

ATRS Global Airport Benchmarking Report 2003

Presented to
Pacific Economic Cooperation Council (PECC) Conference, 5-6
September, 2003, Singapore

The Global Airport Benchmarking Task Force
of Air Transport Research Society (ATRS)

www.atrsworld.org

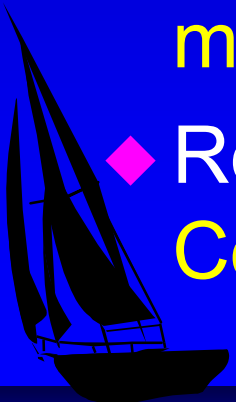
Asia Pacific: Peter Forsyth, Yuichiro Yoshida, Yeong-Heok Lee;
Europe: Jaap de Wit, Eric Pels, Keith Mason, Nicole Adler,
North America: David Gillen, Tae Oum, Bijan Vasigh, Chunyan Yu
Project Coordinator: Tae Oum



Outline



- ◆ Objective of the Study; Sample Airports
- ◆ **Comments on Previous Studies - Methods** for Measuring and Comparing Efficiency and Cost Performance
- ◆ **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 variables beyond managerial control.





Most Previous Studies

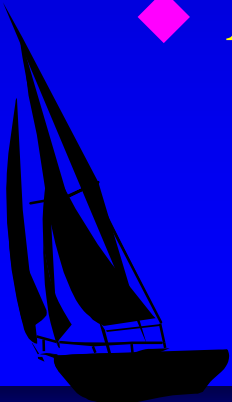
- ◆ Limited to analysis of airports in a certain country or continent.
- ◆ Used less than comprehensive measures;
- ◆ Ignored Multiple Outputs/Services –especially ignoring Non-Aeronautical Services (Commercial; Development, etc)
- ◆ Ignored so-called **soft-cost inputs** including outsourcing services
- ◆ Did not control for the factors beyond managerial control





New in 2003 Report

- ◆ Covers 2000 and 2001, and new airports added (2002 reports covers 1999 only)
- ◆ Variable factor productivity (VFP)
- ◆ Cost competitiveness indicator
- ◆ A brief survey of air travel security charge.



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
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
Europe										
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
MXP	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



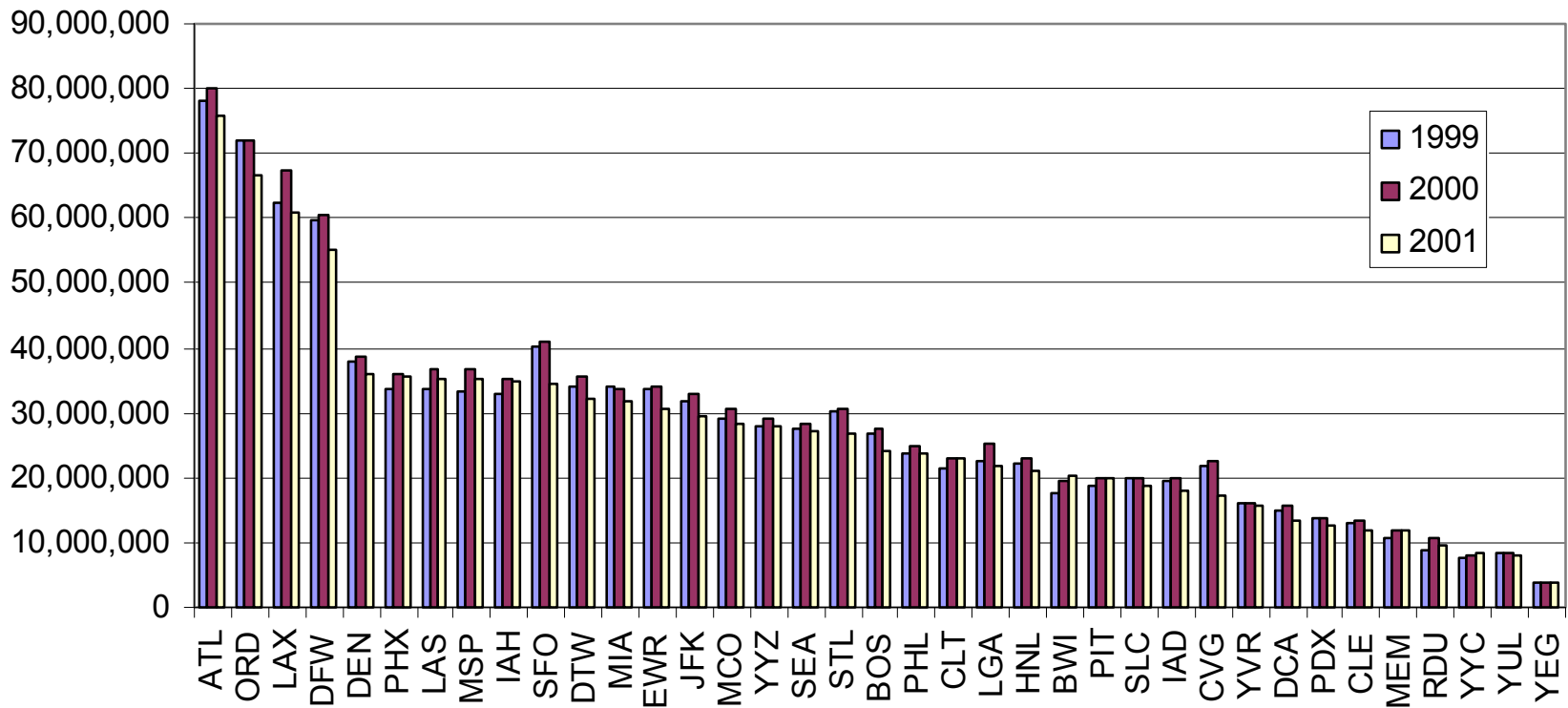


Sample airport characteristics – Asia Pacific

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



Figure 34.1 Passenger Traffic: 1999-2001
North America



**Figure 3.4.1 Passenger Traffic 1999-2001
Europe**

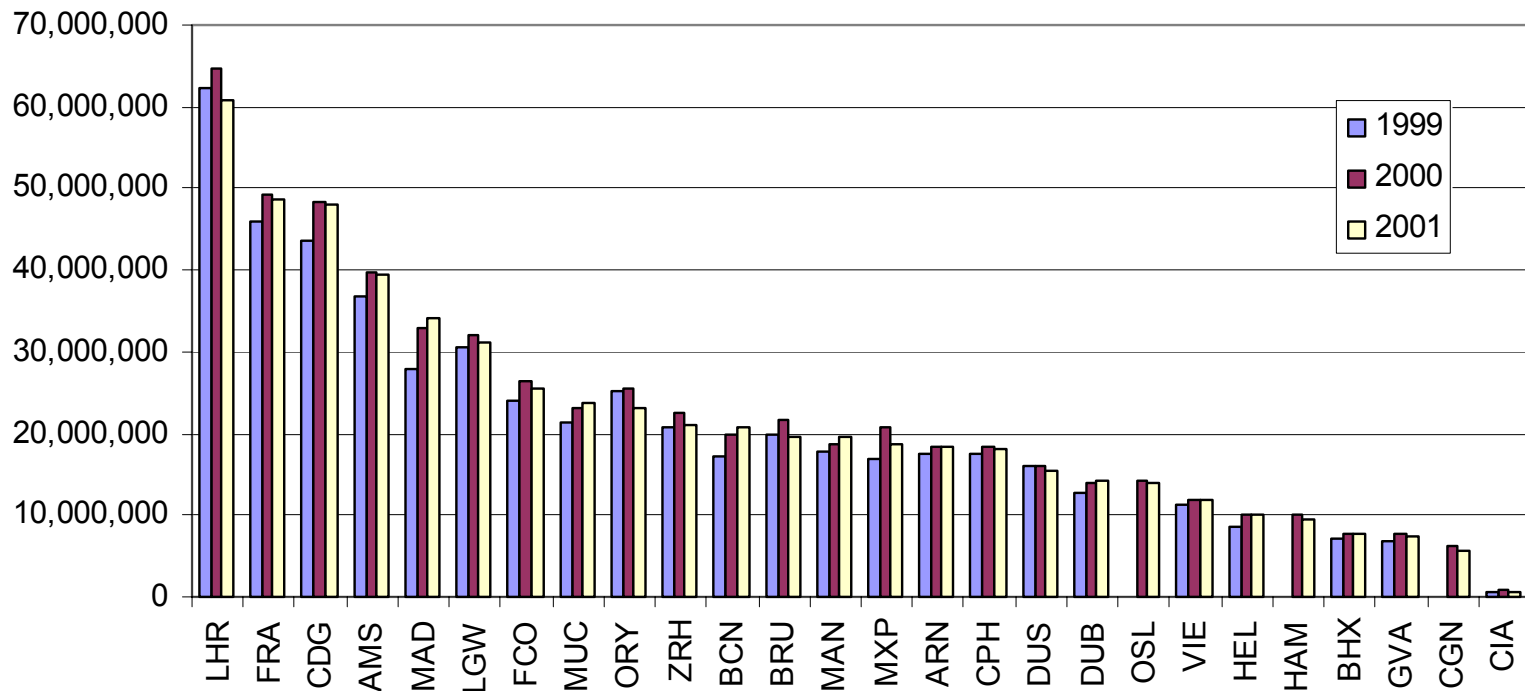
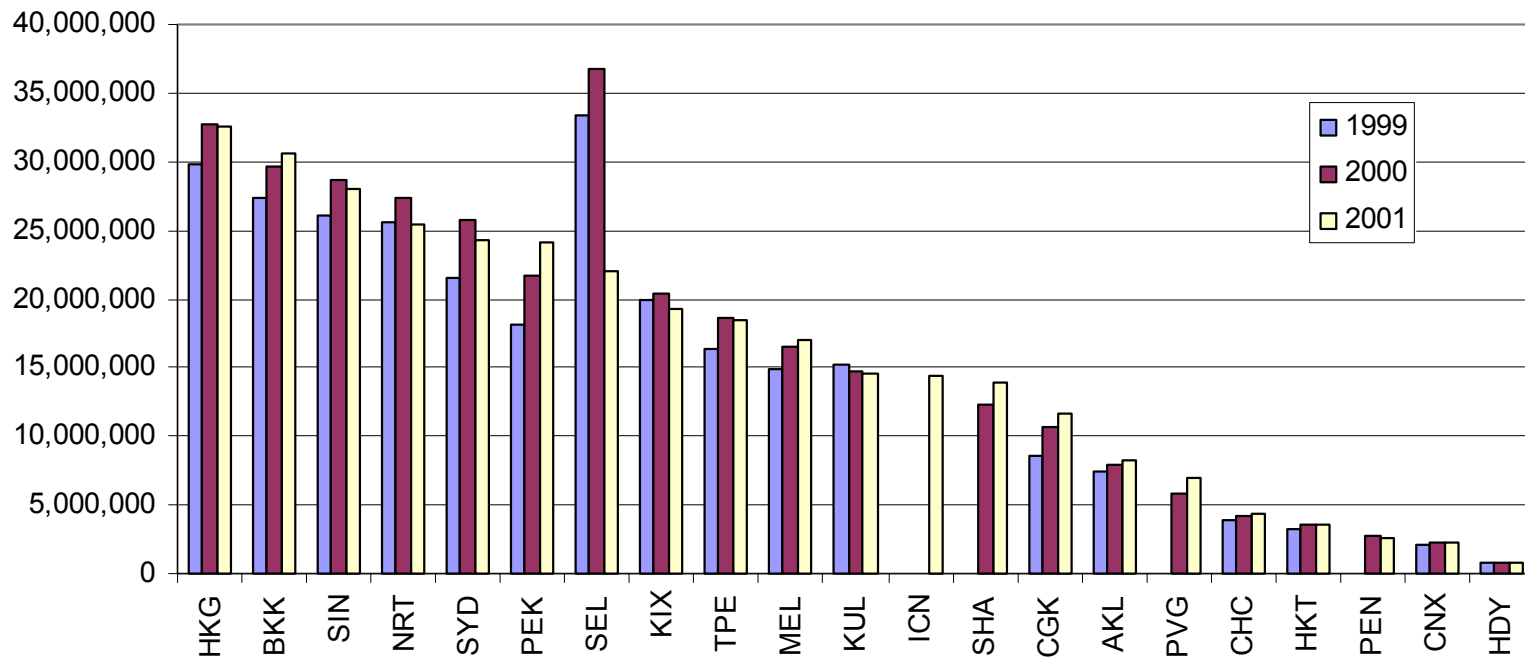


Figure 3.4.1 Passenger Traffic 1999- 2001
Asia Pacific





**Figure 3.4.1d Percent Change in Passenger Traffic 2001 over 2000:
North America**

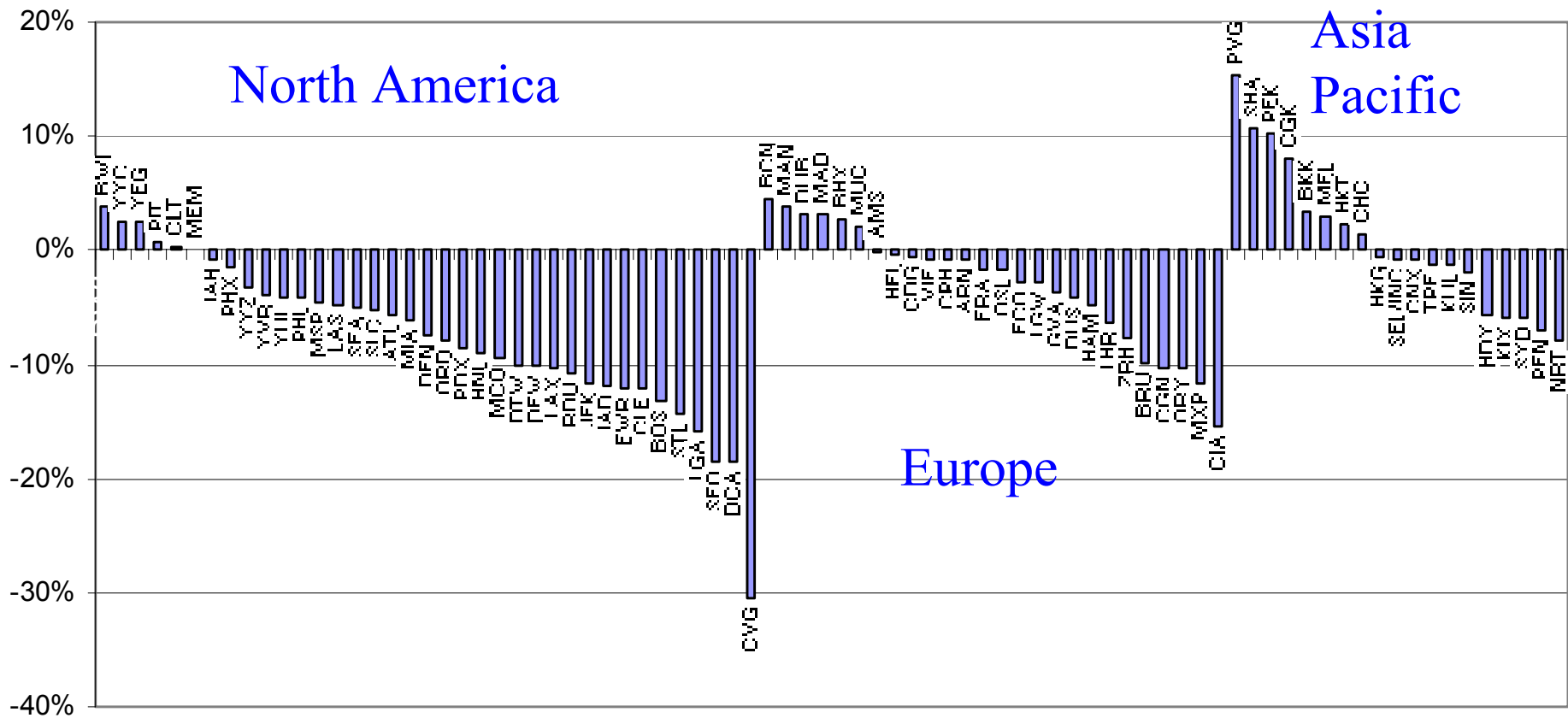
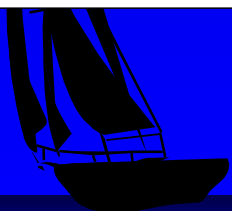
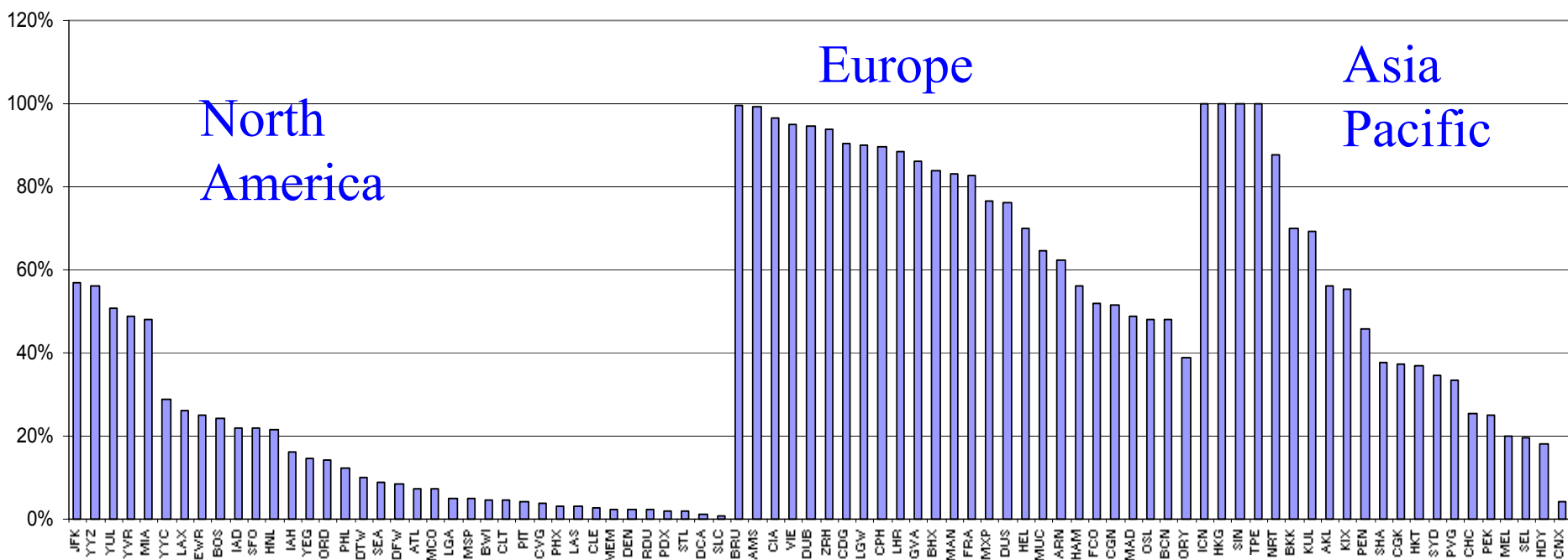




Figure 3.4.1 Share of International Passengers 2001:



Sample airport characteristics

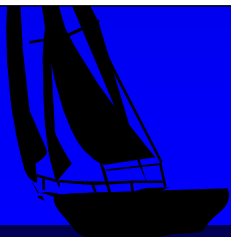
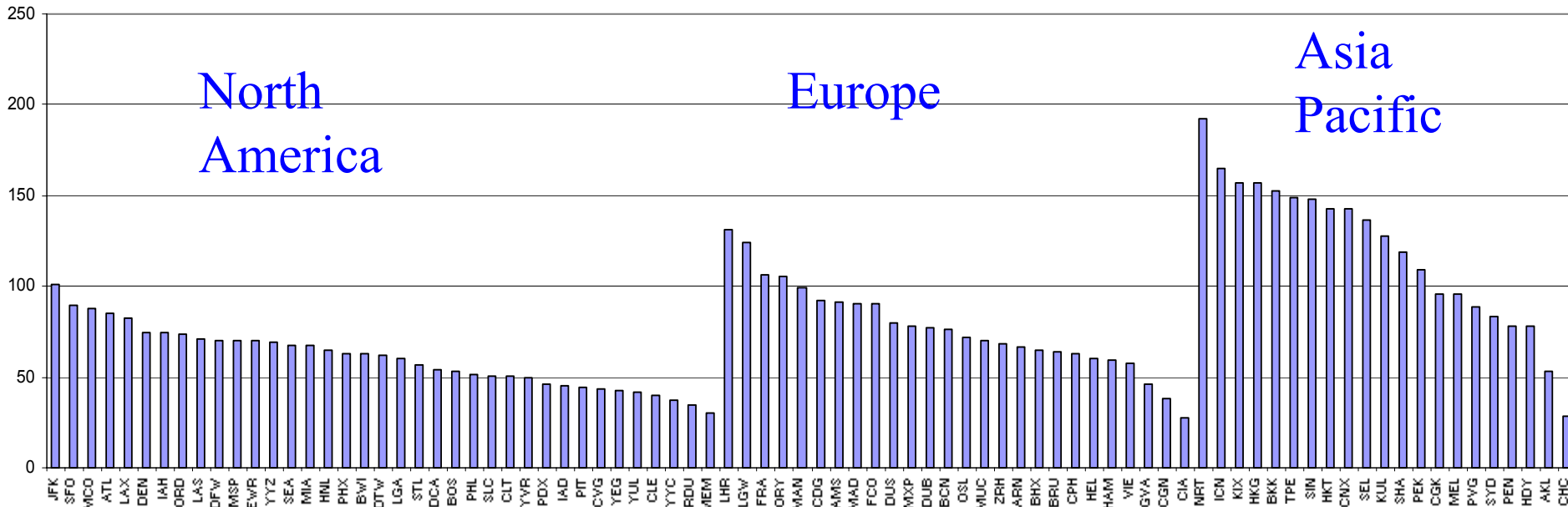


Figure 3.4.5 Passengers per Aircraft Movement 2001:

North
America

Europe

Asia
Pacific





Airport Productivity Analysis

Inputs	Outputs
Labor Other non-capital (soft cost) inputs Runways Terminals Gates (Air bridges)	Aircraft movements Passengers Cargo 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)



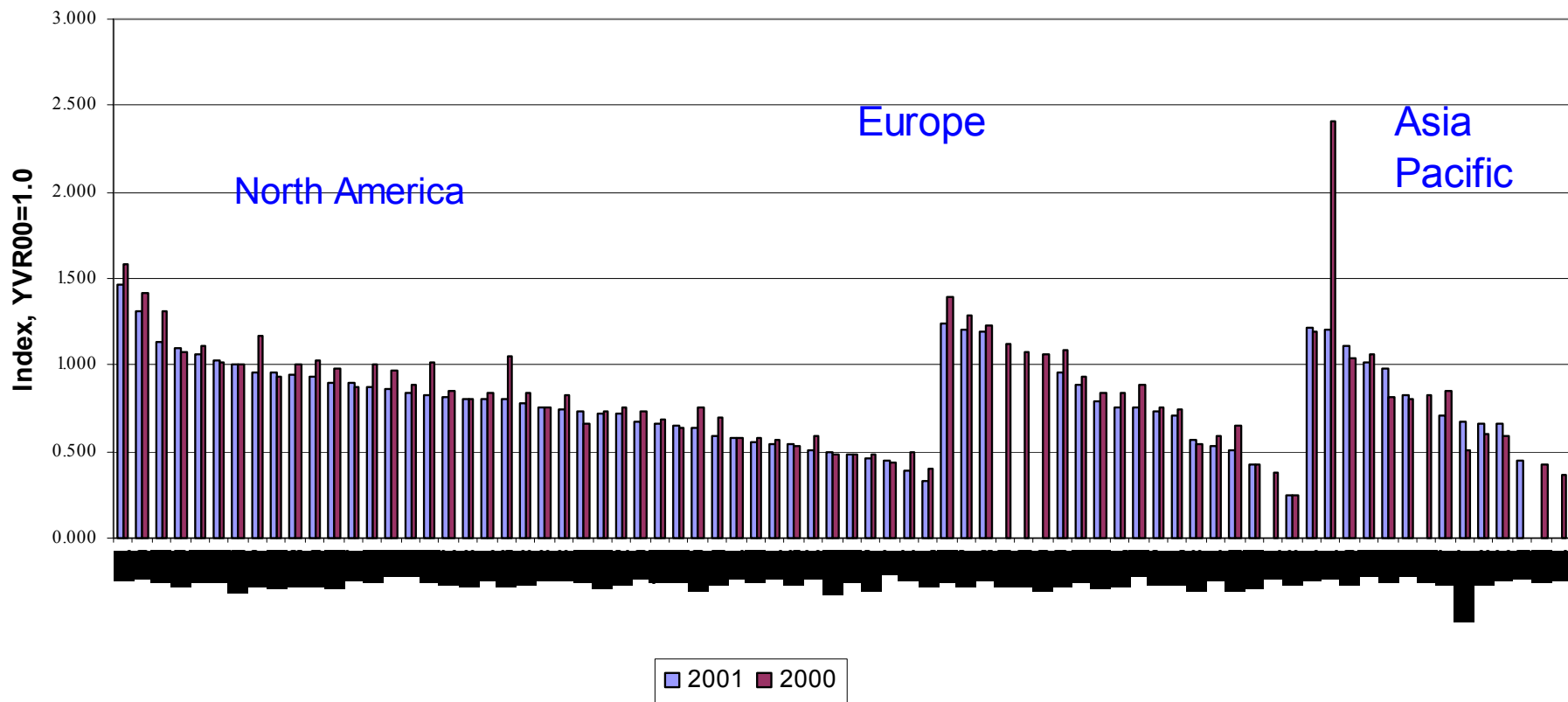
PFP won't tell the whole story

(YVR-00 = 1.0)

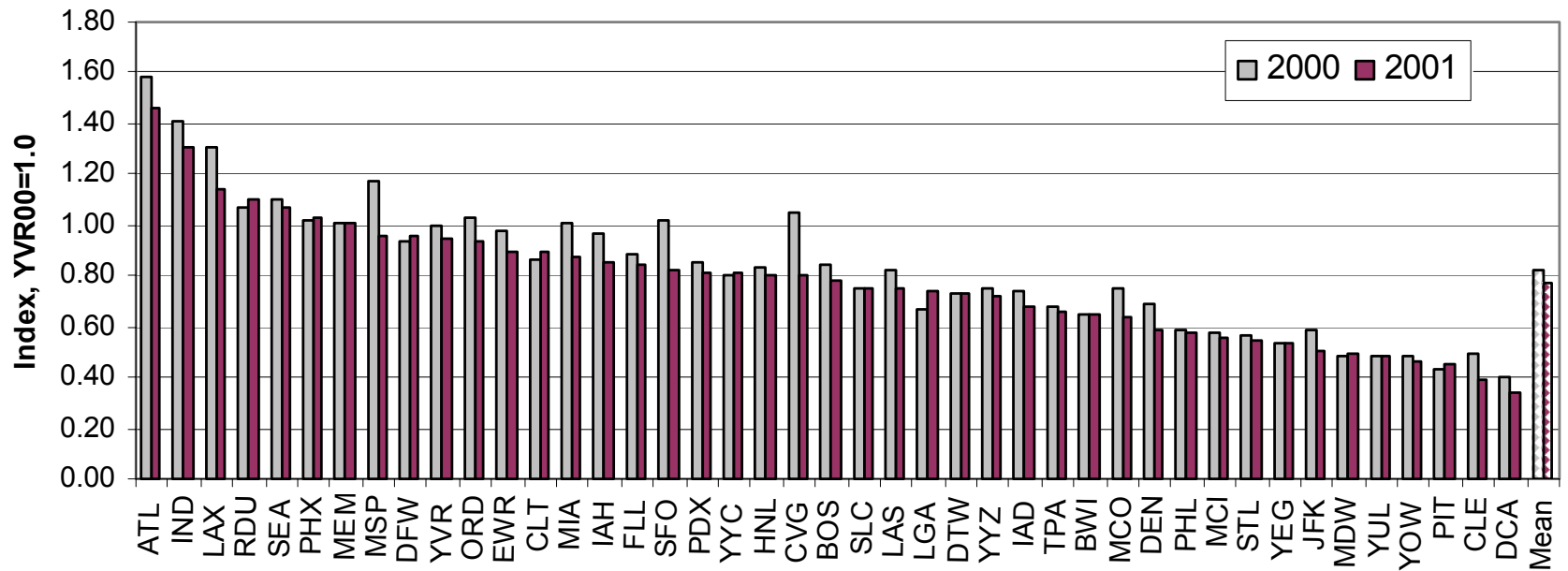
	Labour Productivity		Soft Cost Input Productivity		Capital Productivity					
	2000	2001	2000	2001	Terminal		Gate		Runway	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
North America										
ATL	1.34	1.19	3.46	4.02	1.77	1.57	1.14	1.01	2.94	2.61
BOS	0.64	0.60	0.77	0.67	1.36	1.29	0.94	0.89	1.18	1.12
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

Gross TFP

Figure S-6 Gross Total Factor Productivity



**Figure 4.3.2a Total Factor Productivity
North America**



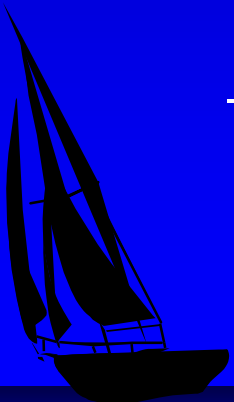
Potential Reasons for the 'Gross'

Productivity Differentials



◆ **Potential Factors Beyond Managerial Control**

- Airport size (Scale of aggregate output)
- Average aircraft size using the airport
- Share of international traffic
- Share of air cargo services
- Extent of capacity shortage - congestion delay



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

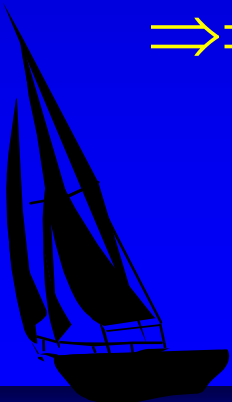


◆ **Factors within Managerial Control**

- 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





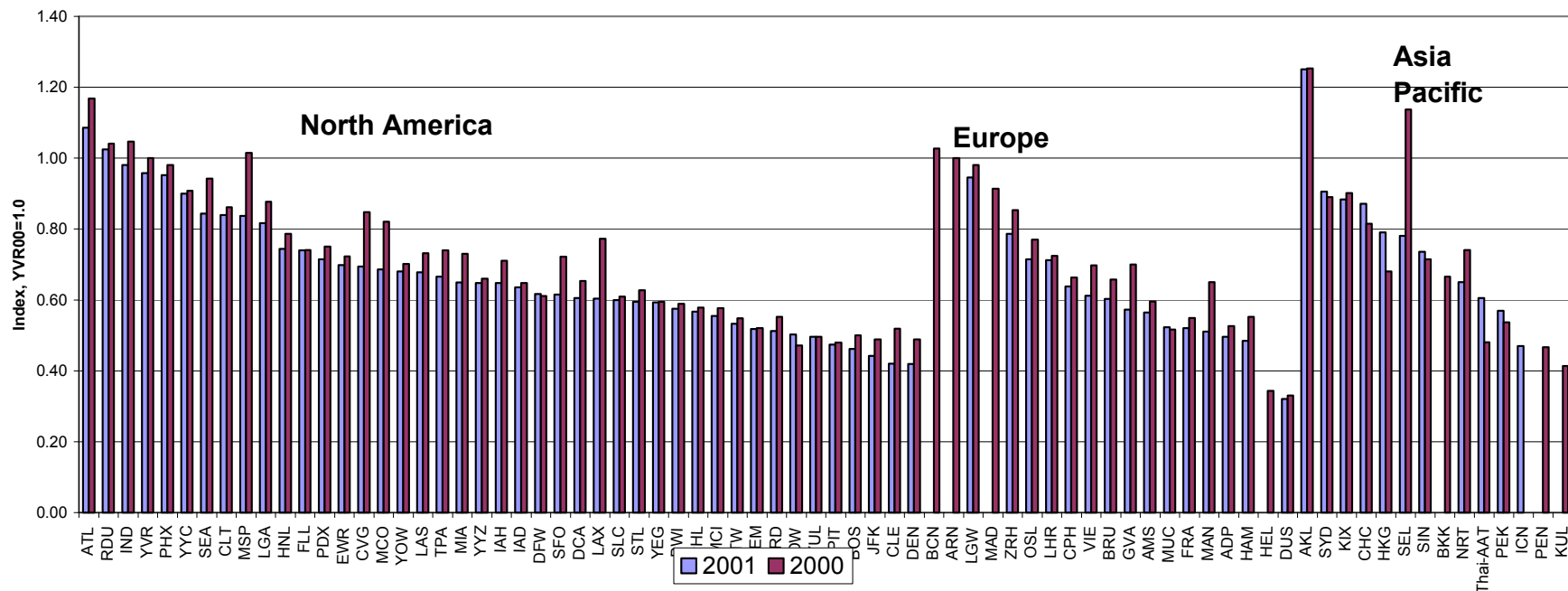
Factors affecting 'Gross' TFP

	<i>Coefficients</i>	<i>T-Value</i>
Intercept	0.897	8.750
Airport Size	0.146	5.732
%NonAviation	0.113	2.464
Terminal Operators	0.101	2.068
%Cargo	0.155	6.477
Capacity Constraints	0.248	7.871
R Square	0.480	
Observations	196	



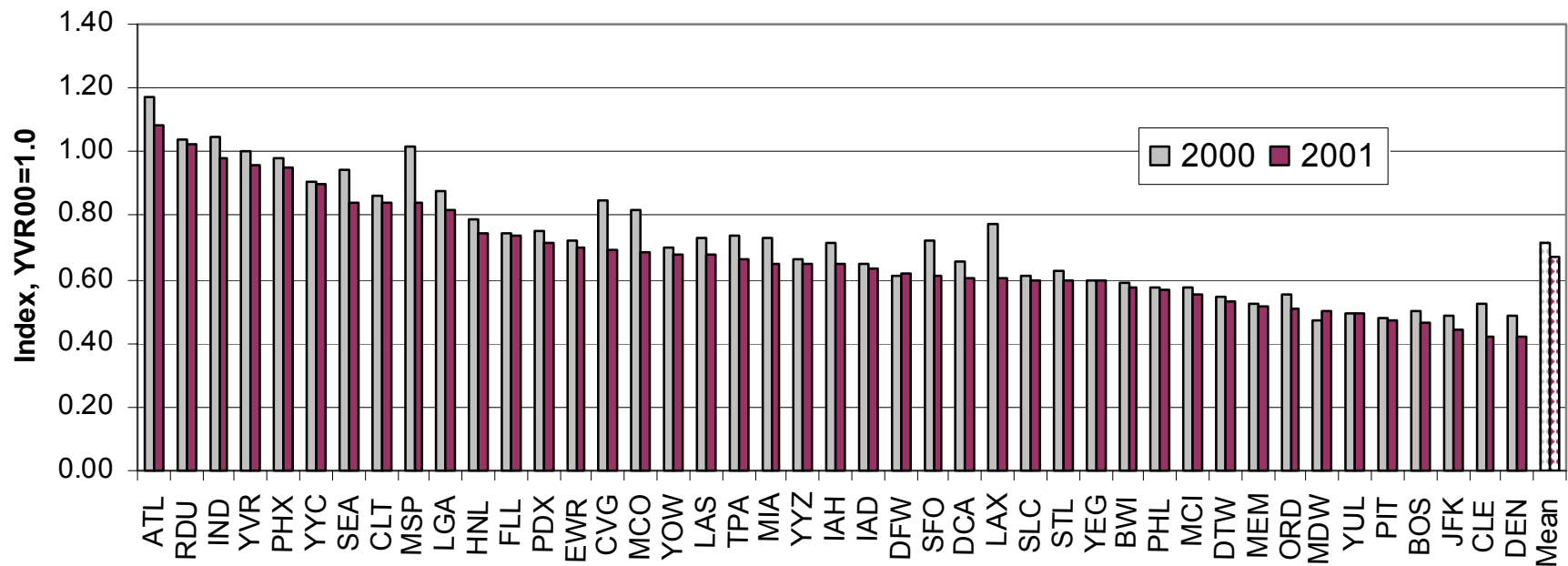
Residual TFP (YVR00=1)

Figure S-7 Residual Total Factor Productivity



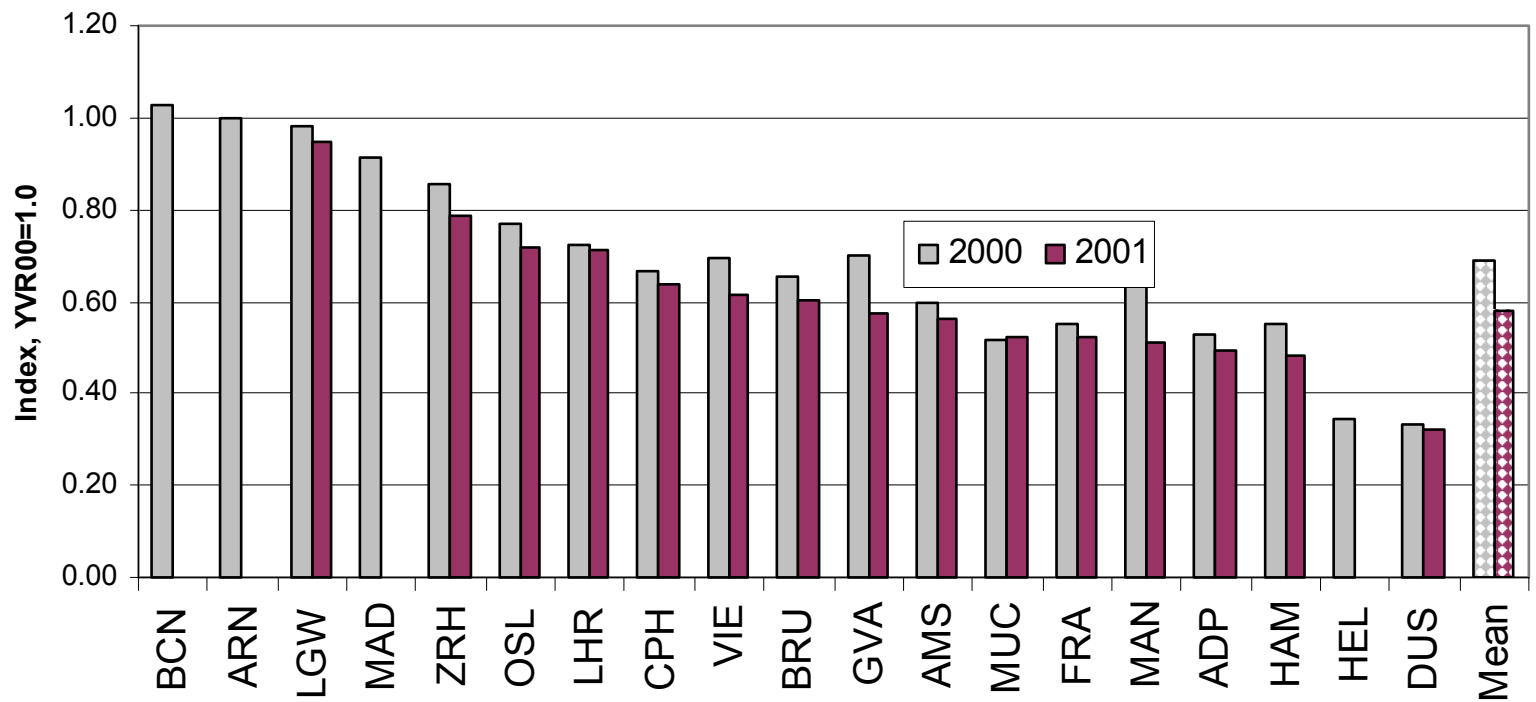
North America RTFP (YVR00=1)

Figure S-12 Residual Total Factor Productivity
North America



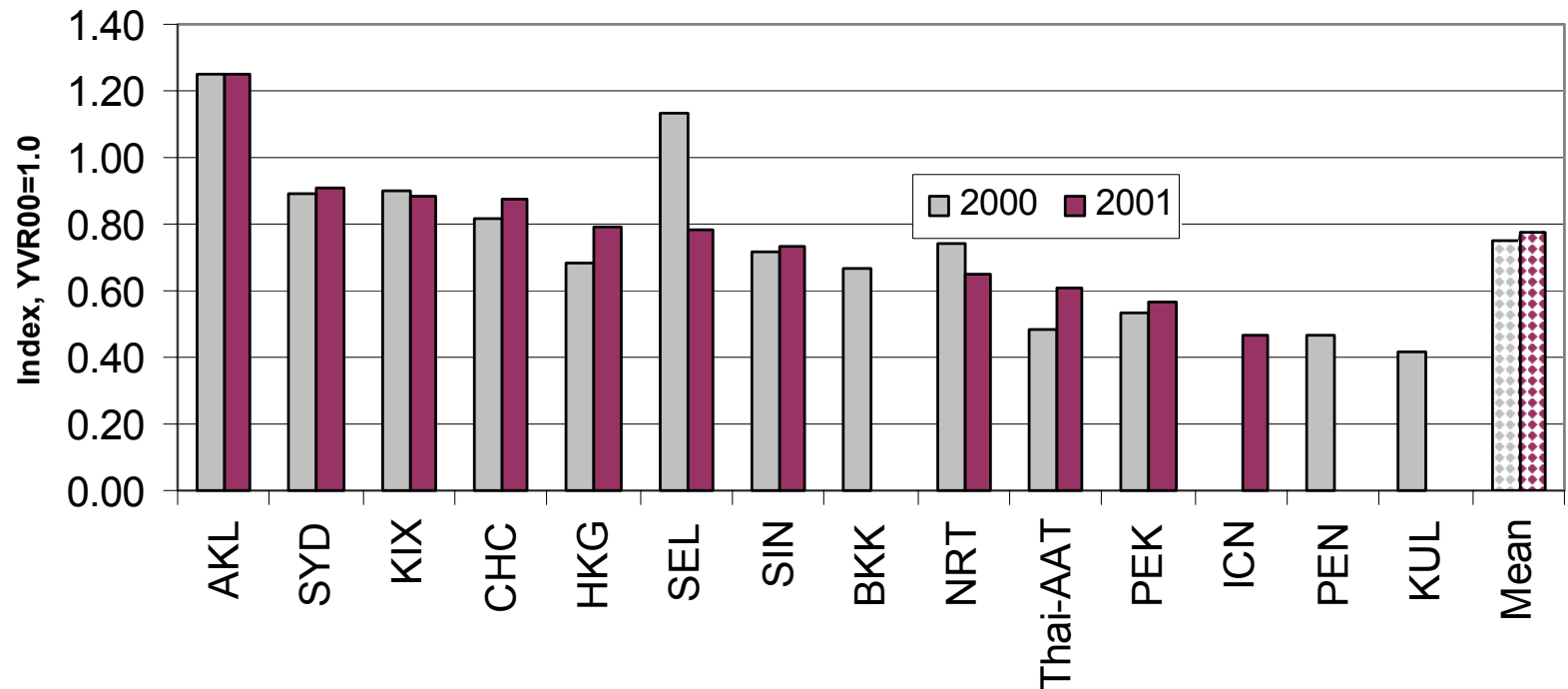
Europe RTFP (YVR00=1)

Figure S-11 Residual Total Factor Productivity
Europe



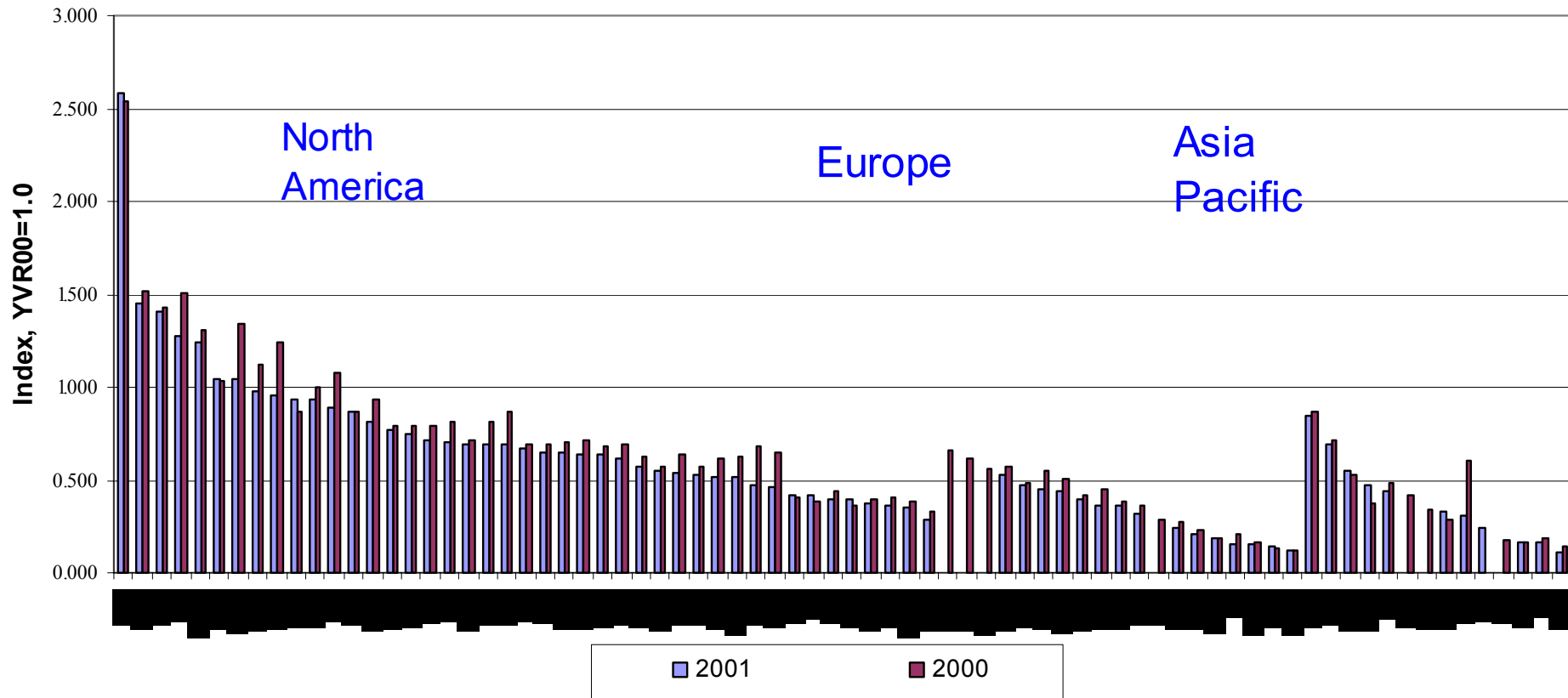
Asia Pacific RTFP (YVR00=1)

Figure S-10 Residual Total Factor Productivity
Asia Pacific

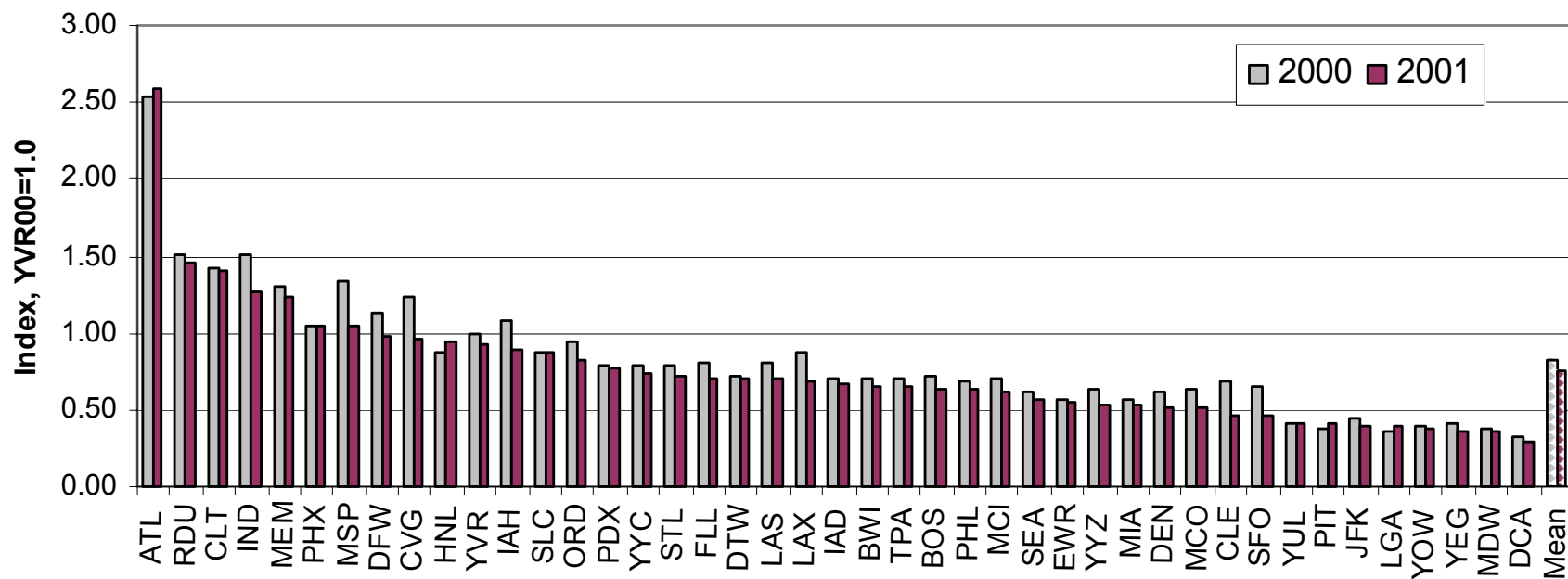


Gross VFP

Figure S-4 Gross Variable Factor Productivity



**Figure 4.3.1a Variable Factor Productivity
North America**





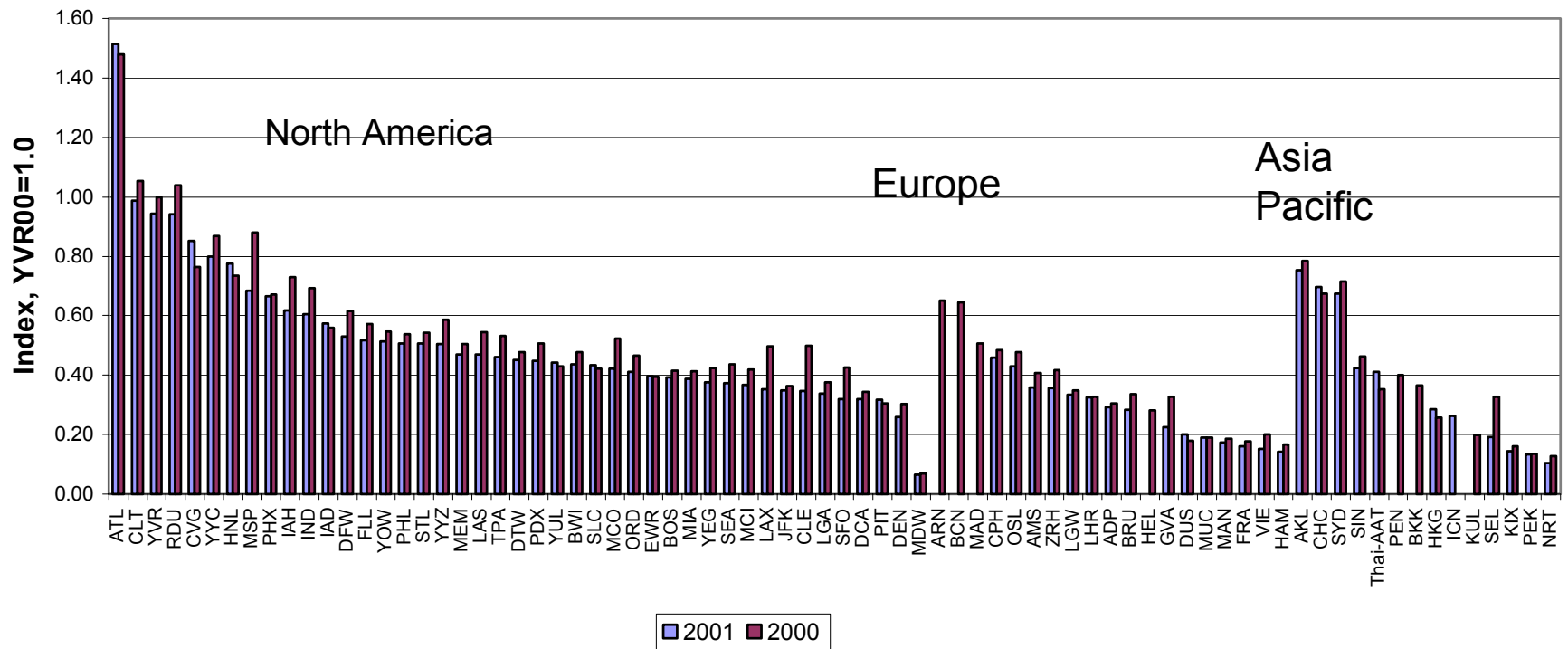
Factors affecting 'Gross' VFP

	<i>Coefficients</i>	<i>T-Value</i>
Intercept	0.035	0.173
Airport Size	0.159	3.264
%International	-0.142	-6.137
%NonAviation	0.413	4.714
Terminal Operators	0.308	3.302
%Cargo	0.151	3.103
Capacity Constraints	0.177	2.816
R Square	0.380	
Observations	196	



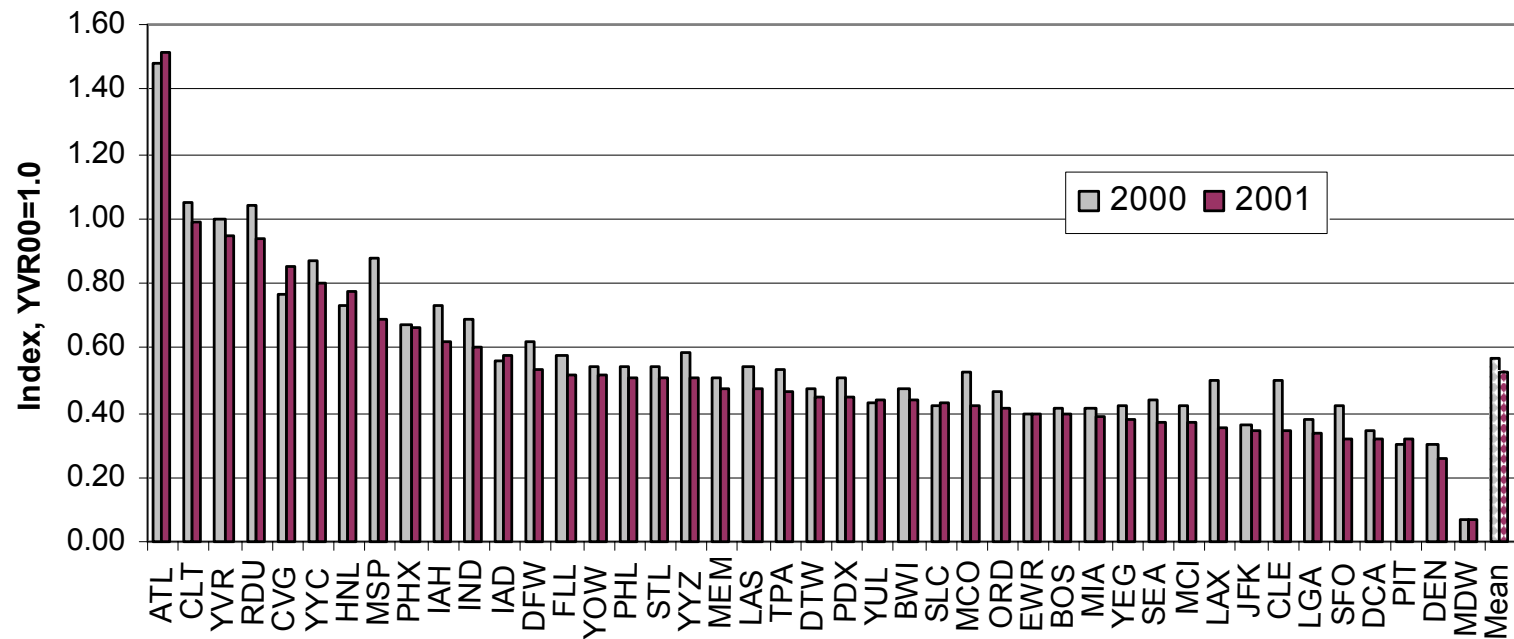
Residual VFP (YVR00=1)

Figure S-5 Residual Variable Factor Productivity



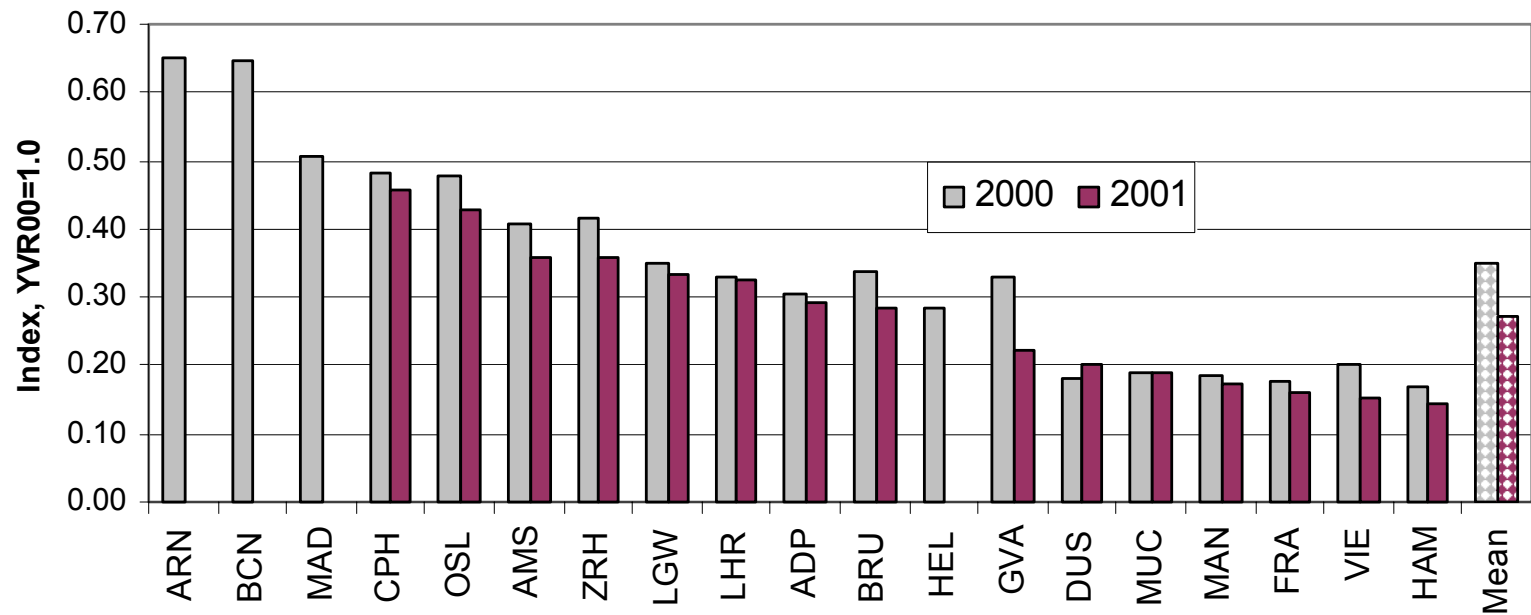
North America RVFP (YVR00=1)

Figure S-7 Residual Variable Factor Productivity
North America



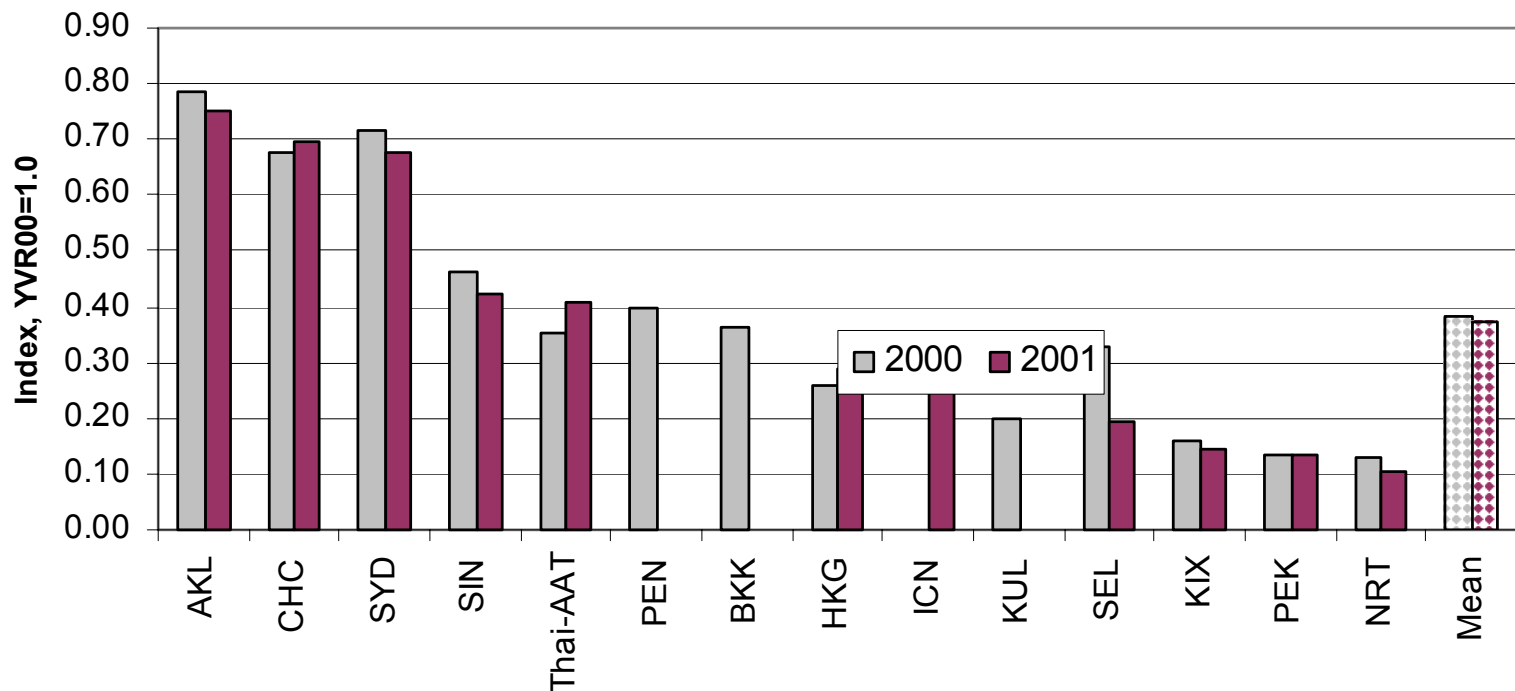
Europe RVFP (YVR00=1)

Figure S-6 Residual Variable Factor Productivity
Europe



Asia Pacific RVFP (YVR00=1)

Figure S-5 Residual Variable Factor Productivity
Asia Pacific



Cost Competitiveness

determined by two factors

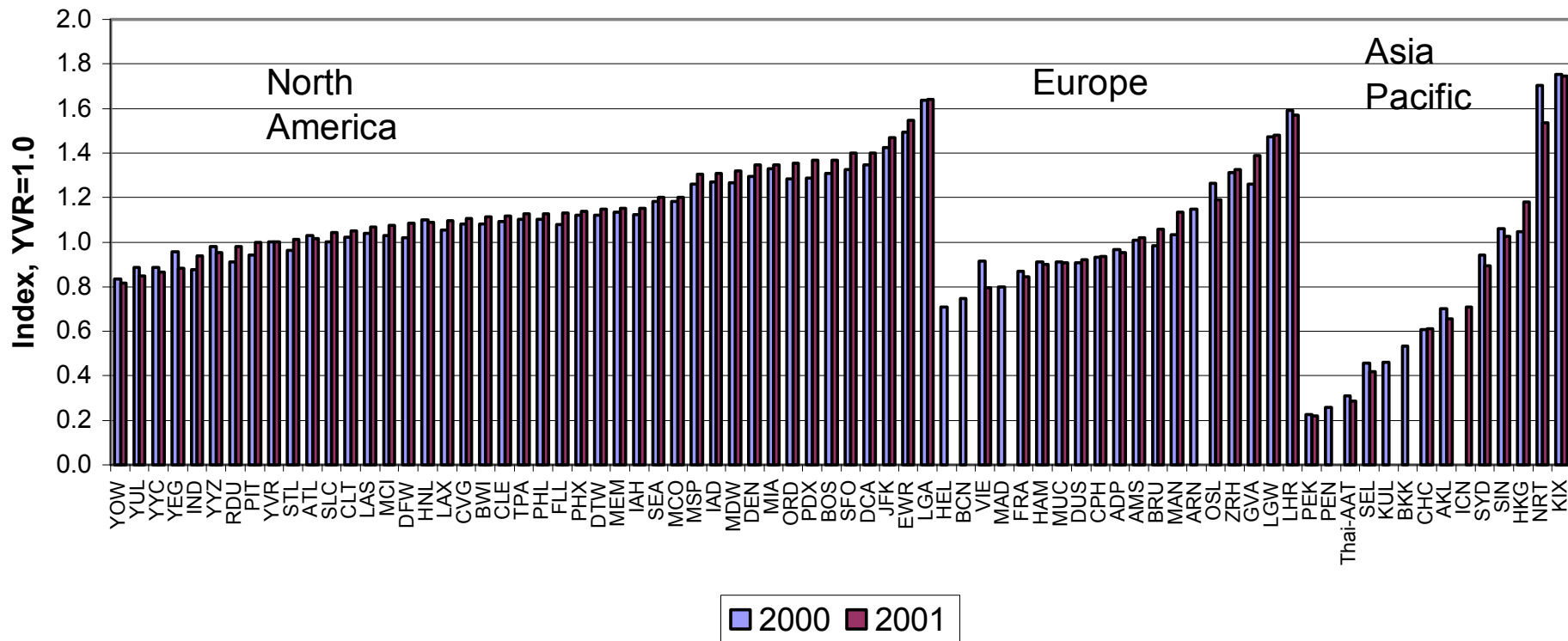
- ◆ **Productive Efficiency – Residual VFP**
- ◆ **Variable Input Prices**



Variable Input Price (YVR=1)

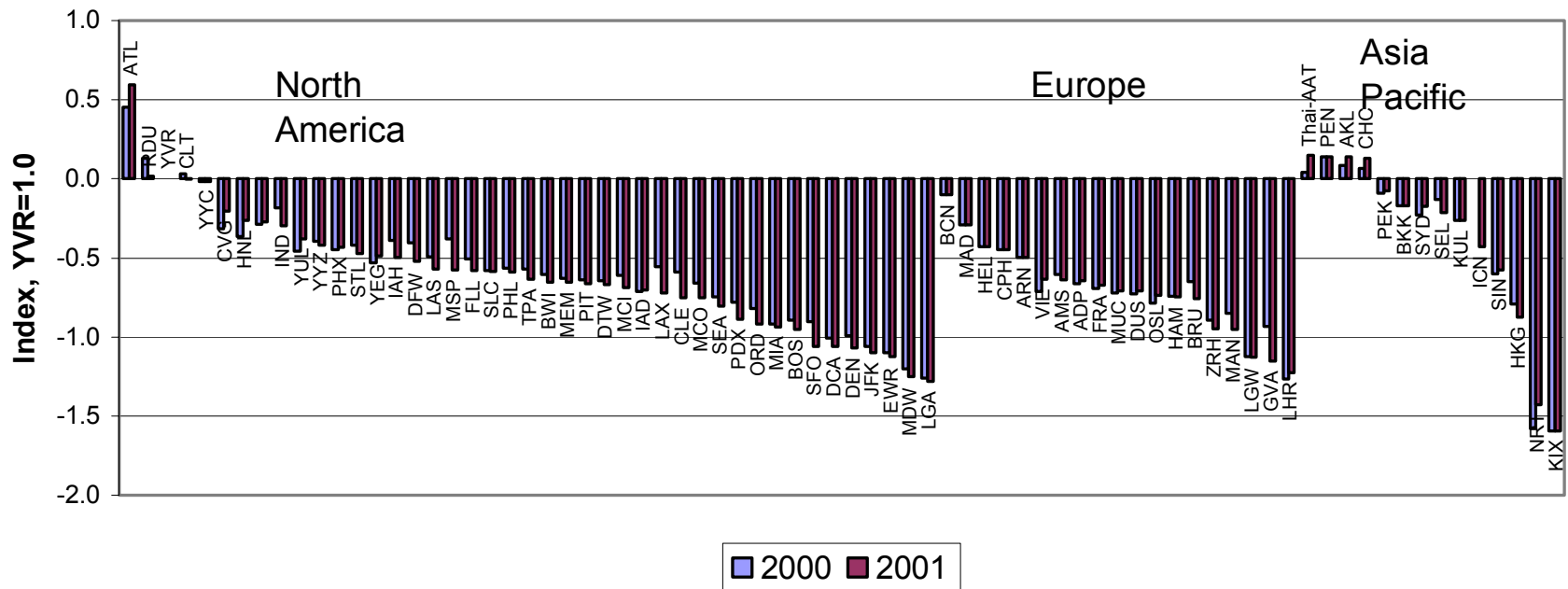


Variable Input Price Index



Cost Competitiveness (YVR=0)

Cost Competitiveness Indicator
% above or below YVR



Top Performers



based on residual TFP, residual VFP, CC

Residual VFP (Labor+Soft cost inputs only):

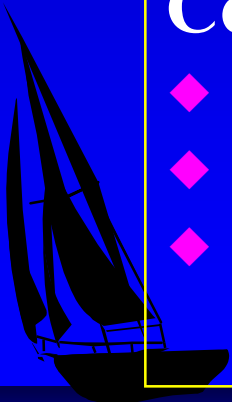
- ◆ Atlanta, Charlotte, Vancouver, RDU, CVG, Calgary
- ◆ Auckland, Christchurch, Sydney
- ◆ (Arlanda, Barcelona, Madrid), Copenhagen, Oslo, Amsterdam,

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



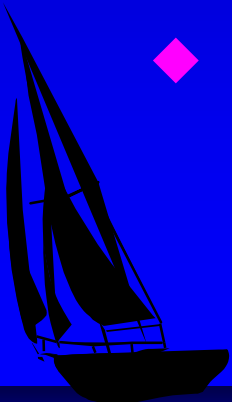
- ◆ Benchmark airport charges
- ◆ further explore airport quality performance
- ◆ Measure the impact of increased airport security and safety measures on various performance measures
- ◆ Identify areas for managerial improvement, and how?



ATRS Benchmarking Work



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



ATRS Annual Conferences



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





Thank You

