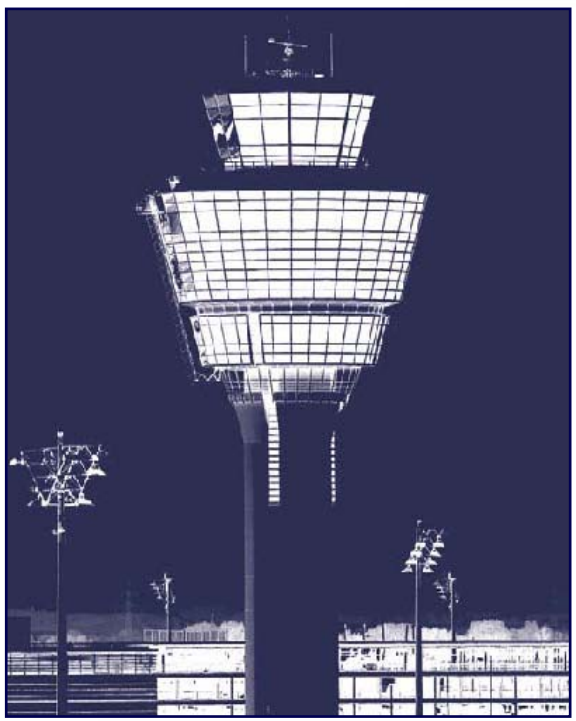
The Relative Efficiency of German and British Airports

An Application of Partial Factor Methodology and Data Envelopment Analysis



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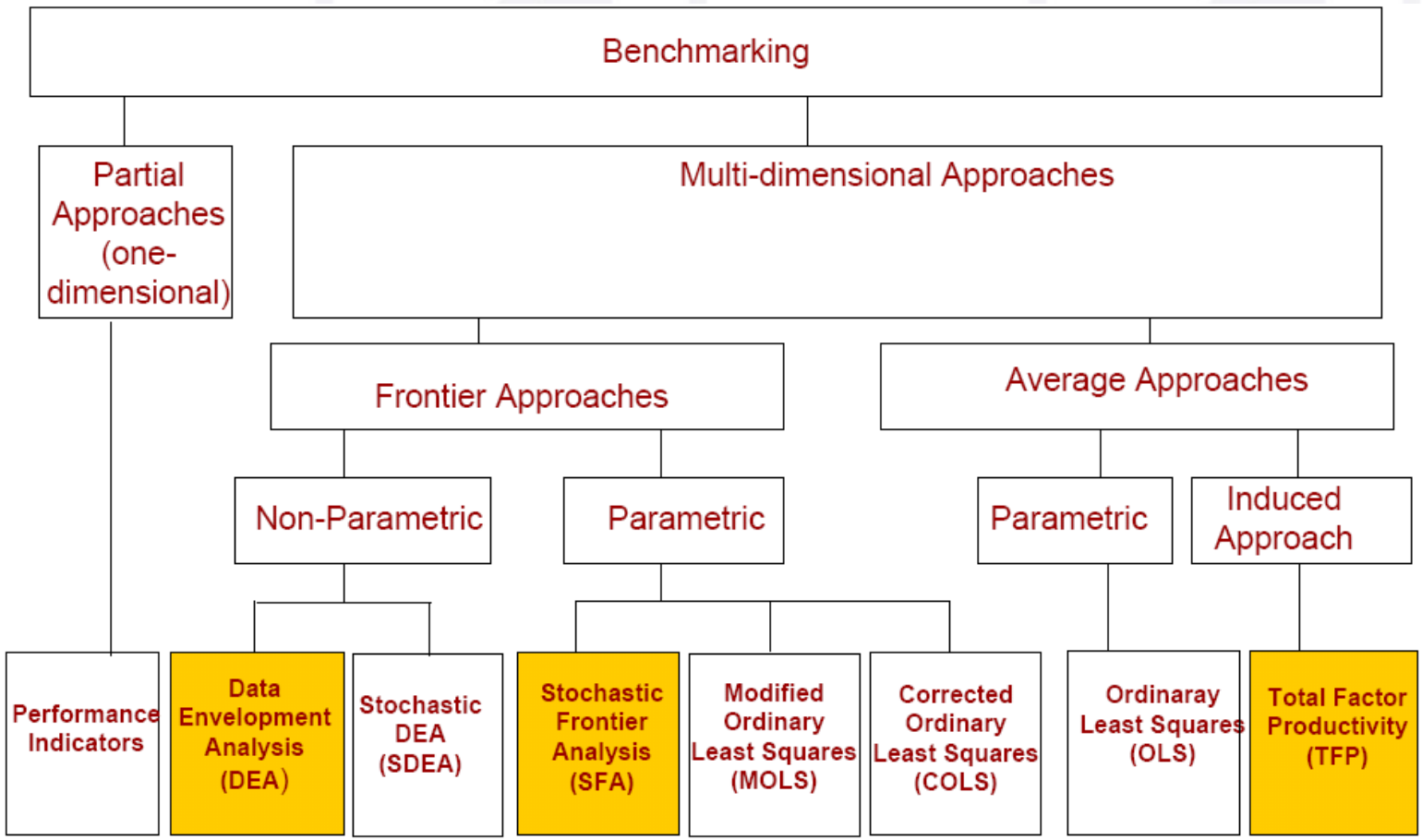
Introduction

- Productivity analysis of German and British airports using partial productivity methodology
  - Ratio analysis depicting capital, labor and financial performance
  - Sample: 18 German international airports from 1998-2004 and 14 British international airports from fiscal years 1995-2005
- Data Envelopment Analysis as a verification method (in progress)

Methodology



Source: von Hirschhausen (2005)

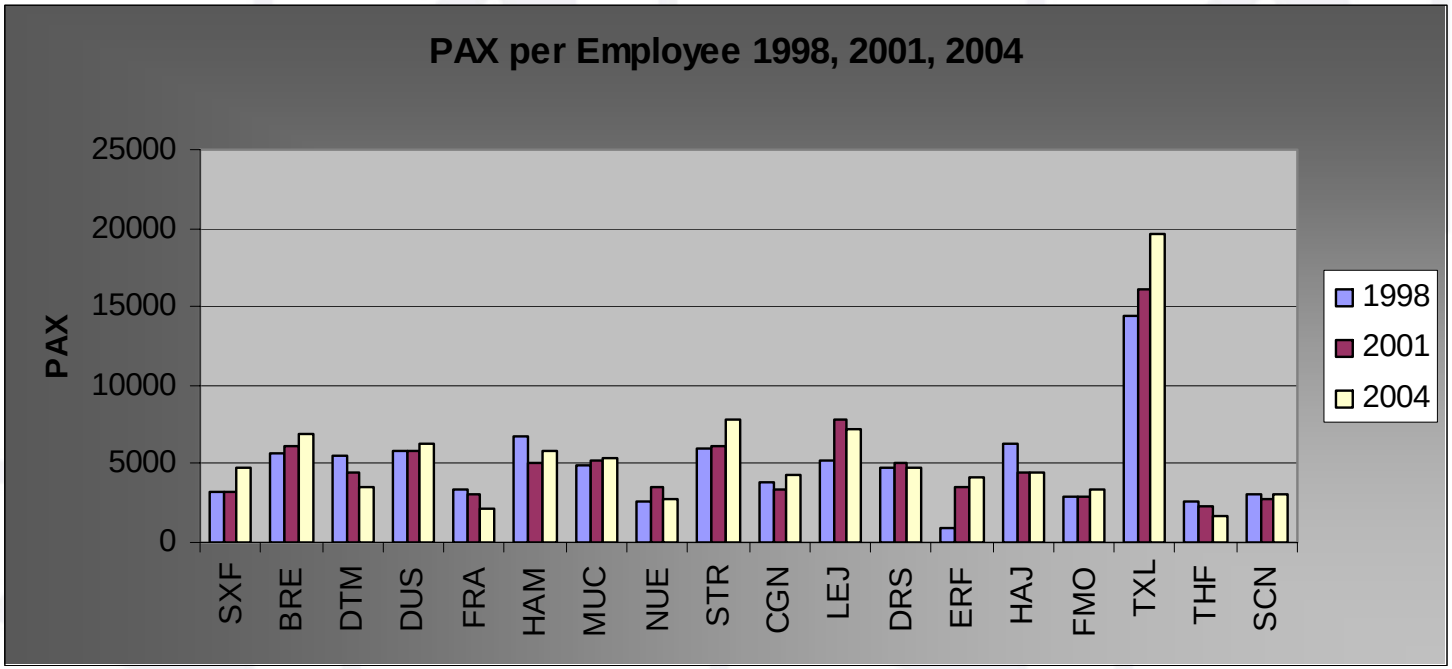
Methodology: Partial Indicators

Area of Measurement		Indicator
Financial Performance		Real Costs per WLU Real Revenues per WLU Real Aeronautical Revenues per WLU Real Commercial Revenues per WLU Aeronautical/Total Revenue (%) Revenue/Expenses Ratio
Capital Productivity	Terminal Capacity	PAX(000) per Gate PAX per M^2 (Terminal Side)
	Runway Capacity	Movements(000) per Runway
Labor Productivity		PAX per Employee Movements per Employee WLU(000) per Employee

Methodology: Partial Indicators

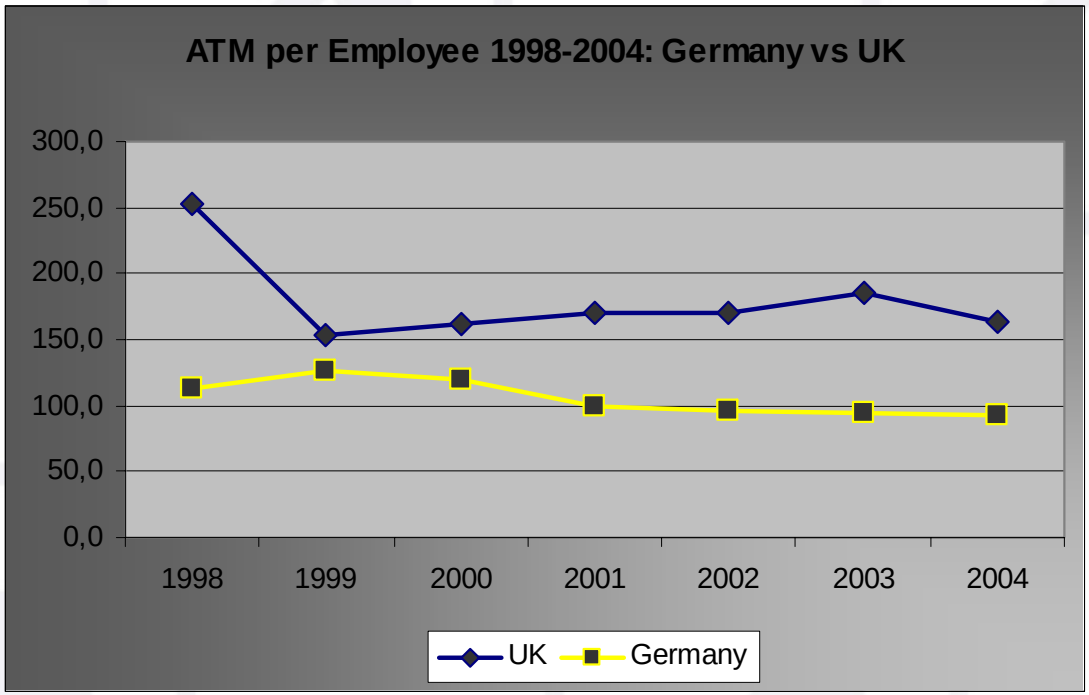
- e.g. PAX per Employee
- Advantages
  - Can derive simple comparisons between separate input and output factors
  - Provide for comparisons in specific areas
  - Ease of computation
- Disadvantages
  - Comparisons could be invalid when comparing observations that have different input mixes
  - Do not take into account factor prices
  - Cannot handle multiple outputs and inputs

Methodology:
Criticisms of Partial Indicators



Labor productivity indicators at Berlin Airport Tegel are extremely high in comparison to other German int'l airports

Methodology:
Criticisms of Partial Indicators



Degree of vertical integration is imperative in regards to labor productivity comparability

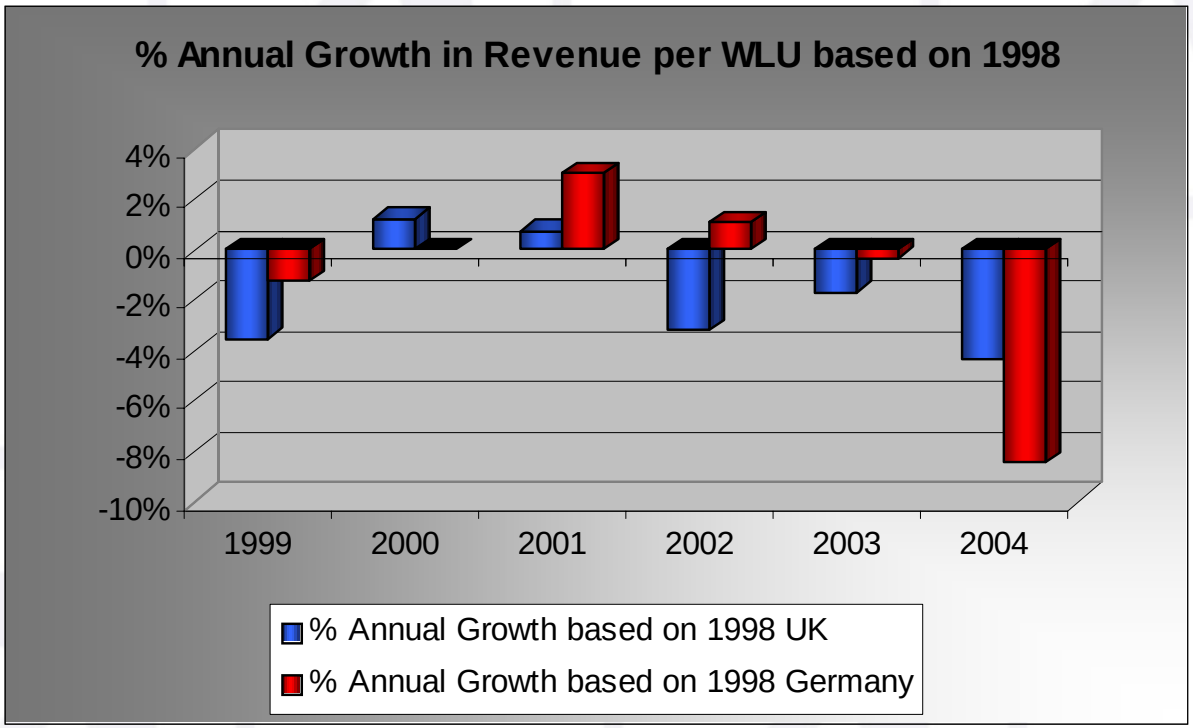
Methodology: DEA

- Non-parametric statistical method which provides overall relative efficiency scores through formulation of efficient frontier
- Advantages
  - Multiple inputs and outputs
  - Overall efficiency measurement to verify partial productivity indicators
- Disadvantages
  - Depicts firm inefficiencies, but does not explain why

Data Set

- Usage of Panel Data from 1998 to 2004
- Financial Data:
  - Published data from financial reports
  - Sample = 9 German airports (Aggregated data from Berlin and Fraport), 14 British airports
- Capacity Data:
  - Sample = 18 German Airports, Capacity data for British airports still being ascertained

Financial Performance 1999 – 2004
Germany and the UK



Financial Performance 1999 – 2004
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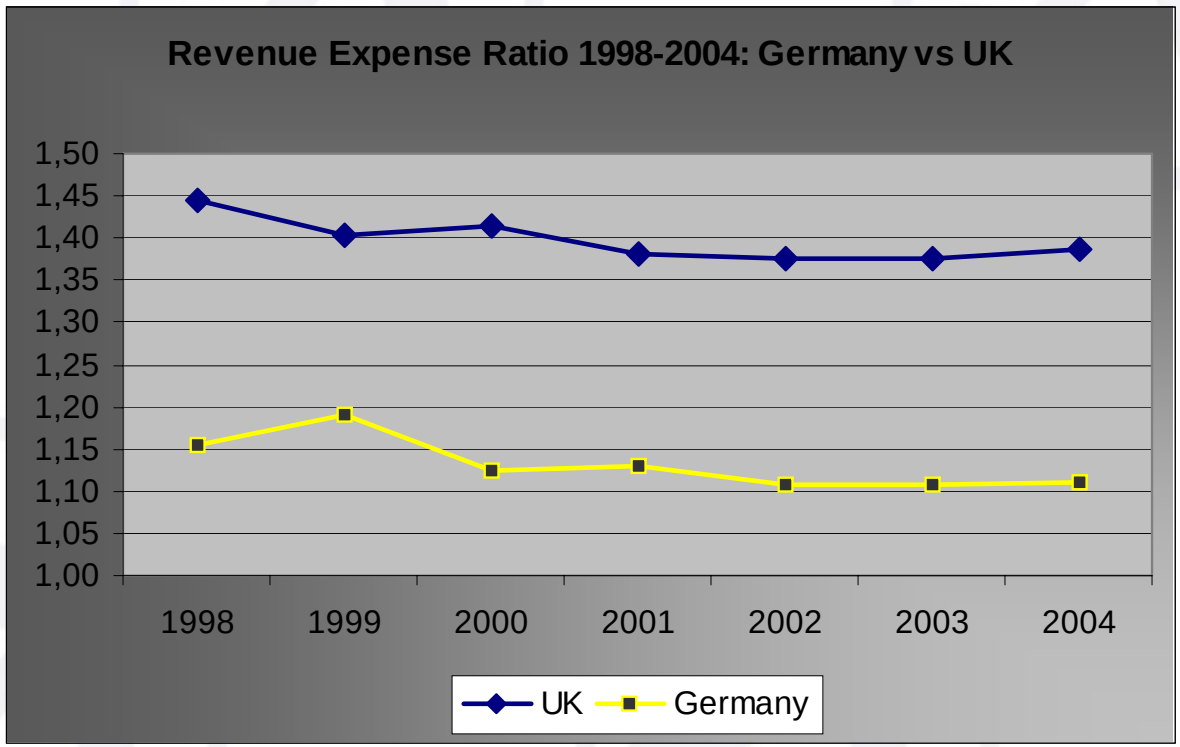
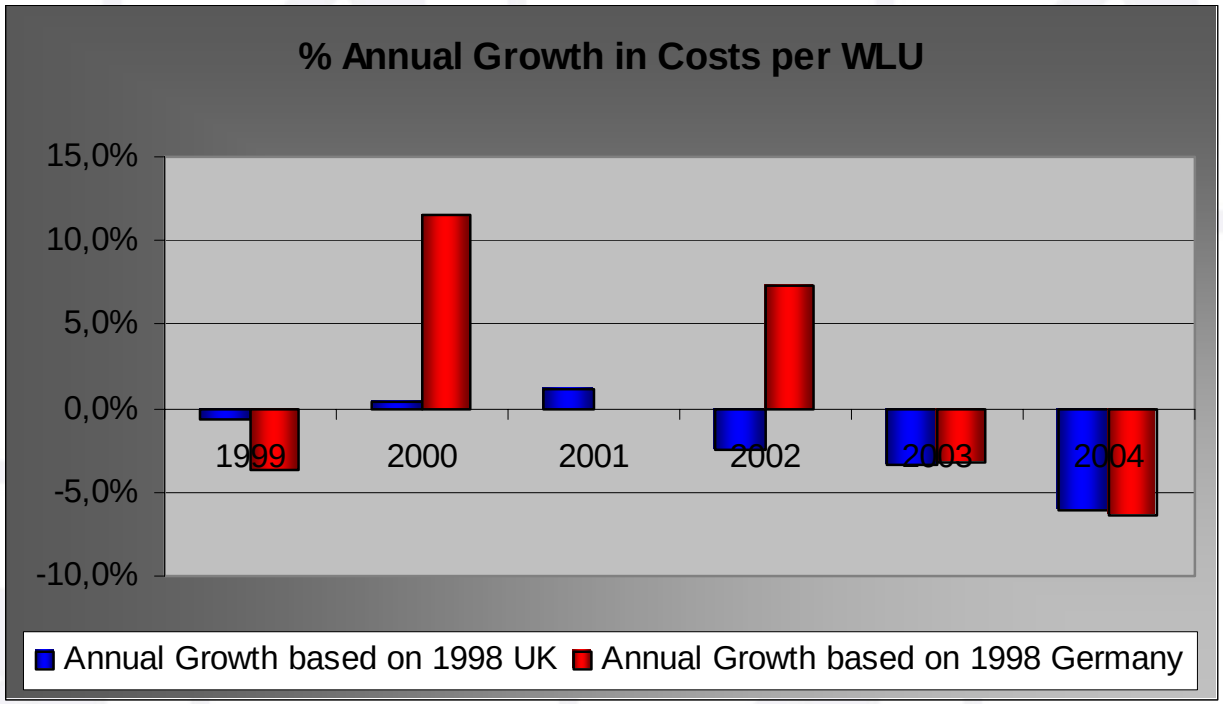


Financial Performance 1999 – 2004 Germany and the UK

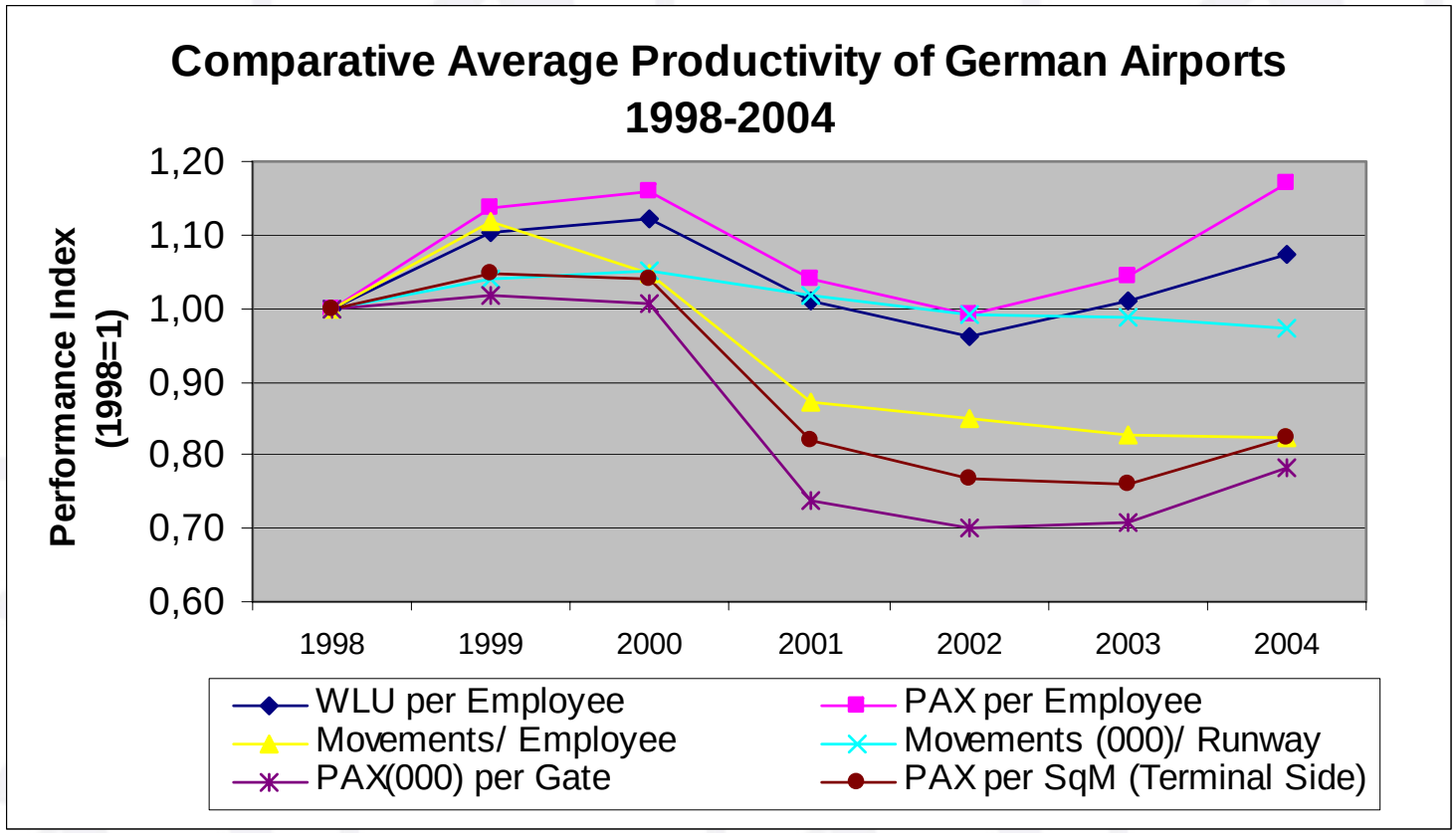


Cost efficiency has been improving for both groups of airports

Average Performance - Germany

Average Performance of German Airports 98-04		
Indicator	FY 1998	FY 2004
WLU per Employee	4,76	5,11
Real Costs per WLU	17,61 €	19,51 €
Real Revenues per WLU	19,85 €	18,67 €
Real Aeronautical Revenues per WLU	12,78 €	11,28 €
Real Commercial Revenues per WLU	6,07 €	5,64 €
Aeronautical/Total Revenue (%)	63,85%	60,50%
Rev:Ex Ratio	1,16	1,06
PAX per Employee	4279,23	5000,34
Movements per Employee	113,58	93,51
Movements (000)/ Runway	65,48	63,58
PAX(000) per Gate	257,50	201,95
PAX/ SqM (Terminal Side)	110,04	90,44

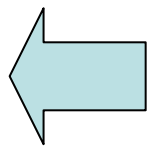
Average Performance (Capacity) Germany



Average Productivity by Size Germany

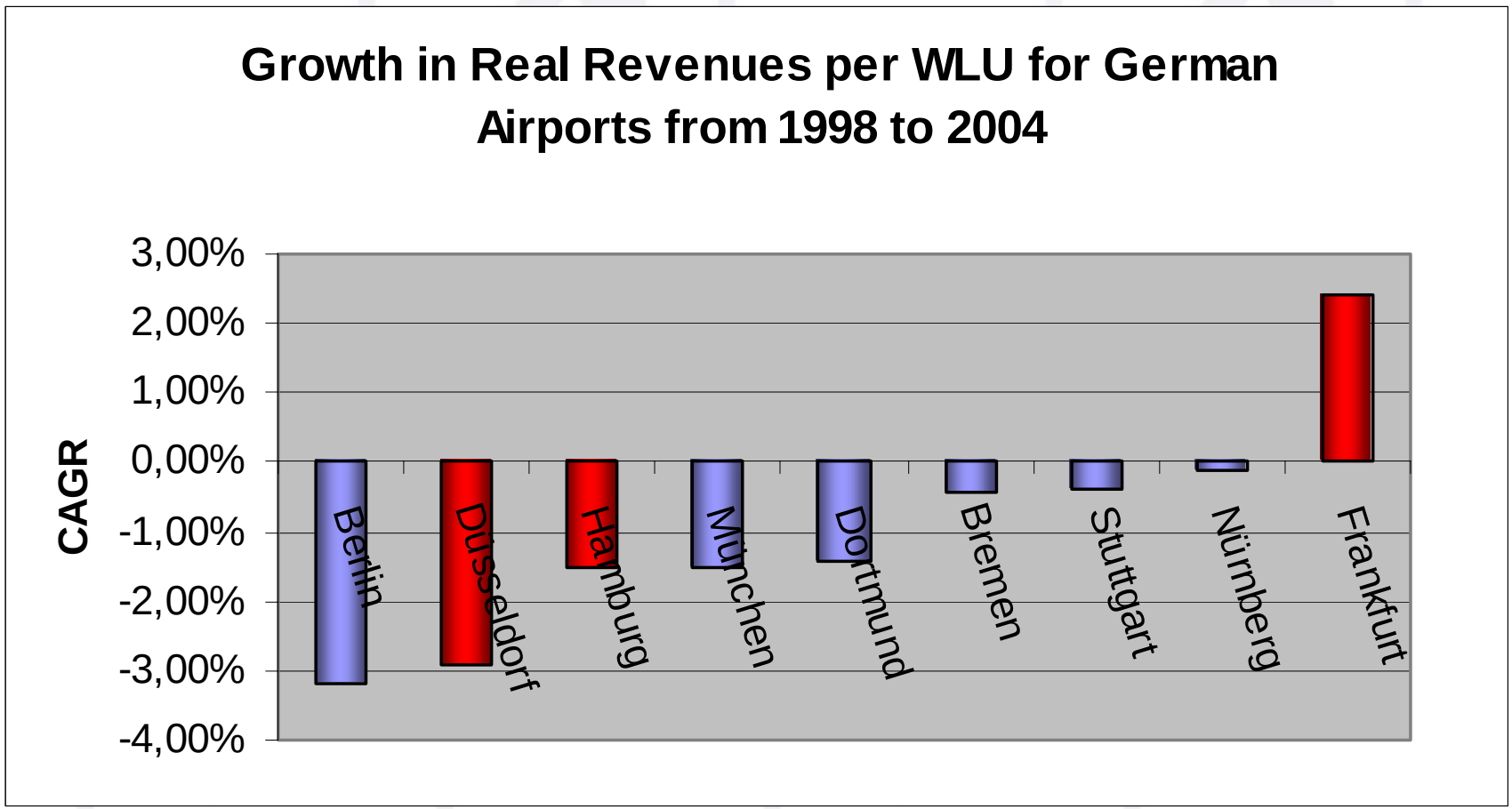
Average Productivity of German Airports by Size 1998-2004		
Indicator	Small*	Other
WLU(000) per Employee	4,10	5,24
PAX per Employee	4158,78	5175,09
Movements per Employee	127,31	84,73
Movements(000) per Runway	33,02	95,77
PAX(000) per Gate	173,07	260,46
PAX per SqM (Terminal Side)	78,07	116,47

* Small < 3.000.000 PAX in 2001

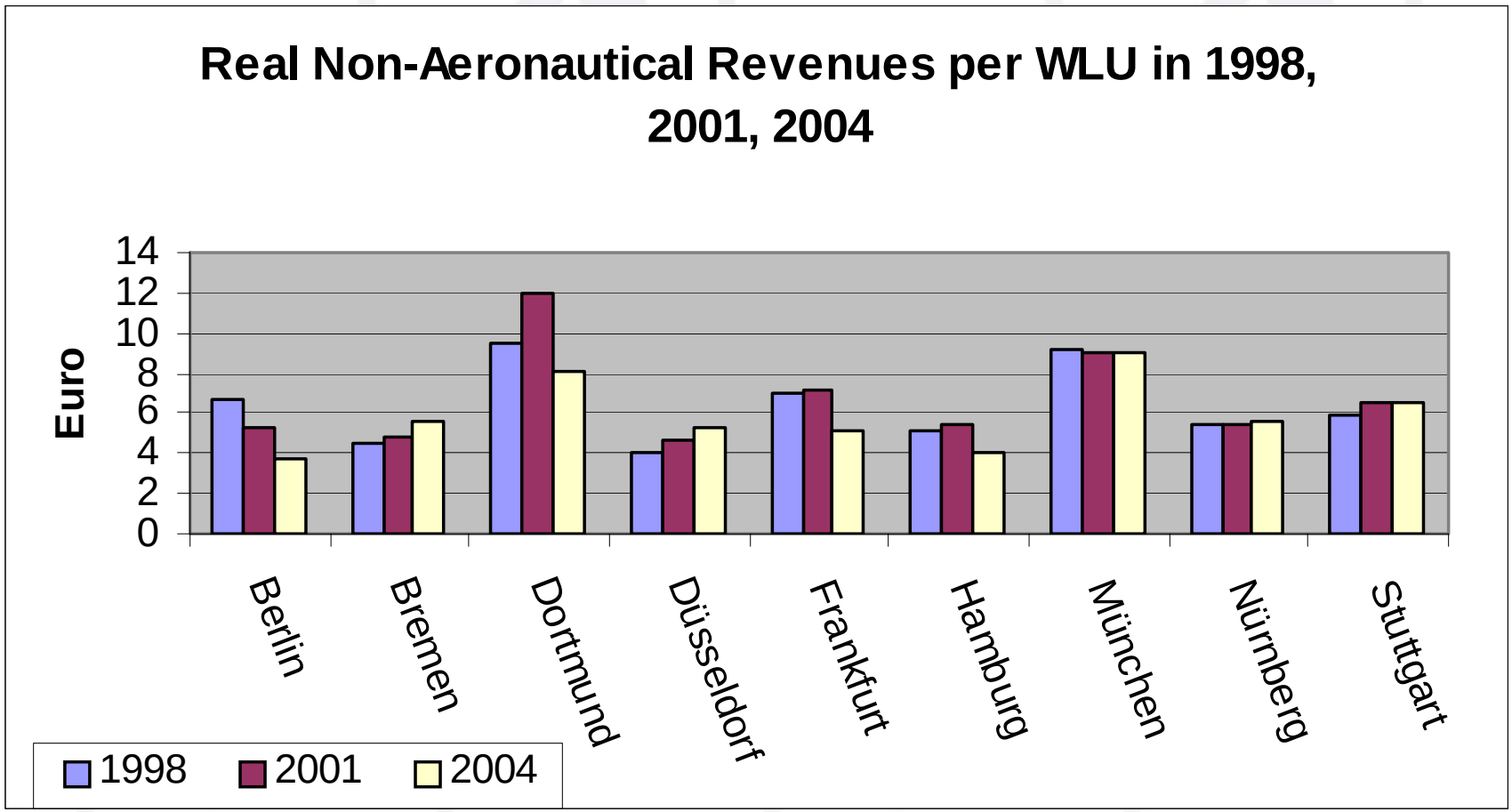


What is the reason for ATM labor efficiency discrepancy?

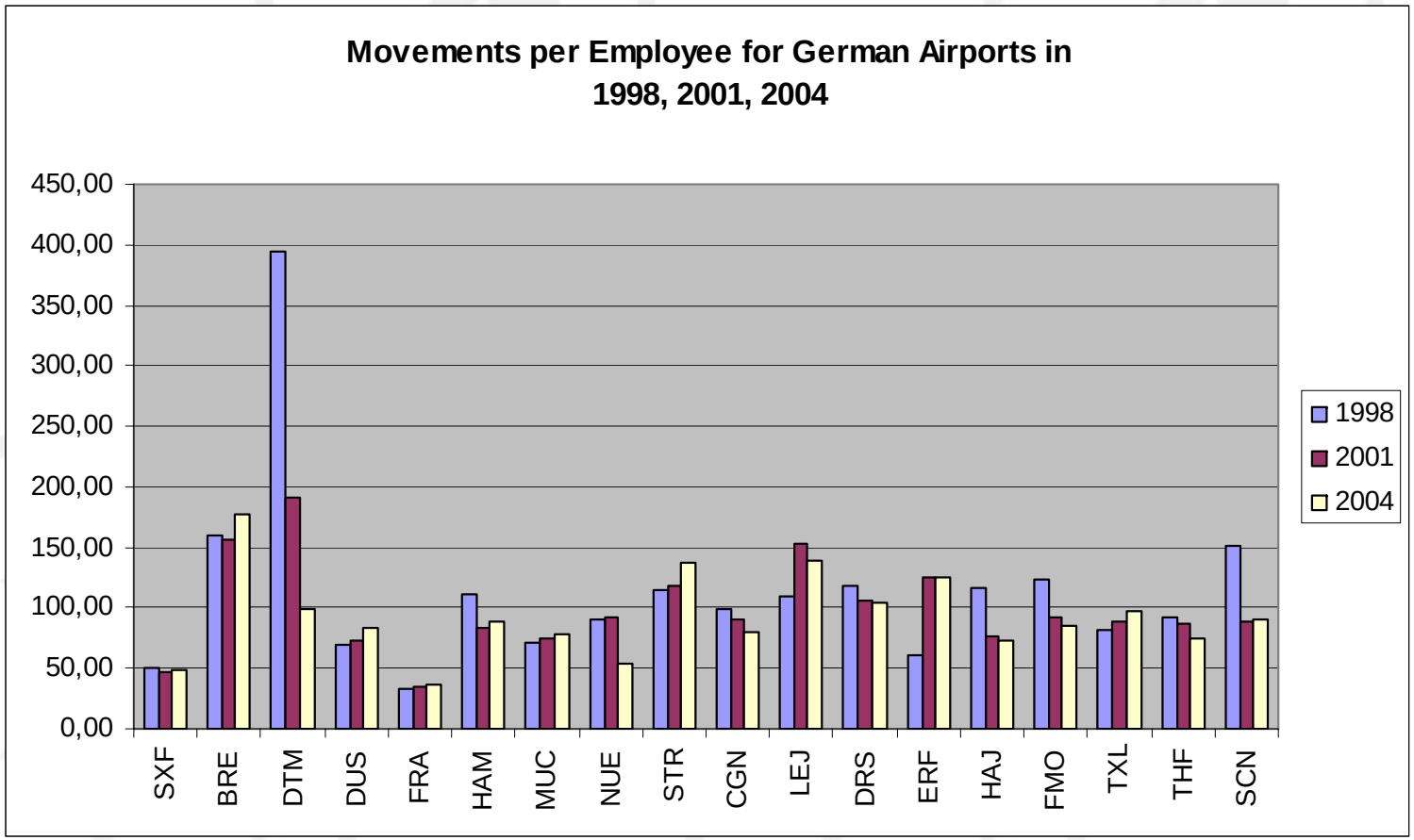
Financial Performance



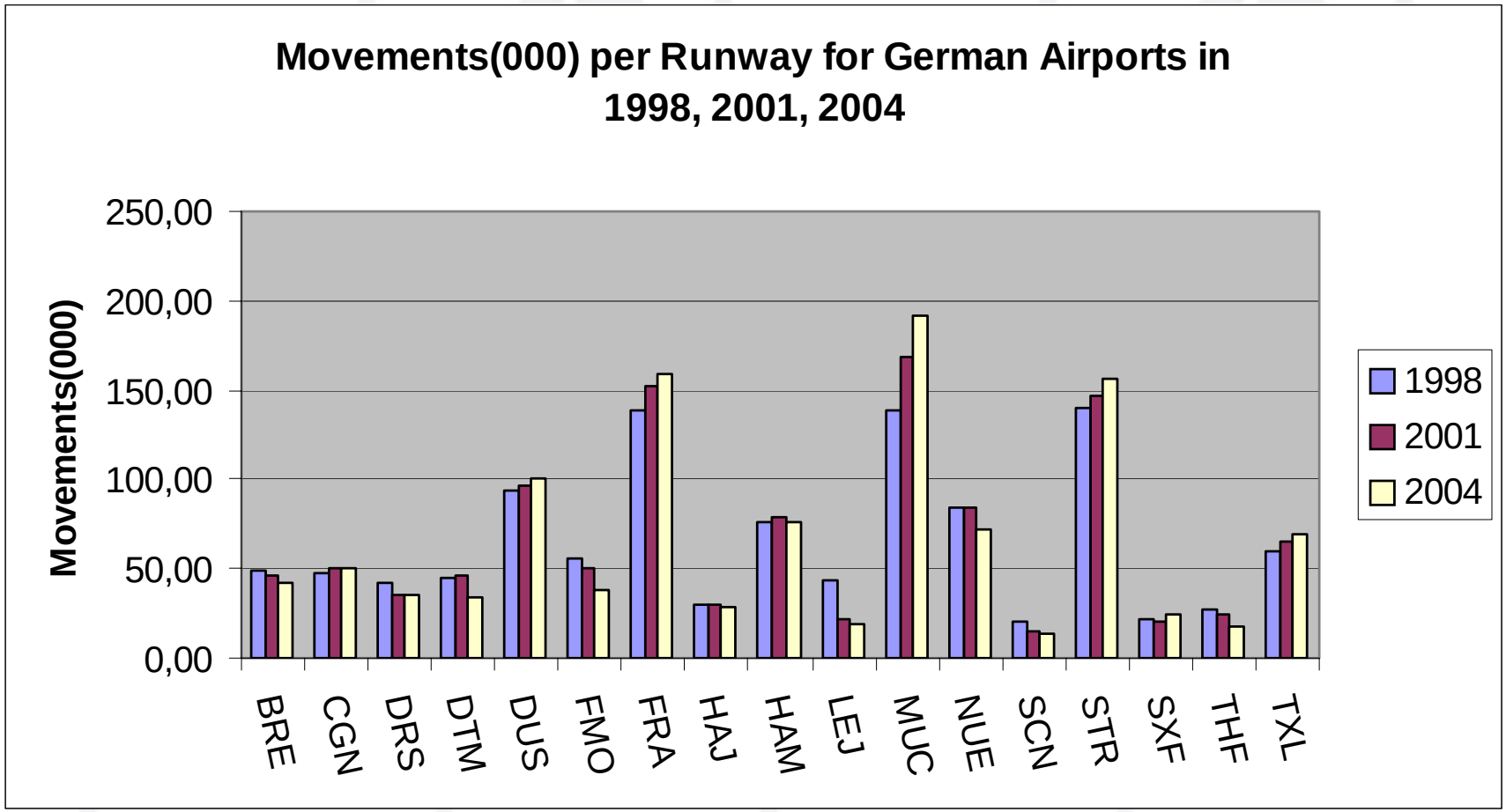
Commercial Performance 1998-2004



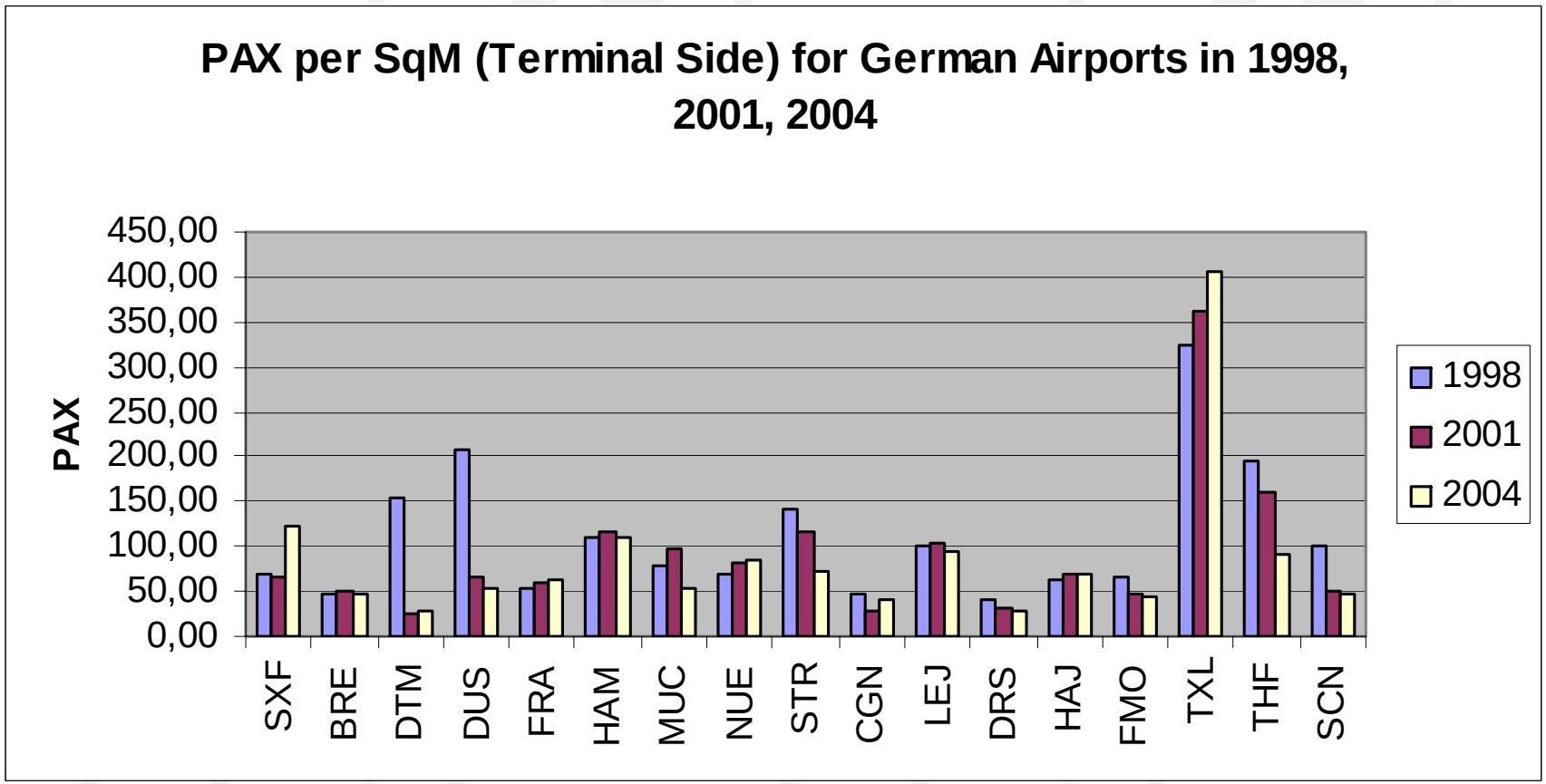
Labor Productivity



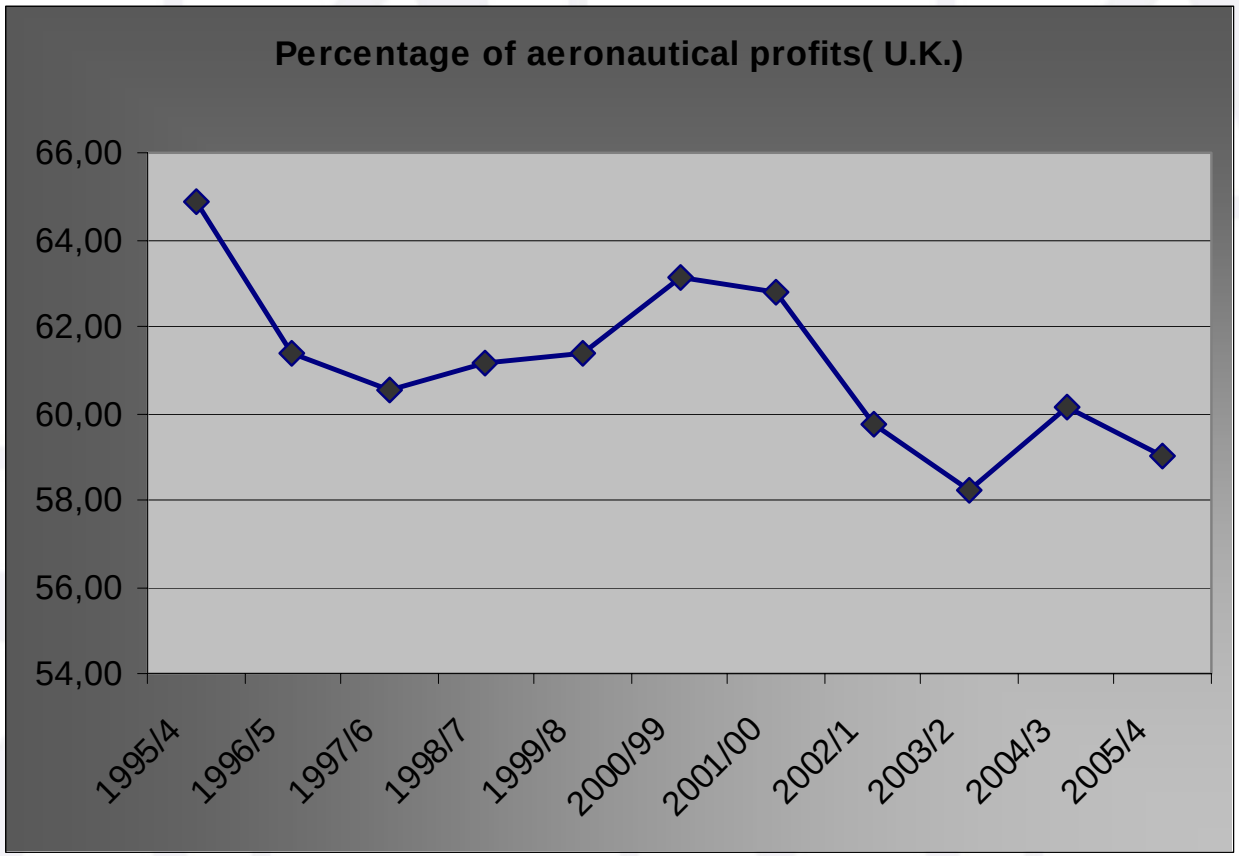
Capital Productivity: Runway Capacity



Capital Productivity: Terminal Capacity

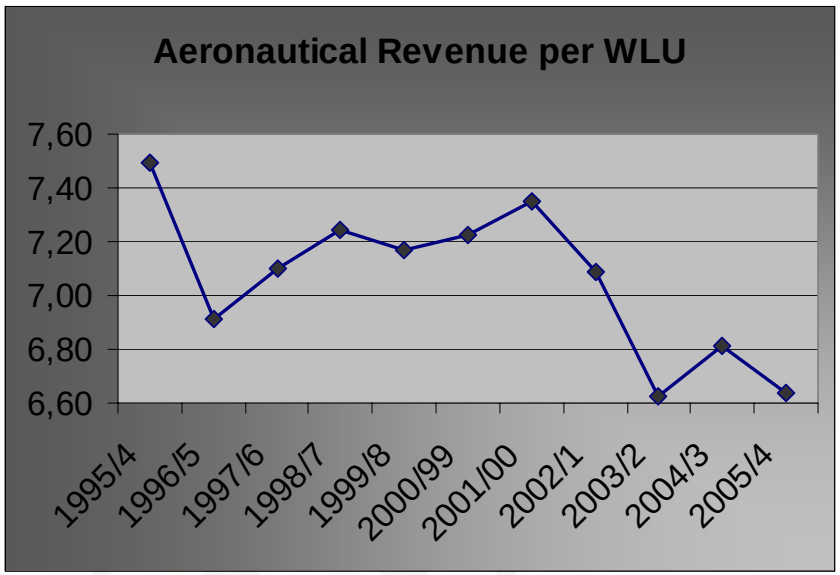


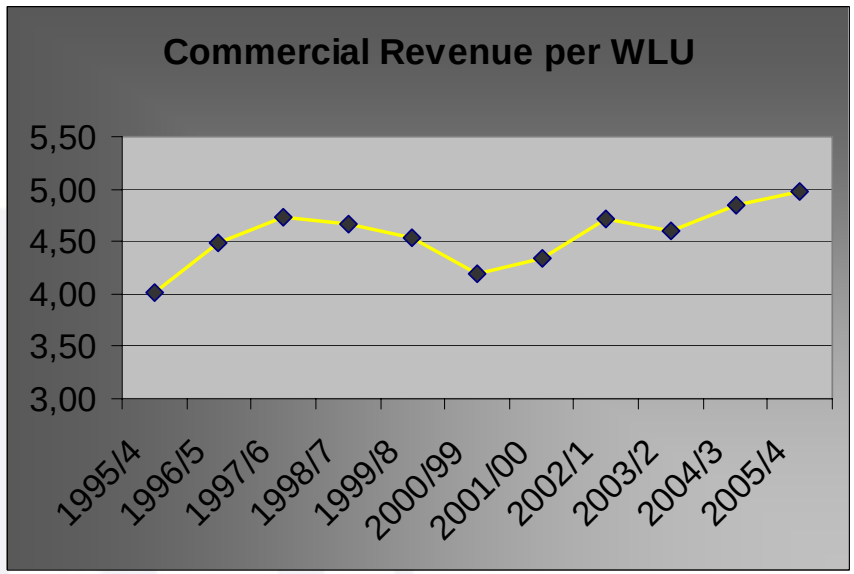
Financial Performance: British Airports



Financial Performance: British Airports

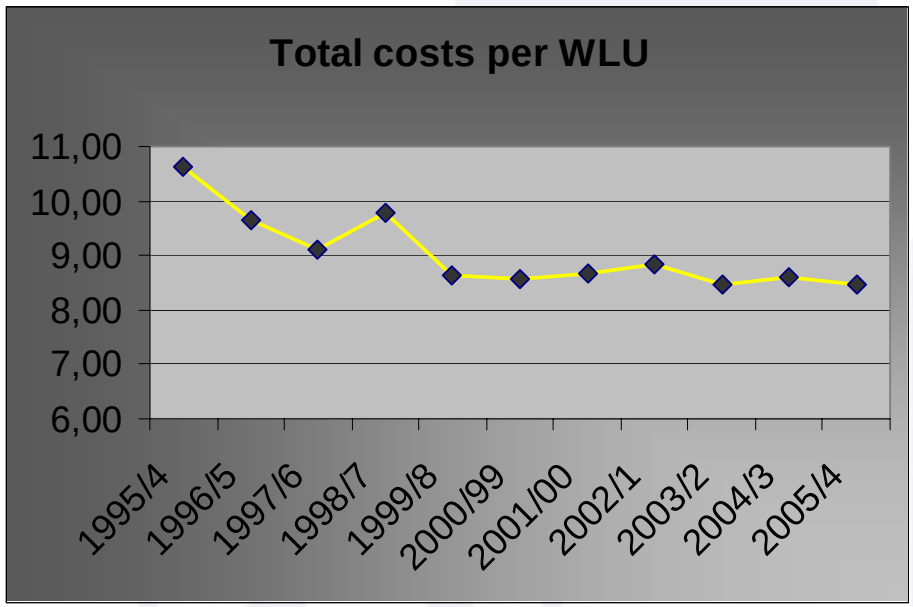
An individualized comparison of revenue structure shows a substantial improvement in average commercial performance

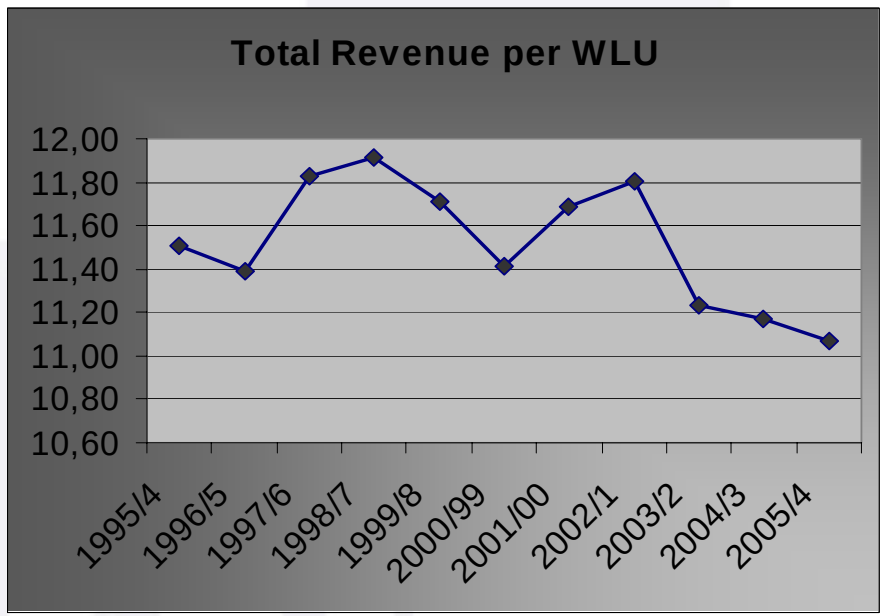




Financial Performance: British Airports

Revenue efficiency decreased sharply after 2001, while cost efficiency remained fairly stagnant (slight decrease)





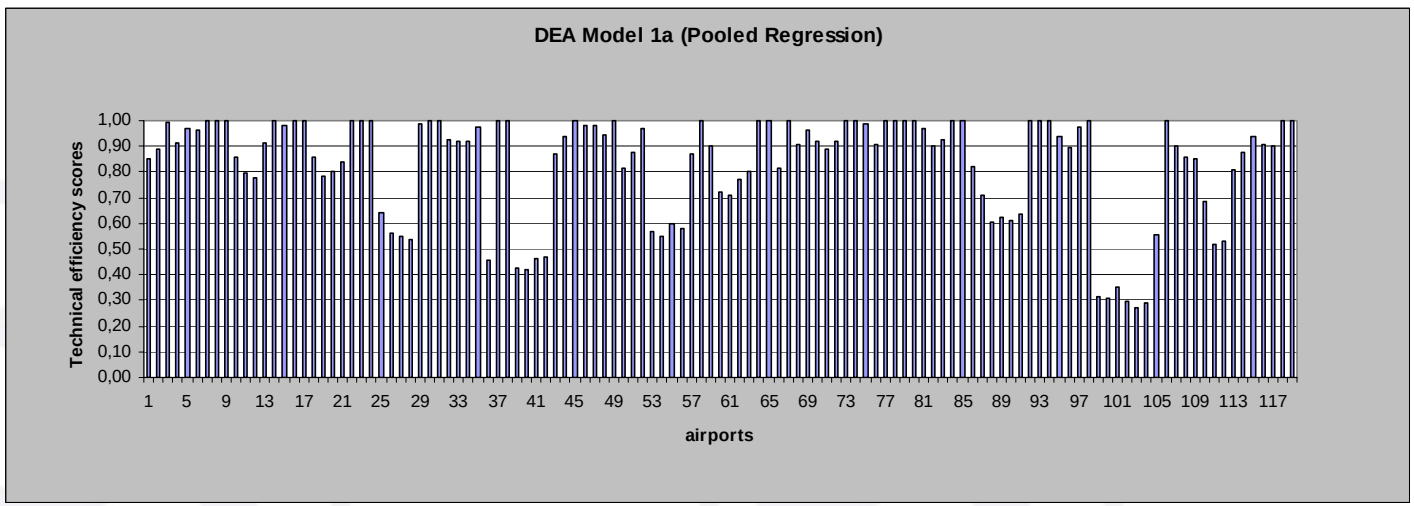
DEA Models Estimated

- Analysis of two separate classes of services – Terminal Services and Movements (Gillen and Lall, 1997)
- DEA currently only estimated for German airports

Model 1a: Terminal Services	**Model 1b: Air traffic movements**
Outputs: Total PAX, Air freight (approx. by WLU) *Inputs:* No. of runways No. of gates Terminal Area (in m^2) No. of employees No. of baggage collection belts No. of public parking spots	*Outputs:* Air traffic movements *Inputs:* Airport area (in m^2) No. of runways Runway area (approx. by length of runway) No. of employees

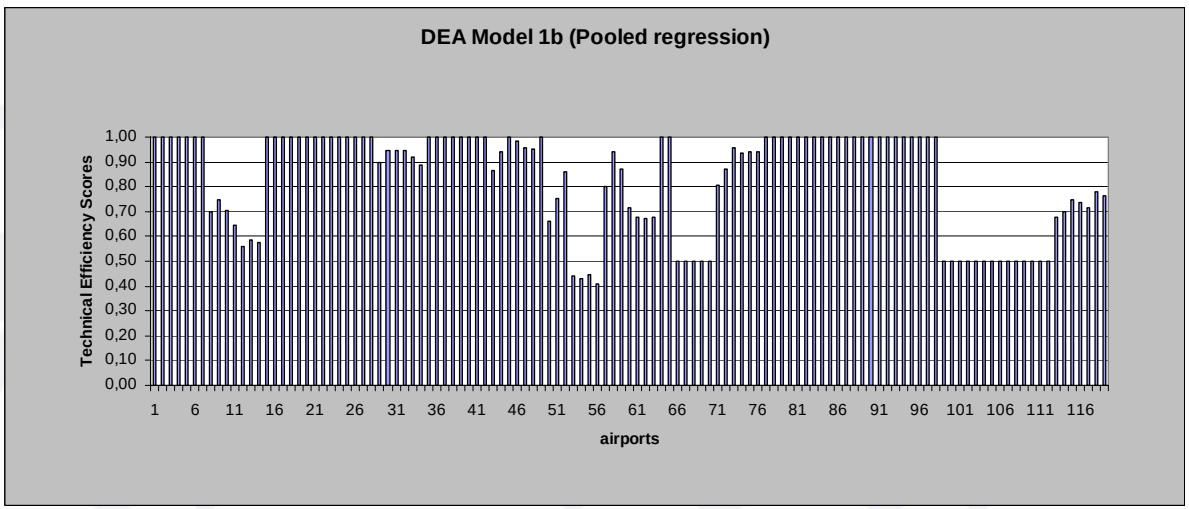
DEA Model 1a: Terminal Services

- Efficiency for terminal services increased at BRE, LEJ, NUE, SXF, and TXL
- FRA, DUS, TXL and MUC are (relatively) efficient



DEA Model 1b: Aircraft Movements

- Only MUC and TXL have shown significant decreases in inefficiencies from 1998 to 2004
- MUC and STR are highly efficient in the German sample set



Conclusion

- Initial results indicate that British airports perform significantly better than German airports
- Non-aeronautical operations have been of increased importance for both British and German markets
- Revenue efficiency has diminished in both markets, but cost efficiency has also

Agenda for Further Research

- Disaggregated financial data
  - To make fair comparisons and correct adjustments
- Further development in the international comparison
- Correlation analysis between partial indicators and DEA
- Estimation of a DEA model which includes financial information
  - Aeronautical revenues as an output or operating costs as an input
- Application of different methodologies