Key Findings: 2013 ATRS Global Airport Performance Benchmarking Project

Tae Hoon Oum

Yap Yin Choo

Chunyan Yu

Embry-Riddle Aeronautical University, yuc@erau.edu

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2013 ATRS Global Airport Performance Benchmarking Project

Key Findings

Prof. Tae Hoon Oum, Dr. Yap Yin Choo, Prof. Chunyan Yu

ATRS Global Airport Benchmarking Task Force:
Asia Pacific: P. Forsyth, Xiaowen Fu, Yeong-Heok Lee, Yuichiro Yoshida, Japhet Law, Shinya Hanaoka
Europe: Nicole Adler, Jaap de Wit, Hans-Martin Niemeier, Eric Pels
North America: Tae Oum, Bijan Vasigh, Jia Yan, Chunyan Yu
Middle East: Paul Hooper
OBJECTIVE OF THE BENCHMARKING STUDY

- To provide a comprehensive, unbiased comparison of airport performance focusing on
  - Productivity and Operating/Mgt Efficiency
  - Unit Cost Competitiveness
  - Airport User Charges

- Our study does not treat service quality differentials across airports because of our research resource constraints
2013 ATRS Global Airport Performance Benchmarking Project

Airport Database
195 MAJOR AIRPORTS AROUND THE WORLD

- N. America, 77
- Asia Pacific, 51
- Europe, 67
- Oceania Countries (16)
- Asia (35)
- United States (65)
- Canada (12)

12 new airports
The ATRS Database contains historic information (since FY 2002) including financial data, traffic and capacity data for the major airports and airport groups in the following geographic regions:

- **Asia Pacific including Oceania; Europe; North America**
- Limited data on S. America and Africa

The data in each continent is segregated into:

- Traffic statistics and composition
- Airport characteristics (runways, terminals, ownership form, etc)
- Aeronautical Activities and Revenue
- Non-Aeronautical Activities and Revenue
- Labor input and other Operating Expenses
- Financial info obtained from Balance Sheets

Visit [http://www.atrsworld.org/Database.html](http://www.atrsworld.org/Database.html) for more details and to purchase.
2013 ATRS Global Airport Performance Benchmarking Project

Airport Characteristics
PASSENGERS TRAFFIC, FY2011
(IN ’000 PASSENGERS)
PASSENGER TRAFFIC (’000) - TOP 10 AIRPORTS:

<table>
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<th>2007</th>
<th>2009</th>
<th>2011</th>
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Objective | Data | Airport Characteristics | Methodology | Efficiency & Cost | User Charge
### AIRCRAFT MOVEMENTS, FY 2010

(‘000 ATM)

<table>
<thead>
<tr>
<th>Objective</th>
<th>Data</th>
<th>Airport Characteristics</th>
<th>Methodology</th>
<th>Efficiency &amp; Cost</th>
<th>User Charge</th>
</tr>
</thead>
</table>

#### Asia Pacific

- PEK
- HND
- CAN
- CGK
- PVG
- HKG
- SGN
- DEL
- BKK
- SYD
- KUL
- BOM
- SHA
- ICN
- SZX
- MNL
- CAN
- TPE
- AKL
- XMN
- GMP
- MAA
- KIX
- SUB
- PER
- WLG
- HKG
- NGO
- ADL
- CHC
- NKT
- PEN
- GUM
- CMB
- CNS
- MFM
- OOL
- CNX
- TSV
- DRW
- REP
- PNH
- NTL
- HDY
- DUD
- ZQN
- CEI
- CDG
- FRA
- LH
- MAD
- AMS
- MUC
- FCO
- IST
- BCN
- ZRH
- CPH
- LGW
- VIE
- BRU
- OSLO
- ORY
- DUS
- ARN
- MXP
- HEL
- PMI
- ATH
- TXL
- MAN
- DUB
- GVA
- HAM
- NCE
- PRG
- LIS
- STN
- CGN
- WAW
- LYS
- SAW
- LED
- LPA
- BUD
- AGP
- EDI
- TLV
- LTN
- LIN
- BHX
- BS
- CRL
- LUX
- HAJ
- ALC
- RIX
- GLA
- BGY
- BLQ
- BRS
- NAP
- OPO
- CIA
- SOF
- BEG
- TRN
- ZAG
- TLL
- LJU
- MLA
- BTS
- KEF
- SZG
- ATL
- ORD
- DFW
- DEN
- LAX
- CLT
- IAH
- LAS
- DFW
- PHL
- PHL
- YYZ
- JFK
- EWR
- MSN
- SFO
- MIA
- LGW
- BOI
- SEA
- SAV
- MEK
- PRG
- LIS
- STN
- CGN
- WAW
- LYS
- SAW
- LED
- LPA
- AUS
- SAT
- DAL
- YWG
- CMH
- SMF
- ABQ
- MSY
- ANC
- SJC
- BDL
- BNA
- BUR
- SNA
- YH
- JAX
- OXD
- YYJ
- RIC
- OKC
- PVD
- ALB
- TUS
- PBI
- RNO
- YYT
- YQK
- YQY

#### Europe

- LON
- FRA
- CDG
- MCO
- FCO
- IST
- BCN
- ZRH
- CPH
- LGW
- VIE
- BRU
- OSLO
- ORY
- DUS
- ARN
- MXP
- HEL
- PMI
- ATH
- TXL
- MAN
- DUB
- GVA
- HAM
- NCE
- PRG
- LIS
- STN
- CGN
- WAW
- LYS
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- LED
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- CRL
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- OXD
- YYJ
- RIC
- OKC
- PVD
- ALB
- TUS
- PBI
- RNO
- YYT
- YQK

#### North America

- LGA
- MCI
- PIT
- YOW
- YEG
- AUS
- SAT
- DAL
- YWG
- CMH
- SMF
- ABQ
- MSY
- ANC
- SJ
- BDL
- BNA
- BUR
- SNA
- YH
- JAX
- OXD
- YYJ
- RIC
- OKC
- PVD
- ALB
- TUS
- PBI
- RNO
- YYT
- YQK
PASSENGERS PER AIRCRAFT MOVEMENTS, FY 2011
% NON-AERO REVENUE, FY 2011

Asia Pacific
Europe
North America

Objective
Data
Airport Characteristics
Methodology
Efficiency & Cost
User Charge
2013 ATRS Global Airport Performance Benchmarking Project

Methodology
AIRPORT PRODUCTIVITY INDEX

**Outputs**
- Aircraft movement
- Passenger
- {Cargo tonnes}
- Non-aeronautical revenue output

**Inputs**
- Labour
- Other non-capital (soft-cost) input
- [Runways, terminal size, # of gates]

---

**Objective**

**Data**

**Airport Characteristics**

**Methodology**

**Efficiency & Cost**

**User Charge**
METHODOLOGY: EFFICIENCY MEASUREMENT

- Variable Factor Productivity (VFP) Index
  - Impossible - Total Factor Productivity (TFP) because of capital input cost accounting problem (comparable across different countries)

- Unit Operating Cost Competitiveness Index:
  Combines VFP and Input Price Index
MULTILATERAL AGGREGATION METHOD

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

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

\[
\ln \frac{X_i}{X_j} = \sum \frac{W_{ki} + \bar{W}_k}{2} \ln \frac{X_{ki}}{\bar{X}_k} - \sum \frac{W_{kj} + \bar{W}_k}{2} \ln \frac{X_{kj}}{\bar{X}_k}
\]
**GROSS VARIABLE FACTOR PRODUCTIVITY (VFP)**
NORTH AMERICA LARGE AIRPORTS
(YVR=1.0), FY 2011

![Bar chart showing GROSS VFP for various airports in North America.](image-url)
POTENTIAL REASONS FOR THE MEASURED PRODUCTIVITY (GROSS VFP) DIFFERENTIALS

Factors Beyond Managerial Control:

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

We compute residual (Net) Variable Factor Productivity (RVFP) after removing effects of these Factors
GROSS VARIABLE FACTOR PRODUCTIVITY VS RESIDUAL VFP: NORTH AMERICA (YVR=1.0), FY 2011
We explored Alternative approaches:

- Data Envelopment Analysis (DEA)
- Econometric Cost Function Approach including Stochastic Frontier methods (SFA)

The rankings for top and bottom ranked airports are consistent despite using VFP, DEA or SFA.

Note: Industry acceptance of our report using more advanced/sophisticated methods is one of our major concern
RESIDUAL RANKING COMPARISON OF TOP 15 AIRPORTS IN US

Rank

ATL  RDU  RNO  CLT  PBI  BNA  MSP  JAX  LGA  SAT  TPA  SNA  MCO  MKE  FLL

Residual VFP Ranking  Residual DEA Ranking  Residual SFA Ranking

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RESIDUAL RANKING COMPARISON OF BOTTOM 15 AIRPORTS IN US

![Graph showing residual ranking comparison of bottom 15 airports in the US.](image-url)
RESIDUAL RANKING COMPARISON OF MID-RANKED 15 AIRPORTS IN US
2013 ATRS Airport Benchmarking

Key Results on Efficiency & Cost
RESIDUAL (NET) VARIABLE FACTOR PRODUCTIVITY (VFP): ASIA (HKG=1.0), FY 2011

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**Gimpo, Incheon, Guam**

Airports

Gimpo, Incheon, Guam

Airport Groups

- ICN
- GUM
- HAK
- HKG
- SIN
- CGK
- PEK
- HDY
- CAN
- CAN
- CAN
- PEN
- XMN
- KTX
- KTX
- KUL
- CMB
- NGO
- KIX

**Residual VFP**

**Mean**
RESIDUAL (NET) VARIABLE FACTOR PRODUCTIVITY (VFP): OCEANIA (SYD=1.0), FY 2011

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RESIDUAL (NET) VARIABLE FACTOR PRODUCTIVITY (VFP): EUROPE LARGE AIRPORTS (CPH=1.0), FY 2011

Copenhagen Kastrup, Athens, Zurich

Airport Groups

Objective | Data | Airport Characteristics | Methodology | Efficiency & Cost | User Charge
**RESIDUAL (NET) VARIABLE FACTOR PRODUCTIVITY (VFP):**
**EUROPE SMALL & MEDIUM AIRPORTS (CPH=1.0), FY 2011**

### Objective
- Data
- Airport Characteristics
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- Efficiency & Cost
- User Charge

#### Geneva, Basel, Nice
RESIDUAL (NET) VARIABLE FACTOR PRODUCTIVITY (VFP): NORTH AMERICA LARGE AIRPORTS (YVR=1.0), FY 2011

<table>
<thead>
<tr>
<th>Airport</th>
<th>VFP</th>
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<tr>
<td>Atlanta</td>
<td>1.6</td>
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<tr>
<td>Minneapolis St. Paul</td>
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<tr>
<td>Charlotte</td>
<td>1.2</td>
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</table>

**Objective**

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RESIDUAL (NET) VARIABLE FACTOR PRODUCTIVITY (VFP):
N. AMERICA SMALL & MEDIUM AIRPORTS (YVR=1.0), FY 2011

Oklahoma City, Richmond, Raleigh-Durham
TOP EFFICIENCY PERFORMERS (2013)
(based on Net VFP index=operating/management efficiency)

Asia Pacific:
- **Asian Airports:**
  - Gimpo, Incheon, Guam
- **Oceania Airports:**
  - Sydney, Auckland, Townsville

Europe:
- **Large Airports (> 15 million pax):**
  - Copenhagen Kastrup, Athens, Zurich
- **Small/Medium Airports (< 15 millions Pax):**
  - Geneva, Basel, Nice
TOP EFFICIENCY PERFORMERS (2013)
(based on Net VFP index=operating/management efficiency)

North America:

- **Large Airports (> 15 million pax):**
  - {Atlanta (Globally Most Efficient Airport)}
  - Minneapolis St Paul, Charlotte, Tampa

- **Small/Medium Airports (< 15 millions Pax):**
  - Oklahoma City, Richmond, Raleigh-Durham

Global (10th Global Excellence Award)

- Hartsfield-Jackson Atlanta International Airport
PAST AIRPORT EFFICIENCY EXCELLENCE
TOP PERFORMERS, 2008 - 2012

North America
- Hartsfield-Jackson Atlanta International Airport

Europe
- Copenhagen Kastrup International Airport

Asia-Pacific
- Hong Kong International Airport

Large Airport Category:
- Oslo International Airport
- Small/Medium Airport Category:
  - Geneva Cointrin International Airport

Large Airport Category:
- Hong Kong International Airport
- Small/Medium Airport Category:
  - Seoul Gimpo International Airport

Asian Airport Excellence Award:
- Hong Kong International Airport
- Oceania Excellence Award:
  - Sydney Airport

Objective | Data | Airport Characteristics | Methodology | Efficiency & Cost | User Charge
COST COMPETITIVENESS = NET VFP AND INPUT PRICE EFFECT

ASIA (HKG=0.0) – THE HIGHER THE BETTER

**Airport Groups**

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<thead>
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**Airports**

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**Objective**

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COST COMPETITIVENESS = NET VFP AND INPUT PRICE EFFECT
OCEANIA (SYD=0.0)

Queensland Airport Limited (QAL),
Auckland, Dunedin (NZ)
COST COMPETITIVENESS = NET VFP AND INPUT PRICE EFFECT
EUROPE - LARGE AIRPORTS (CPH=0.0)

Athens, Lisbon, ANA (Aeroportos de Portugal)
COST COMPETITIVENESS = NET VFP AND INPUT PRICE EFFECT
EUROPE - SMALL & MEDIUM AIRPORTS (CPH=0.0)

Ljubljana (Slovenia), Basel, Tallinn (Estonia)
COST COMPETITIVENESS = NET VFP AND INPUT PRICE EFFECT
N. AMERICA - LARGE AIRPORTS (YVR=0.0)

Objective Data Airport Characteristics Methodology Efficiency & Cost User Charge

Atlanta, Charlotte, Orlando
COST COMPETITIVENESS: = NET VFP AND INPUT PRICE EFFECT
N. AMERICA - SMALL & MEDIUM AIRPORTS (YVR=0.0)

Oklahoma City, Richmond (Virginia), Raleigh-Durham
2013 ATRS Airport Benchmarking

User Charge Comparison
LANDING CHARGES
FOR BOEING 767-400, 2012 (IN US$)
ASIA PACIFIC: COMBINED LANDING AND PASSENGER CHARGES FOR BOEING 767, 2012 (IN US$)

Lowest charges: **Taipei Taoyuan, Dunedin (New Zealand)**

Highest charges: **Osaka Kansai, Tokyo Narita**
EUROPE: COMBINED LANDING AND PASSENGER CHARGES FOR BOEING 767, 2012 (IN US$)

Lowest charges: Riga (Latvia), Luxembourg

Highest charges: London Heathrow, Ben Gurion (Tel Aviv)
NORTH AMERICA: COST PER ENPLANED PASSENGER, 2011 (IN US$)

Canada:
Lowest CPE: Victoria, Regina
Highest CPE: Toronto, Montreal

United States:
Lowest CPE: Charlotte, California Bob Hope (Burbank, CA)
Highest CPE: New York JFK, Newark Liberty
The ATRS Global Airport Performance Benchmarking Report: 3 volumes, over 600 pages of valuable data and analysis.

Can be purchased by visiting www.atrsworld.org

Report sale finances our annual benchmarking research project
ACKNOWLEDGEMENT OF APPRECIATION

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- Gatwick Airport Ltd
- Copenhagen International Airport
- Istanbul Sabiha Gockcen International Airport
- Korea Airports Corporation
- Kazan international airport, Russia
- German Aerospace Center
- Airbus
- Boeing
Thank You

2014 ATRS World Conference
(Bordeaux, France, July 17-20, 2014)