

# *ATRS Global Airport Performance Benchmarking Report, 2003*

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*UBC and Air Transport Research Society*

[www.atrsworld.org](http://www.atrsworld.org)

*presented at*

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# ATRS Global Airport Benchmarking Task Force Members

*[www.atrsworld.org](http://www.atrsworld.org)*

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# Outline



- ◆ Objective of the Study; Sample Airports
- ◆ **Gross Productivity and Costs** – why they can not be used for comparison
- ◆ Removing effects of **the factors beyond managerial control**
- ◆ Results on **Residual Productivities and Cost Competitiveness**





# *Objective of the Study*

- ◆ To do a comprehensive, unbiased assessment of airport performance, including:

- **Productivity and Efficiency**
  - **Unit Cost Competitiveness**
- 

- ◆ **Future: Aviation User charges levels;**  
Impacts of Safety and Security on Airport;  
Identifying Key Areas Need Improving, and How



## *Objective of the Study - Cont.*



### ◆ Identify effects of

- Airport operating environment
- Extent of Business Diversification (commercial services)
- Extent of outsourcing
- Service quality

On productivity, unit cost and other performance measures,

### ◆ And remove the effects of the variables beyond managerial control.





# *Airports Included in our Study*

	Partial Data	Full Data
Canada-U.S.	43 airports	43 airports
Europe	26 airports	19 airports
Asia-Pacific	21 airports	14 airports
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Total	90 airports	76 airports



# Data Sources



- ◆ **US FAA and DOT statistics; AEA Statistics**
- ◆ ICAO Digest of Statistics:
  - annual financial data – for some airports
- ◆ ACI; IATA data
  - annual traffic statistics
  - Capacity information
  - general information surveys (Asia Pacific and Europe); occasional and not complete
- ◆ IMF and World Bank – various price indices including GDP deflators for service sectors
- ◆ Various government and other sources for security charges
- ◆ **Obtained some data directly from our sample airports**



# Sample airport characteristics – N. America



Airport	Total Passengers (000's)		Passengers/ Movement		% International Passengers		% Aeronautical Revenues		Customer Satisfaction*	
	2,000	2,001	2,000	2,001	2,000	2,001	2,000	2,001	2,000	2,001
ATL	80,162	75,849	88	85	7%	7%	48%	42%	3.92	3.68
BOS	26,973	24,200	62	53	16%	24%	46%	45%	3.44	3.44
CVG	22,538	17,270	47	44	4%	4%	57%	61%	4.13	4.13
DFW	51,349	55,151	73	70	8%	8%	52%	55%	3.85	3.51
DTW	35,535	32,294	64	62	11%	10%	54%	55%	3.23	2.98
EWR	34,188	30,500	76	70	25%	23%	70%	70%	3.63	3.28
HNL	23,017	21,096	67	65	22%	21%	29%	34%	3.44	3.44
IAD	20,661	17,860	43	45	18%	22%	61%	59%	3.55	3.35
IAH	35,251	34,975	73	74	16%	16%	46%	53%	3.88	3.56
JFK	32,856	29,400	95	101	57%	57%	72%	72%	3.32	3.13
LAX	67,303	61,025	86	83	26%	26%	41%	41%	3.39	3.15
MCO	30,485	28,167	85	88	8%	7%	36%	39%	3.89	3.89
MIA	33,621	31,668	65	67	48%	48%	38%	49%	3.44	3.23
MSP	36,752	35,171	70	70	5%	4%	48%	52%	3.97	3.84
ORD	72,144	66,805	79	73	15%	14%	60%	66%	3.73	3.44
PDX	13,823	12,704	43	46	4%	2%	43%	49%	3.74	3.74
PHL	24,918	23,927	51	51	11%	12%	63%	65%	n/a	3.31
SEA	28,409	27,036	64	68	9%	9%	52%	52%	3.91	3.67
SFO	40,980	34,627	93	89	20%	22%	51%	52%	3.55	3.19
YUL	8,493	8,157	41	42	51%	51%	33%	31%	3.64	3.41
YVR	16,247	15,622	48	50	47%	49%	30%	32%	4.25	3.91
YYC	8,090	8,300	48	37	29%	29%	36%	37%	3.91	3.91
YYZ	28,930	28,043	68	69	57%	56%	62%	55%	3.67	3.36





# Sample airport characteristics – Europe



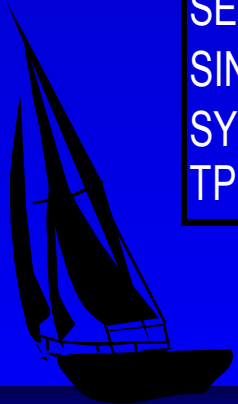
Airport	Total Passengers (000's)		Passengers/ Movement		% International Passengers		% Aeronautical Revenues		Customer Satisfaction*	
	2,000	2,001	2,000	2,001	2,000	2,001	2,000	2,001	2,000	2,001
<b>Europe</b>										
AMS	39,607	39,531	92	92	99%	99%	49%	48%	4.05	3.80
BRU	21,595	19,636	66	64	100%	99%	62%	62%	3.83	3.83
CDG	48,246	47,996	97	92	71%	90%	31%	33%	3.36	3.36
CPH	18,294	18,136	60	63	88%	90%	60%	60%	4.35	4.08
DUS	16,030	15,393	83	80	75%	76%	72%	72%	3.58	3.32
FCO	27,118	25,566	87	90	52%	52%	64%	65%	3.54	3.36
FRA	49,360	48,569	108	107	82%	83%	73%	70%	3.59	3.36
GVA	7,764	7,488	45	46	85%	86%	49%	48%	n/a	3.40
HEL	10,004	9,972	60	60	69%	70%	69%	68%	4.28	4.05
LGW	32,066	31,182	123	124	91%	90%	46%	46%	n/a	3.58
LHR	64,607	60,743	138	131	88%	89%	48%	48%	3.64	3.40
MAN	18,820	19,555	95	99	82%	83%	50%	52%	4.18	3.93
MUC	23,153	23,647	73	70	63%	64%	60%	59%	3.82	3.82
MPX	20,717	18,570	83	78	73%	76%	71%	71%	3.43	3.27
OSL	14,232	13,993	70	71	47%	48%	54%	52%	3.98	3.76
VIE	11,940	11,853	58	58	95%	95%	78%	77%		3.64
ZRH	22,627	21,013	69	68	94%	94%	53%	52%	3.99	3.72





## Sample airport characteristics – Asia Pacific

Airport	Total Passengers (000's)		Passengers/ Movement		% International Passengers		% Aeronautical Revenues		Customer Satisfaction*	
	2,000	2,001	2,000	2,001	2,000	2,001	2,000	2,001	2,000	2,001
BKK	23,534	30,624	166	152	69%	70%	44%	44%	3.60	3.46
HKG	29,610	32,553	175	157	100%	100%	62%	60%	4.03	3.92
KIX	20,576	19,342	166	157	57%	55%	47%	44%	3.87	3.87
KUL	14,733	14,539	134	128	70%	69%	58%	58%	4.16	4.16
PEK	21,691	24,176	116	109	26%	25%	61%	61%	2.99	2.99
SEL	36,727	22,062	155	136	49%	19%	31%	29%	3.09	3.09
SIN	28,618	28,094	155	148	100%	100%	42%	41%	4.31	4.16
SYD	23,800	24,303	78	83	33%	34%	33%	35%	3.82	3.87
TPE	18,681	18,461	161	149	100%	100%	65%	66%	3.27	3.35





# *Airport Productivity Analysis*

<b>Inputs</b>	<b>Outputs</b>
Labor Other non-capital (soft cost) inputs Runways Terminals Gates (Air bridges)	Aircraft movements Passengers Cargo tonnes Other revenues including concessions





# *Productivity MEASUREMENT*

- ◆ Partial Factor Productivity (PFP) Measures:
  - Labor productivity
  - Soft cost input productivity
  - Capital input productivity

*Need to go beyond PFPs*

⇒⇒ Variable Factor Productivity (VFP)  
Total Factor Productivity (TFP)



# PFP won't tell the whole story

(YVR-00 = 1.0)



	Labour		Soft Cost Input		Capital Productivity					
	Productivity		Productivity		Terminal		Gate		Runway	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
<b>North America</b>										
ATL	1.34	1.19	3.46	4.02	1.77	1.57	1.14	1.01	2.94	2.61
BOS	0.64	0.60	0.77	0.67	1.36	1.29	0.94	0.89	1.18	1.12
BWI	0.49	0.50	0.80	0.72	1.42	1.47	0.55	0.58	0.60	0.62
CLE	0.41	0.35	0.85	0.53	1.29	1.08	0.32	0.27	0.41	0.35
CLT	0.80	0.85	1.72	1.66	1.22	1.29	0.48	0.49	0.80	0.85
CVG	0.73	0.53	1.66	1.34	1.67	1.29	0.71	0.55	0.92	0.71
DCA	0.27	0.22	0.37	0.35	0.75	0.62	0.40	0.32	0.35	0.28
DEN	0.65	0.55	0.59	0.50	0.94	0.80	1.05	0.90	1.16	0.99
DFW	0.49	0.48	2.06	1.69	2.33	3.26	1.15	1.11	1.24	1.19
DTW	0.45	0.44	0.92	0.91	2.91	2.88	0.59	0.58	0.81	0.67
EWR	1.29	1.17	0.37	0.36	1.58	1.43	0.88	0.80	1.99	1.80
FLL	0.56	0.55	0.93	0.77	1.79	1.76	0.73	0.72	0.70	0.69
HNL	0.63	0.61	0.97	1.10	1.01	0.90	1.08	1.00	0.99	0.92
IAD	0.56	0.51	0.79	0.80	1.38	1.25	0.47	0.42	1.13	1.02
IAH	0.77	0.71	1.26	0.98	1.59	1.46	0.87	0.80	1.13	1.04
IND	0.55	0.53	2.88	2.23	2.54	2.45	1.28	1.24	0.77	0.74
JFK	1.20	1.03	0.26	0.24	0.80	0.68	0.58	0.50	1.54	1.32
LAS	0.39	0.37	1.29	1.02	2.02	1.92	0.70	0.67	0.95	0.90
LAX	0.51	0.45	1.09	0.84	2.86	2.60	1.58	1.44	3.32	3.03
LGA	0.71	0.74	0.24	0.27	1.14	1.26	0.49	0.54	1.00	1.11
MCI	0.35	0.35	1.00	0.80	1.15	1.13	0.38	0.38	0.47	0.46
MCO	0.72	0.61	0.60	0.49	0.75	0.64	0.79	0.68	1.43	1.22
MDW	0.24	0.26	0.56	0.44	2.93	3.19	0.56	0.61	0.19	0.21
MEM	0.89	0.91	1.60	1.45	2.13	2.17	0.76	0.78	0.64	0.65
MIA	0.50	0.41	0.62	0.63	1.60	1.37	1.17	1.00	2.79	2.39
MSP	0.94	0.80	1.73	1.26	1.70	1.44	0.71	0.60	1.65	1.40
ORD	0.78	0.73	1.09	0.88	2.32	2.17	1.18	1.11	2.03	1.90
PDX	0.83	0.86	0.78	0.72	1.12	1.06	0.79	0.75	0.72	0.69
PHL	0.49	0.49	0.77	0.71	0.65	0.66	0.67	0.68	0.90	0.90
PHX	0.73	0.75	1.22	1.23	1.19	1.17	0.87	0.89	1.63	1.67
PIT	0.47	0.49	0.36	0.38	0.91	0.94	0.37	0.38	0.56	0.58
RDU	0.54	0.56	2.62	2.40	1.75	1.83	0.48	0.51	0.61	0.64
SEA	0.43	0.43	0.78	0.67	1.50	1.49	1.10	1.09	1.95	1.94
SFO	0.47	0.38	0.82	0.53	2.07	1.84	1.39	1.24	1.57	1.39
SLC	0.43	0.42	1.31	1.31	2.29	2.30	0.54	0.54	0.57	0.57
STL	0.35	0.34	1.21	1.04	0.84	0.83	0.51	0.51	0.67	0.66
TPA	0.45	0.44	0.85	0.79	1.11	1.09	0.58	0.56	0.59	0.58
YEG	0.22	0.23	0.54	0.46	1.15	1.21	0.48	0.51	0.22	0.23
YOW	0.21	0.20	0.53	0.51	0.72	0.69	0.59	0.56	0.16	0.15
YUL	0.31	0.31	0.45	0.48	1.30	1.27	0.73	0.71	0.38	0.37
YVR	1.00	0.96	1.00	0.91	1.00	0.96	1.00	0.96	1.00	0.96
YYC	0.72	0.74	0.82	0.74	1.09	1.13	0.87	0.90	0.38	0.40
YYZ	0.60	0.56	0.66	0.53	1.16	1.18	0.86	0.88	1.13	1.15
Mean	0.61	0.57	1.05	0.94	1.51	1.47	0.78	0.74	1.07	1.00



# *Potential Reasons for the 'Gross'*

## *Productivity Differentials*

### ◆ **Potential Factors Beyond Managerial Control**

- Airport size (Scale of aggregate output)
- Average aircraft size using the airport  
(was not statistically significant)
- Share of international traffic
- Share of air cargo services
- Extent of capacity shortage - congestion delay (passenger density for terminal; non-weather delay)





*Potential Reasons for the 'Gross' Productivity  
Differentials – cont'd*

◆ **Factors within Managerial Control**

- Emphasis on commercial activities (non-aeronautical)
- Quality of Service (incl. passenger satisfaction)
- The Extent of outsourcing activities

◆ ***Managerial and technical efficiency  
(which we are trying to measure)***

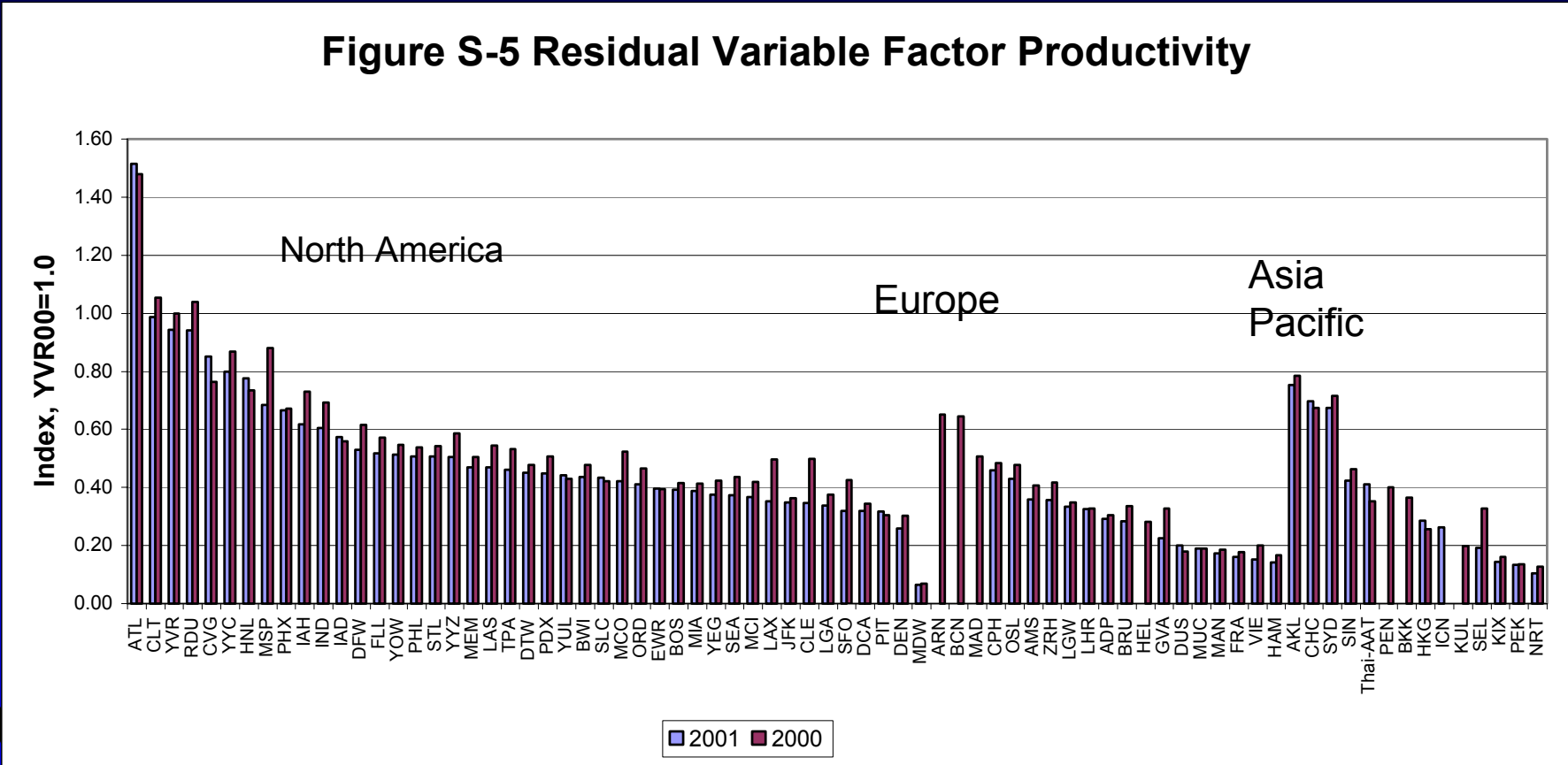
⇒⇒ We compute 'residual (net)' productivity  
measures after removing effects of the Factors  
Beyond Managerial Control



# Residual VFP (YVR 00=1)



## Figure S-5 Residual Variable Factor Productivity

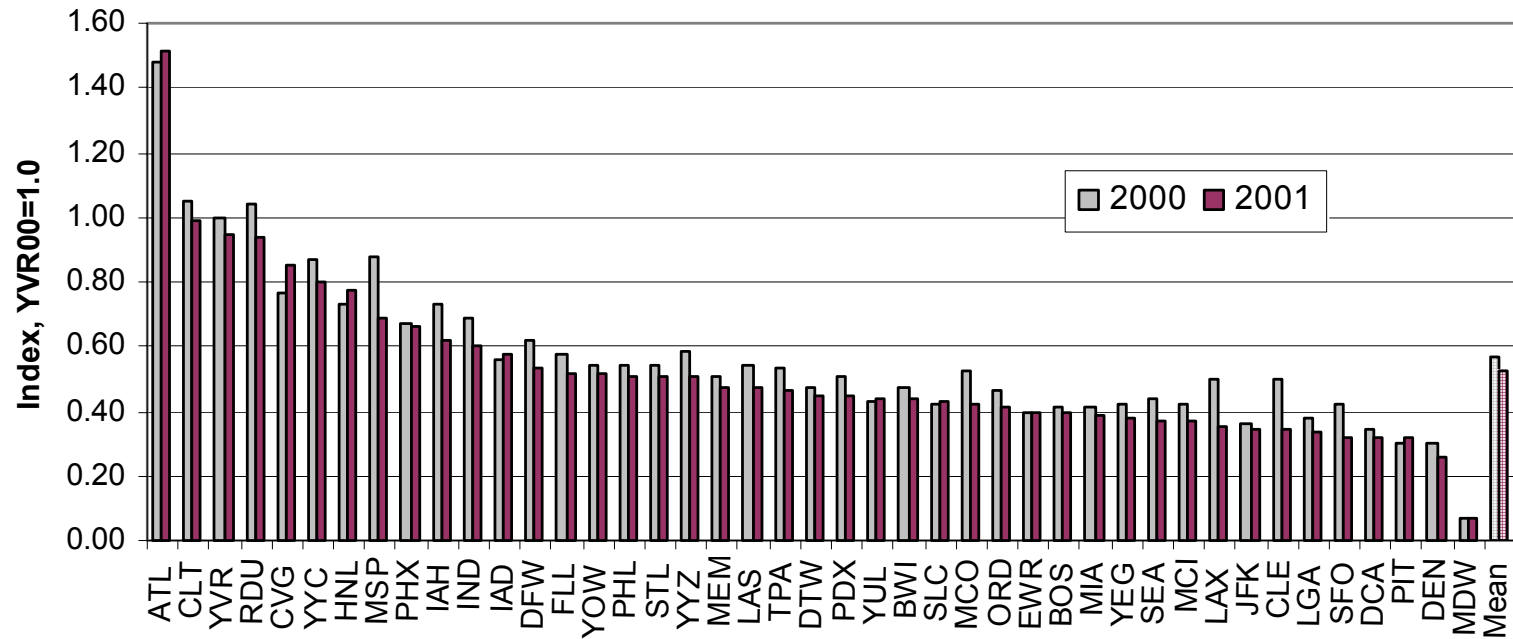




# N. America - RVFP (YVR 00=1)



Figure S-7 Residual Variable Factor Productivity  
North America

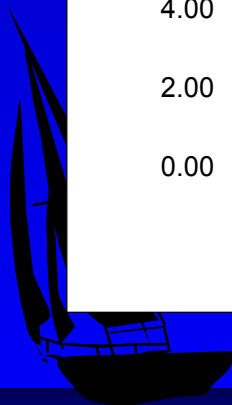
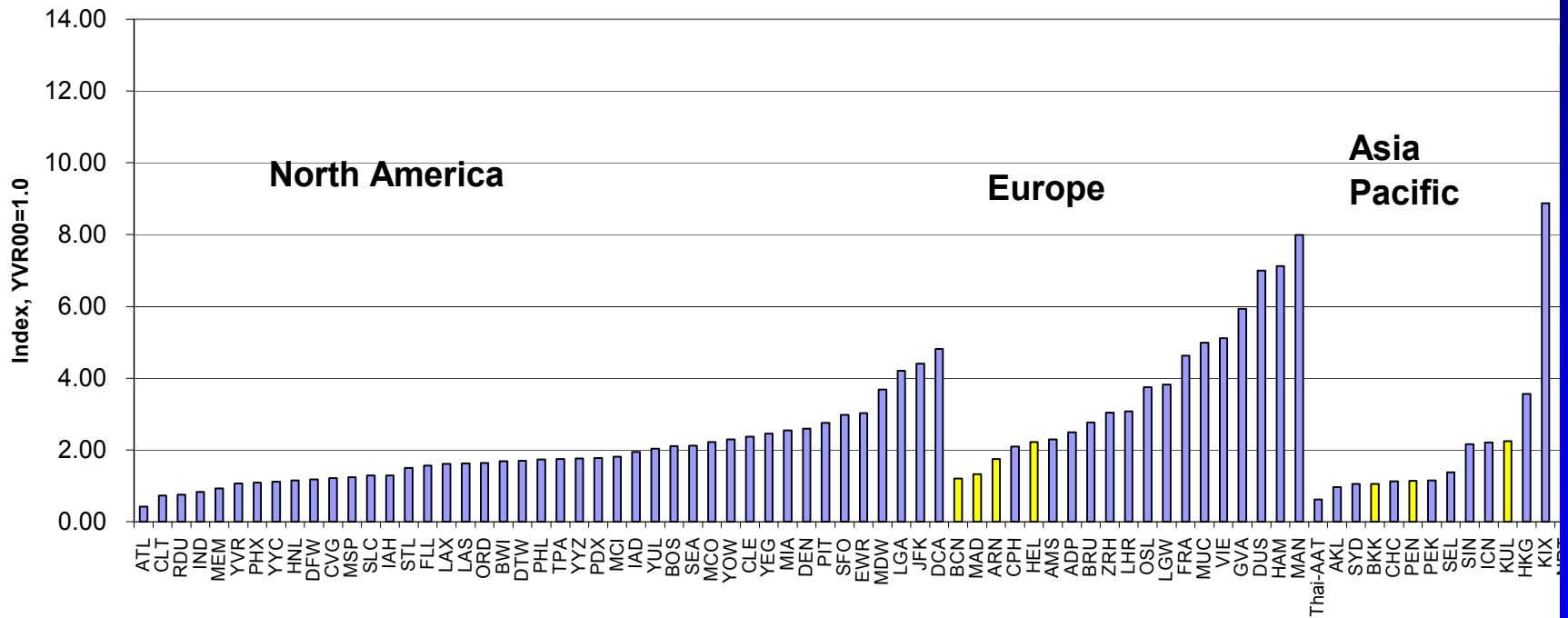


# Unit Variable Cost Index

(YVR00=1)



Figure S-8 Unit Variable Cost Index, 2001



# ***Cost Competitiveness***



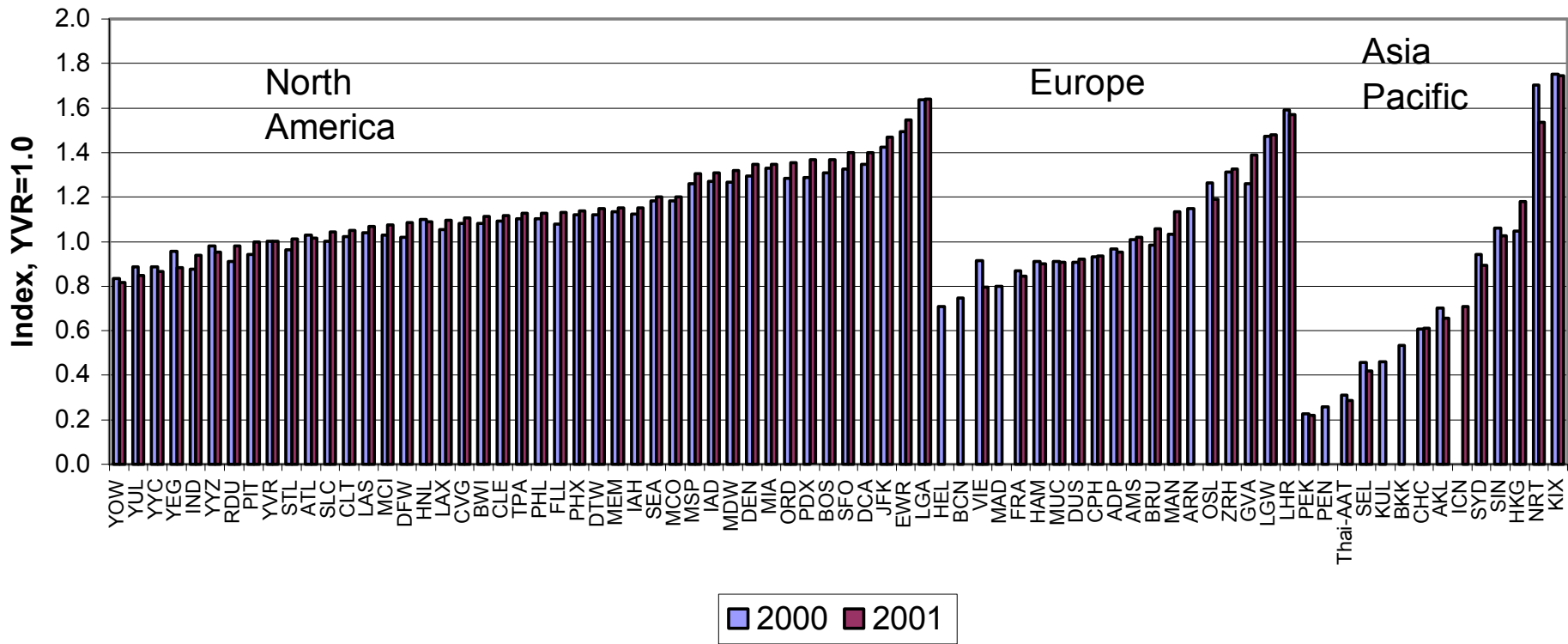
- ◆ **Productive Efficiency – Residual VFP**
- ◆ **Variable Input Prices**



# Variable Input Price (YVR=1)



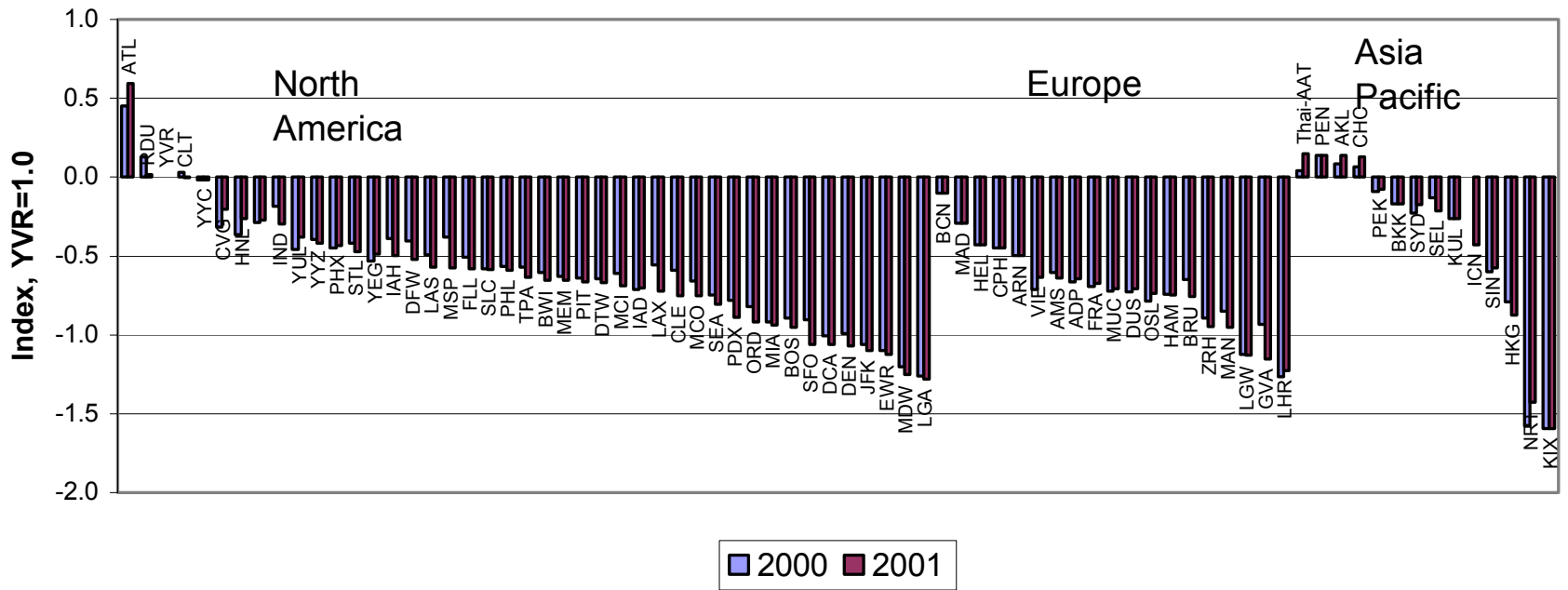
## Variable Input Price Index



# Cost Competitiveness (YVR=0)



**Cost Competitiveness Indicator**  
% above or below YVR



# **Top Performers**

*based on residual VFP, residual TFP, CC*

## **Residual VFP (Labor+Soft cost inputs only):**

- ◆ Atlanta, Charlotte, Vancouver, RDU, CVG, Calgary
- ◆ Auckland, Christchurch, Sydney
- ◆ (Arlanda, Barcelona, Madrid), Copenhagen, Oslo, Amsterdam,

## **Residual TFP**

- ◆ Atlanta, Raleigh-Durham, Indianapolis, Vancouver, PHX, YYC
- ◆ (BCN, ARN), Gatwick, (MAD), Zurich, Oslo, Heathrow, Copenhagen
- ◆ Auckland, Sydney, Kansai, Christchurch

## **Cost Competitiveness**

- ◆ Atlanta, Raleigh-Durham, Vancouver, Charlotte, Calgary
- ◆ (Barcelona, Madrid), Helsinki, Copenhagen
- ◆ Thai-AAT, Auckland, Christchurch, Beijing,

# Future Efforts



- ◆ Airport user charges
- ◆ Service quality performance
- ◆ Impacts of increased airport security on productivity and cost measures
- ◆ *Identify areas for managerial improvement, and how?*



# *ATRS Benchmarking Work*



- ◆ Task Force members are experts in cost, productivity measurement work;
- ◆ The project expenses financed entirely by report sales – 400+ pages; US\$300
  - vol. 1: Executive Summary
  - vol. 2: Main Text and Analysis
  - vol. 3: airport profiles; methodologies
- ◆ **ATRS Corporate member price: US\$210**  
ATRS Corporate membership:
  - One Year: US\$ 500; Two year \$1,000
  - Permanent Membership: US\$2,000





# *ATRS Annual Conferences*



- ◆ Vancouver (1997); Dublin (1998); Hong Kong (1999); Amsterdam (2000); Seoul (2001); Seattle (2002); Toulouse (2003)
- ◆ Istanbul (1-3, July, 2004);  
Rio de Janeiro (July, 2005)
- ◆ Details on ATRS activities are available on  
[www.atrsworld.org](http://www.atrsworld.org)





*Thank You*

