

ATRS Global Airport Benchmarking

Chunyan Yu

David B. O'Maley College of Business
Embry-Riddle Aeronautical University

- ***ATRS Global Airport Performance Benchmarking Task Force:***
 - ***Founding Chairman – Tae Oum; Coordinator - Chunyan Yu***
 - ***Asia Pacific: Peter Forsyth, Xiaowen Fu, Shinyan Hanaoka, Yeong-Heok Lee***
 - ***Japhet Law, Yuichiro Yoshida***
- ***Europe: Nicole Adler, Jaap de Wit, Hans-Martin Niemeier, Eric Pels***
 - ***North America: Bijan Vasigh, Jia Yan, Chunyan Yu***
 - ***Middle East: Paul Hooper***



ATRS Global Airport Benchmarking

- To provide a comprehensive, unbiased comparison of airport performance focusing on
 - **Productivity, Efficiency, Cost Competitiveness**
 - **Financial Results**
 - **Comparison of Airport Charges**
- 2022 - the 21st edition of ATRS Global Airport Benchmarking Report



Geographical Diversification In the Airport Industry

	Airport	Total Passengers 2000		Airport	Total Passengers 2019		Airport	Total Passengers 2020		Airport	Total Passengers 2021
1	ATLANTA (ATL)	80 162 407	1	ATLANTA GA, US (ATL)	110 531 300	1	Guangzhou (CAN)	43 760 427	1	Atlanta (ATL)	75,537,213
2	CHICAGO (ORD)	72 144 244	2	BEIJING, CN (PEK)	100 011 438	2	Atlanta (ATL)	42 918 685	2	Dallas/Fort Worth (DFW)	62,465,756
3	LOS ANGELES (LAX)	66 424 767	3	LOS ANGELES CA, US (LAX)	88 068 031	3	Chengdu (CTU)	40 741 509	3	Denver (DEN)	58,828,552
4	LONDON (LHR)	64 606 826	4	DUBAI, AE (DXB)	86 396 757	4	Dallas/Fort Worth (DFW)	39 364 990	4	Chicago (ORD)	54,020,399
5	DALLAS/FT WORTH (DFW)	60 687 122	5	TOKYO, JP (HND)	85 505 054	5	Shenzhen (SZX)	37 916 059	5	Los Angeles (LAX)	48,007,284
6	TOKYO (HND)	56 402 206	6	CHICAGO IL, US (ORD)	84 649 115	6	Chongqing (CKG)	34 937 789	6	Charlotte (CLT)	43,302,230
7	FRANKFURT/MAIN (FRA)	49 360 630	7	LONDON, GB (LHR)	80 888 305	7	Beijing (PEK)	34 513 827	7	Orlando (MCO)	40,351,068
8	PARIS (CDG)	48 246 137	8	SHANGHAI, CN (PVG)	76 153 455	8	Denver (DEN)	33 741 129	8	Guangzhou (CAN)	40,249,679
9	SAN FRANCISCO (SFO)	41 040 995	9	PARIS, FR (CDG)	76 150 009	9	Kunming (KMG)	32 989 127	9	Chengdu (CTU)	40,117,496
10	AMSTERDAM (AMS)	39 606 925	10	DALLAS/FORT WORTH, US (DFW)	75 066 956	10	Shanghai Hongqian (SHA)	31 165 641	10	Las Vegas (LAS)	39,710,493
11	DENVER (DEN)	38 751 687	11	GUANGZHOU, CN (CAN)	73 386 153	11	Xi'an (XIY)	31 073 884	11	Phoenix (PHX)	38,846,713
12	LAS VEGAS (LAS)	36 865 866	12	AMSTERDAM, NL (AMS)	71 706 999	12	Haneda (HND)	30 965 000	12	Miami (MIA)	37,302,456
13	MINNEAPOLIS/ST PAUL (MSP)	36 751 632	13	HONG KONG, HK (HKG)	71 415 245	13	Chicago O'Hare (ORD)	30 860 251	13	Delhi (DEL)	37,139,957
14	SEOUL (SEL)	36 727 124	14	INCHEON, KR (ICN)	71 204 153	14	Shanghai Pudong (PVG)	30 476 531	14	Istanbul (IST)	36,988,563
15	PHOENIX (PHX)	36 040 469	15	FRANKFURT, DE (FRA)	70 556 072	15	Los Angeles (LAX)	28 779 527	15	Shenzhen (SZX)	36,358,185
16	DETROIT (DTW)	35 535 080	16	DENVER CO, US (DEN)	69 015 703	16	Delhi (DEL)	28 501 000	16	Seattle (SEA)	36,154,015
17	HOUSTON (IAH)	35 251 372	17	NEW DELHI, IN (DEL)	68 490 731	17	Hangzhou (HGH)	28 224 342	17	Mexico City (MEX)	36,056,614
18	NEWARK (EWR)	34 188 468	18	SINGAPORE, SG (SIN)	68 283 000	18	Charlotte (CLT)	27 200 000	18	Chongqing (CKG)	35,766,284
19	MIAMI (MIA)	33 621 273	19	BANGKOK, TH (BKK)	65 421 844	19	Dubai (DXB)	25 900 000	19	Shanghai Hongqiao (SHA)	33,207,337
20	MADRID (MAD)	32 893 190	20	NEW YORK NY, US (JFK)	62 551 072	20	Istanbul (IST)	23 409 000	20	Beijing (PEK)	32,639,013

Increasing Presence of Global Airport Operators

Airport Operators	Number of Airports	Notes
VINCI Airports	53 airports in 12 countries	VINCI Airports signed an agreement to purchase 29.99% of OMA (Grupo Aeroportuario del Centro Norte), which will add 13 airports to its portfolio (Northern and Central Mexico)
GROUPE ADP	28 airports in all continents	Groupe ADP has strategic holdings in TAV (Turkey), AIG(Jordan) and GMR (India)
Fraport AG	31 airports worldwide	In cooperation with its partners, Fraport AG is investing in the expansion of Frankfurt Airport City
Corporacion America Airports	53 airports in 6 countries	Argentina, Armenia, Brazil, Ecuador, Italy, Uruguay

Low Cost Carriers Operate Significant Shares of Seats

	Asia Pacific	Europe	North America
Mean	32%	44%	39%
Median	24%	41%	41%
Minimum	1%	3%	0%
Maximum	85%	100%	96%
Count	50	70	82

* Low Cost Carriers' Market Shares (departure seats) in Oct 2021

Conspicuous Carrier Dominance at Airports

	Asia Pacific	Europe	North America
Mean	44%	44%	47%
Median	38%	40%	43%
Minimum	15%	14%	20%
Maximum	93%	89%	96%
Count	54	70	82

* Dominant Carriers' Market Shares (seats) in Oct 2021

Non-aeronautical Revenues are Vital to Airports

	<i>Asia</i>	<i>Australia/New Zealand</i>	<i>Europe</i>	<i>North America</i>
Mean	57.0%	56.2%	51.9%	45.8%
Median	58.7%	55.3%	51.1%	45.3%
Minimum	21.2%	43.3%	9.8%	15.4%
Maximum	83.5%	70.9%	83.9%	75.7%
Count	30	13	54	81

Share of Non-Aeronautical Revenue - FY2020

Larger Aircraft in Europe and North America smaller aircraft in Asia Pacific

	Asia		Australia /New Zealand		Europe		North America	
	2019	2022	2019	2022	2019	2022	2019	2022
Mean	195	192	143	136	164	171	125	136
Median	190	187	140	137	166	174	123	134
Minimum	128	107	91	90	110	119	68	83
Maximum	307	286	192	181	213	219	178	178
Count	37	37	15	15	67	68	81	81

* Seats per Flight - August Schedule



Emerging From the Pandemic, albeit at different Paces

Number of Non-Stop Destinations

	Airport	October, 2019		Airport	October, 2020		Airport	October, 2021
1	CDG	297	1	IST	260	1	FRA	267
2	FRA	288	2	AMS	223	2	IST	261
3	IST	283	3	CDG	221	3	DFW	238
4	AMS	261	4	PVG	215	4	AMS	234
5	PEK	245	5	DFW	214	5	ORD	229
6	DFW	236	6	FRA	210	6	CDG	217
7	ORD	233	7	DXB	209	7	DXB	203
8	DXB	224	8	PEK	198	8	DEN	201
9	PVG	222	9	ORD	192	9	ATL	197
10	ATL	220	10	LHR	189	10	LHR	196
11	MUC	213	11	CAN	183	11	SVO	177
12	SVO	207	12	VIE	182	12	MUC	173
13	BCN	203	13	DEN	176	13	PVG	170
14	DEN	199	14	SZX	156	14	IAH	170
15	FCO	195	15	MUC	155	15	VIE	169
16	LHR	195	16	ATL	154	16	CLT	166
17	MAD	195	17	MAD	147	17	BCN	165
18	LGW	192	18	STN	147	18	CAN	155
19	VIE	192	19	CLT	146	19	MAD	155
20	GVA	188	20	ICN	143	20	ZRH	154

Emerging From the Pandemic, albeit at different Paces

Number of Departure Seats

	Airport	August, 2019		Airport	August, 2020		Airport	August, 2021		Airport	August, 2022
1	ATL	5,649,216	1	CGK	3,735,161	1	ATL	4,662,902	1	ATL	4,749,253
2	PEK	5,585,939	2	CAN	3,370,976	2	DFW	3,831,835	2	DXB	4,082,589
3	DXB	4,928,089	3	ATL	3,222,258	3	DEN	3,736,563	3	DFW	3,924,350
4	HND	4,742,417	4	HND	2,975,621	4	ORD	3,727,639	4	HND	3,841,828
5	LAX	4,689,867	5	PEK	2,895,795	5	LAX	3,304,485	5	IST	3,825,377
6	ORD	4,576,338	6	CTU	2,890,403	6	IST	2,902,176	6	ORD	3,772,331
7	LHR	4,478,338	7	SZX	2,801,236	7	CAN	2,728,987	7	DEN	3,738,762
8	CDG	4,220,888	8	DEN	2,615,675	8	AMS	2,535,188	8	LHR	3,678,230
9	FRA	4,172,623	9	DFW	2,584,547	9	HND	2,512,473	9	LAX	3,579,363
10	PVG	4,090,134	10	KMG	2,507,465	10	SEA	2,470,035	10	CDG	3,404,016
11	DFW	4,042,849	11	PVG	2,504,913	11	DEL	2,457,785	11	DEL	3,344,717
12	HKG	3,994,901	12	CKG	2,402,599	12	SZX	2,420,357	12	CAN	3,301,787
13	IST	3,908,308	13	SHA	2,400,274	13	CLT	2,412,606	13	JFK	3,227,944
14	CAN	3,881,621	14	XIY	2,340,655	14	LAS	2,380,626	14	FRA	3,157,563
15	ICN	3,750,372	15	ORD	2,102,985	15	FRA	2,318,673	15	AMS	3,141,463
16	AMS	3,693,421	16	HGH	1,994,902	16	PEK	2,317,808	16	CGK	3,094,781
17	DEN	3,653,896	17	CDG	1,824,220	17	DXB	2,317,066	17	LAS	2,844,460
18	SIN	3,606,234	18	AMS	1,789,563	18	CDG	2,311,058	18	MAD	2,792,919
19	DEL	3,528,718	19	LAX	1,762,965	19	JFK	2,308,254	19	MEX	2,649,887
20	JFK	3,464,721	20	SEA	1,655,742	20	MCO	2,300,648	20	SZX	2,639,605

The Airport Efficiency Excellence Awards

- Award Winning Airports are decided by rankings in terms of residual **Variable Factor Productivity** (VFP) Index in their respective region and size categories.



Productivity and Efficiency

- Productivity is defined as the ratio of output to input
 - Airports employ multiple inputs to produce multiple outputs → complications arise in how to Aggregate
 - Need to use simple methodology acceptable and understood by the industry and government agencies
 - Multilateral Index Procedure to Measure Total factor productivity (TFP) or Multiple Factor Productivity
 - <https://www.bls.gov/productivity/>
 - Variable Factor Productivity



Productivity and Efficiency

Multilateral Index Procedure

- This multilateral **output (input)** index procedure uses the **revenue (cost)** shares to aggregate **output (inputs)**

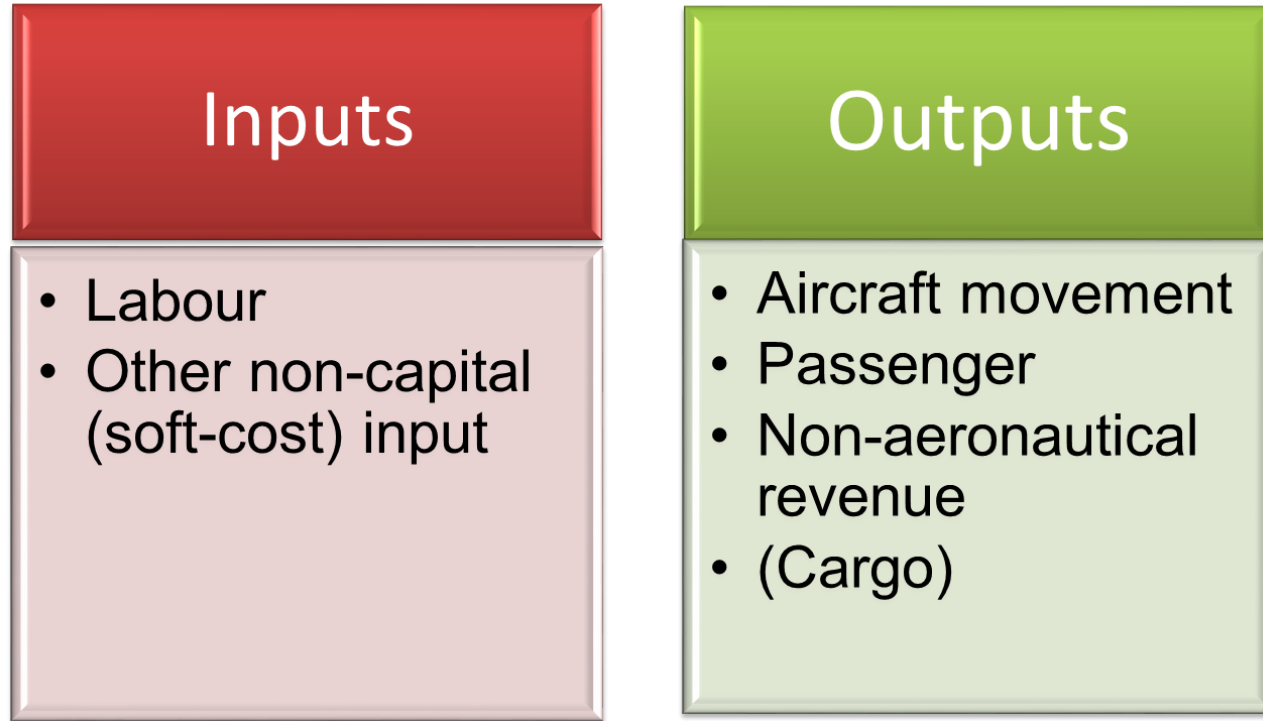
$$\ln \frac{Y_i}{Y_j} = \sum \frac{R_{ki} + \bar{R}_k}{2} \ln \frac{Y_{ki}}{\tilde{Y}_k} - \sum \frac{R_{kj} + \bar{R}_k}{2} \ln \frac{Y_{kj}}{\tilde{Y}_k}$$

$$\ln \frac{X_i}{X_j} = \sum \frac{W_{ki} + \bar{W}_k}{2} \ln \frac{X_{ki}}{\tilde{X}_k} - \sum \frac{W_{kj} + \bar{W}_k}{2} \ln \frac{X_{kj}}{\tilde{X}_k}$$



Productivity and Efficiency

Variable Factor Productivity (VFP) Index



**Gross Variable Factor Productivity
or Observed Productivity**



Observed Productivity \neq Efficiency

- **Efficiency** measures how well a firm performs relative to the best practice or the most output obtainable from a given input level with the given production
- The observed productivity does not always reflect the true efficiency level because of factors beyond managerial control



Productivity and Efficiency

Factors Beyond Managerial Control:

- Airport size (Scale of aggregate output)
- Average aircraft size
- Share of international traffic
- Share of air cargo traffic
- Extent of capacity shortage - congestion delay
- etc
- FY 2020 - Influence of COVID

Residual (Net) variable factor productivity (RVFP) is computed after removing effects of these Factors



Effects of the Pandemic

- Airports have different fiscal year ending month
 - the number of months impacted by covid
- Different Pandemic Policy and Travel Restrictions
 - Oxford COVID-19 GOVERNMENT RESPONSE TRACKER
 - Stringency index, International travel controls, Restrictions on internal movement
 - U.S and Canada at State or Province Level
 - Other Countries at Country level



Oxford COVID-19 Government Response Indicators

	<i>International travel controls</i>	<i>Restrictions on internal movement</i>	<i>Stringency Index</i>
North America			
Mean	1.9102	0.7033	38.5421
Median	1.7419	0.6260	39.7487
Standard Deviation	0.8577	0.3853	15.5270
Minimum	0.9919	0.0161	18.6137
Maximum	3.4344	1.7667	72.8014
Count	82	82	82
Europe			
Mean	2.3996	1.0274	54.5076
Median	2.5929	1.1393	54.2931
Standard Deviation	0.4817	0.5287	8.7143
Minimum	1.1530	0.0000	36.3836
Maximum	2.9754	1.8466	73.7524
Count	50	50	50
Asia Pacific			
Mean	2.4131	0.8511	43.0353
Median	2.4672	0.9033	39.0311
Standard Deviation	0.7933	0.4993	19.3511
Minimum	1.2673	0.0000	18.1228
Maximum	3.5726	1.7322	76.5138
Count	54	54	54



The Airport Efficiency Excellence Awards

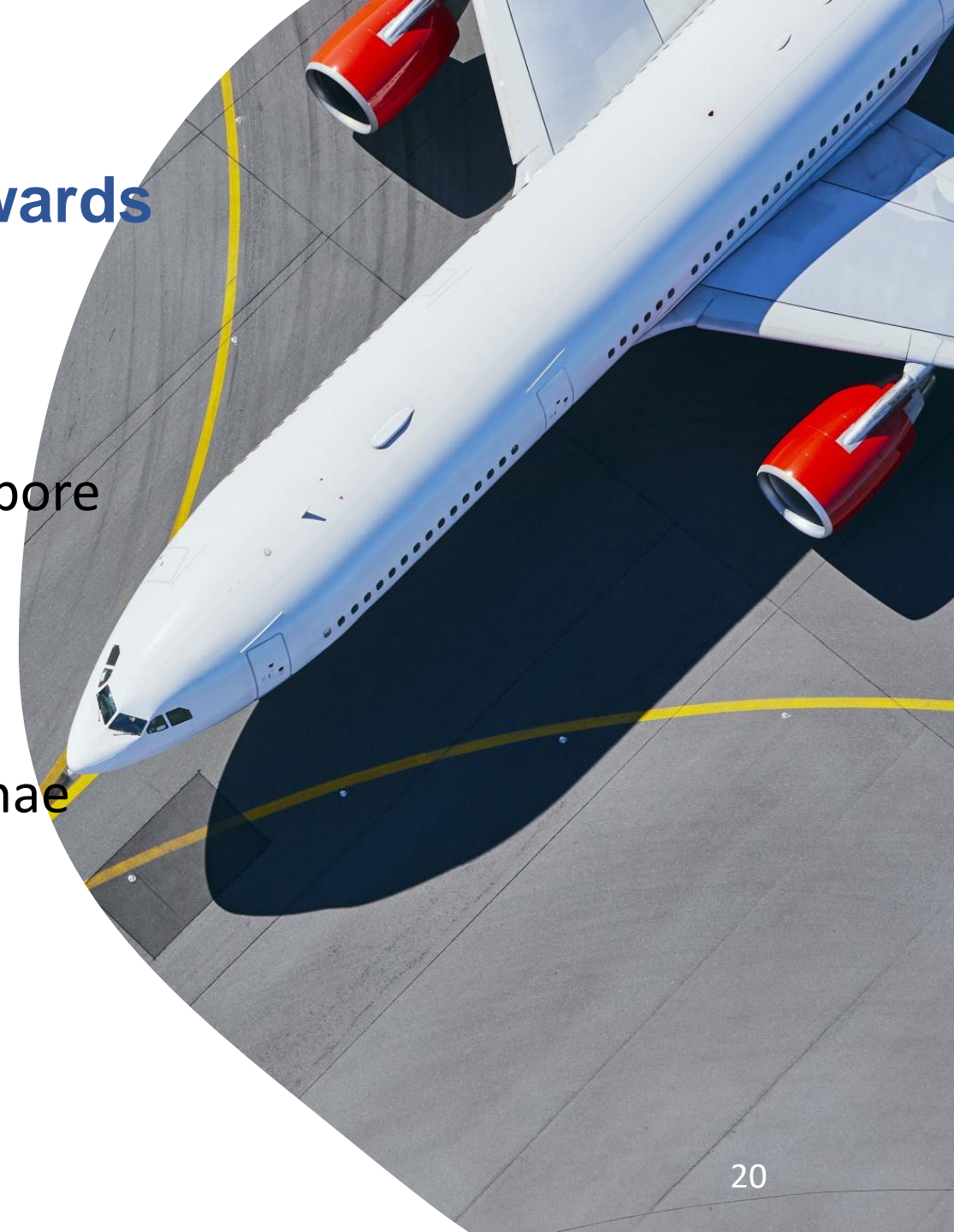
Top Efficiency Award Winners



The Airport Efficiency Excellence Awards

Asia Pacific:

- Over 40 million passengers per year: Singapore Changi
- 20-40 million passengers per year: Jeju International
- Under 20 million passengers per year: Gimhae International
- Oceania Airports: Sydney Airport



The Airport Efficiency Excellence Awards

Europe:

- Over 40 million passengers per year: Amsterdam Schiphol
- 25-40 million passengers per year: Zurich Airport
- 10-25 million passengers per year: Stuttgart Airport
- Under 10 million passengers per year: EuroAirport Basel-Mulhouse-Freiburg



The Airport Efficiency Excellence Awards

North America (Canada/US):

- Over 40 million passengers per year: Orlando International Airport
- 15-40 million passengers per year: Detroit Metropolitan Airport
- 5 - 15 million passengers per year: Mineta San Jose International Airport
- Under 5 million passengers per year: Victoria International Airport



The Airport Efficiency Excellence Awards

ATRS Roll of Excellence in Efficiency

- Special recognition for airports that have consistently achieved excellence in operational efficiency over time
 - Hartsfield–Jackson Atlanta International Airport
 - Copenhagen Airport



Thank you!

