	48.92%
18	KUNMING	2437.196	81.19%	18.81%
19	GUIYANG	2299.171	33.93%	66.07%
20	DALIAN	2099.353	53.95%	46.05%
21	NANNING	1722.098	38.40%	61.60%
22	URUMQI	1248.204	81.20%	18.80%
23	YINING	95.36694	93.38%	6.62%



Add international cities

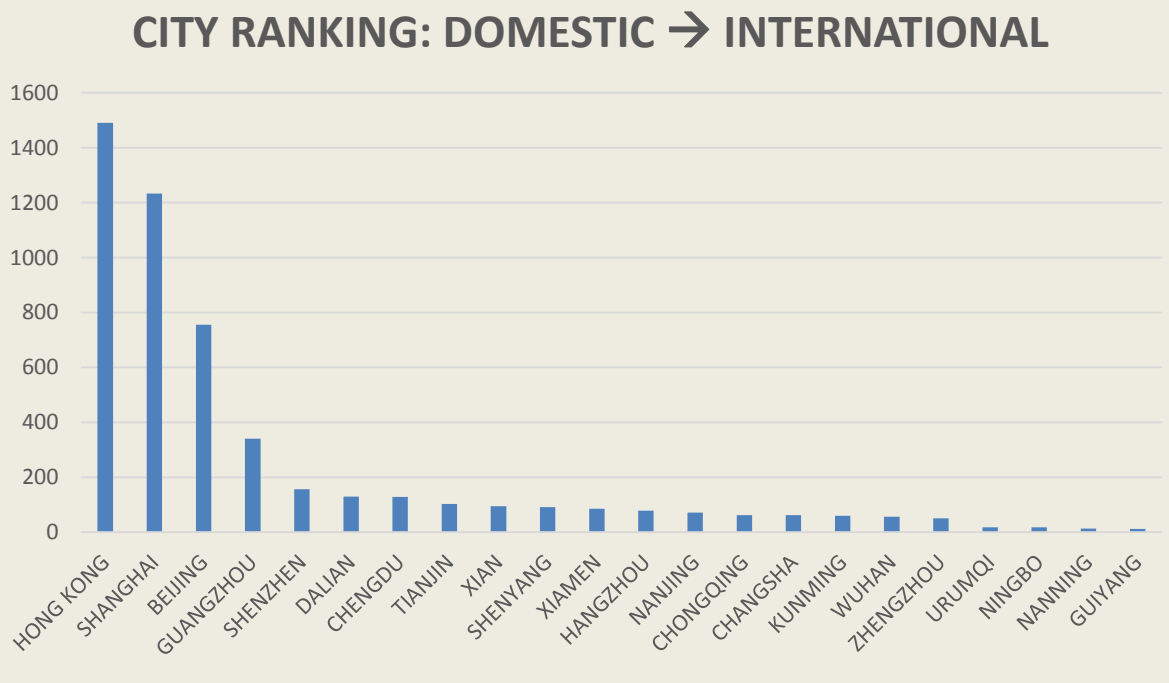
NO.	CITY
1	TOKYO
2	SEOUL
3	TAIPEI
4	NEW YORK
5	SINGAPORE
6	LOS ANGELES
7	FRANKFURT
8	ATLANTA
9	DUBAI
10	PARIS
11	LONDON
12	OSAKA
13	NAGOYA



Network connectivity

City ranking: Domestic → international

HONG KONG	1490.05	1
SHANGHAI	1233.48	2
BEIJING	754.95	3
GUANGZHOU	340.91	4
SHENZHEN	157.03	5
DALIAN	129.94	6
CHENGDU	127.99	7
TIANJIN	103.06	8
XIAN	95.06	9
SHENYANG	90.77	10
XIAMEN	85.97	11
HANGZHOU	78.34	12
NANJING	71.15	13
CHONGQING	62.42	14
CHANGSHA	61.7	15
KUNMING	59.75	16
WUHAN	55.87	17
ZHENGZHOU	50.66	18
URUMQI	18.36	19
NINGBO	18.14	20
NANNING	13.42	21
GUIYANG	11.92	22
YINING	0	23



Conclusion

1. With capacity constraints, HKIA should pay more attention to O-D traffic; airport charges could be used as instrument
2. Make sure capacity expansions on schedule
3. Challenges in managing more volatile cargo business post-2008 for airlines and airport
4. Global air-travel trends: 1) De-concentration; 2) Hub-bypassing; 3) Intensified competition among hubs
5. Well connected to mainland China is critical
   - Impact of HSR
   - Mainland China's air liberalization policy

Thank you