UNIVERSITÄT DUISBURG ESSEN

Open-Minded

ESM

FOM Hochschule | ild Institut für Logistik- & Dienstleistungsmanagement der FOM University of Applied Sciences

PIM

Bundesministerium für Bildung und Forschung

HELENA

Higher Education Global Efficiency Analysis

Higher Education Productivity Modelling with Data Envelopment Analysis Methods

Golnaz Maleki, Matthias Klumpp, Marc Cuypers, HELENA Project, PIM, University of Duisburg-Essen

26th ESM Forum 2012, FOM, Essen, Germany, 22.10.2012

Agenda

1. Introduction
2. Data and DEA Method
3. Case Study
4. Discussion

UNIVERSITÄT DUISBURG ESSEN
Open-Minded

Background

- International efforts to increase the performance of universities
  - Increasing growth rates of students
  - Increasing societal expectations towards universities
  - Lack of sufficient government financial resources
- Efficiency analysis methods
  - MCDM (Multi Criteria Decision Making), DEA (Data Envelopment Analysis), AHP (Analytic Hierarchy Process), SFA (Stochastic Frontier Analysis)

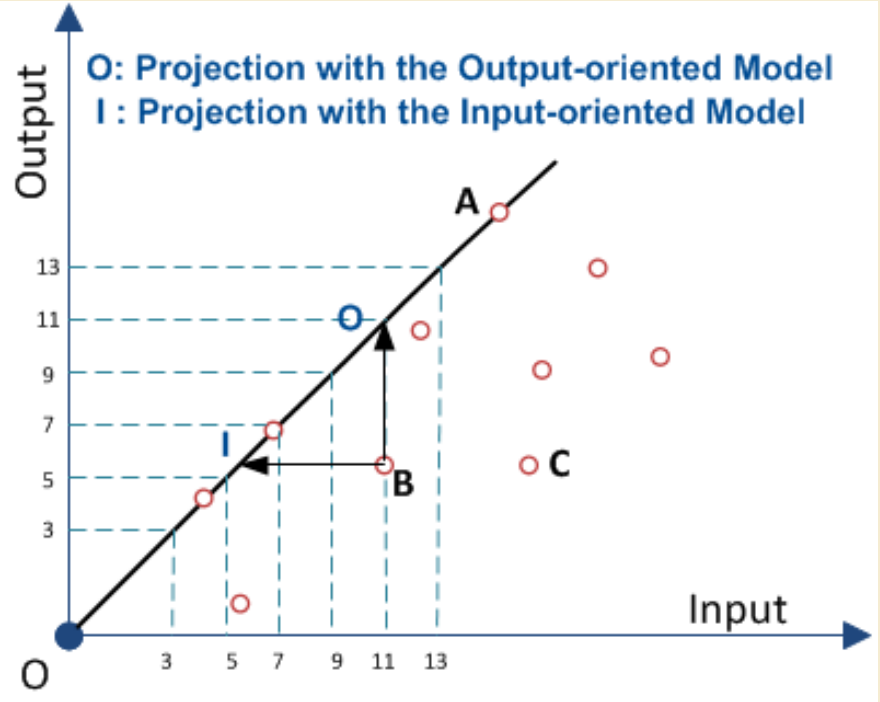
Specific Research Question

- Which DEA Models can be the most adequate to evaluate the performance of universities?

2. Data and DEA Method

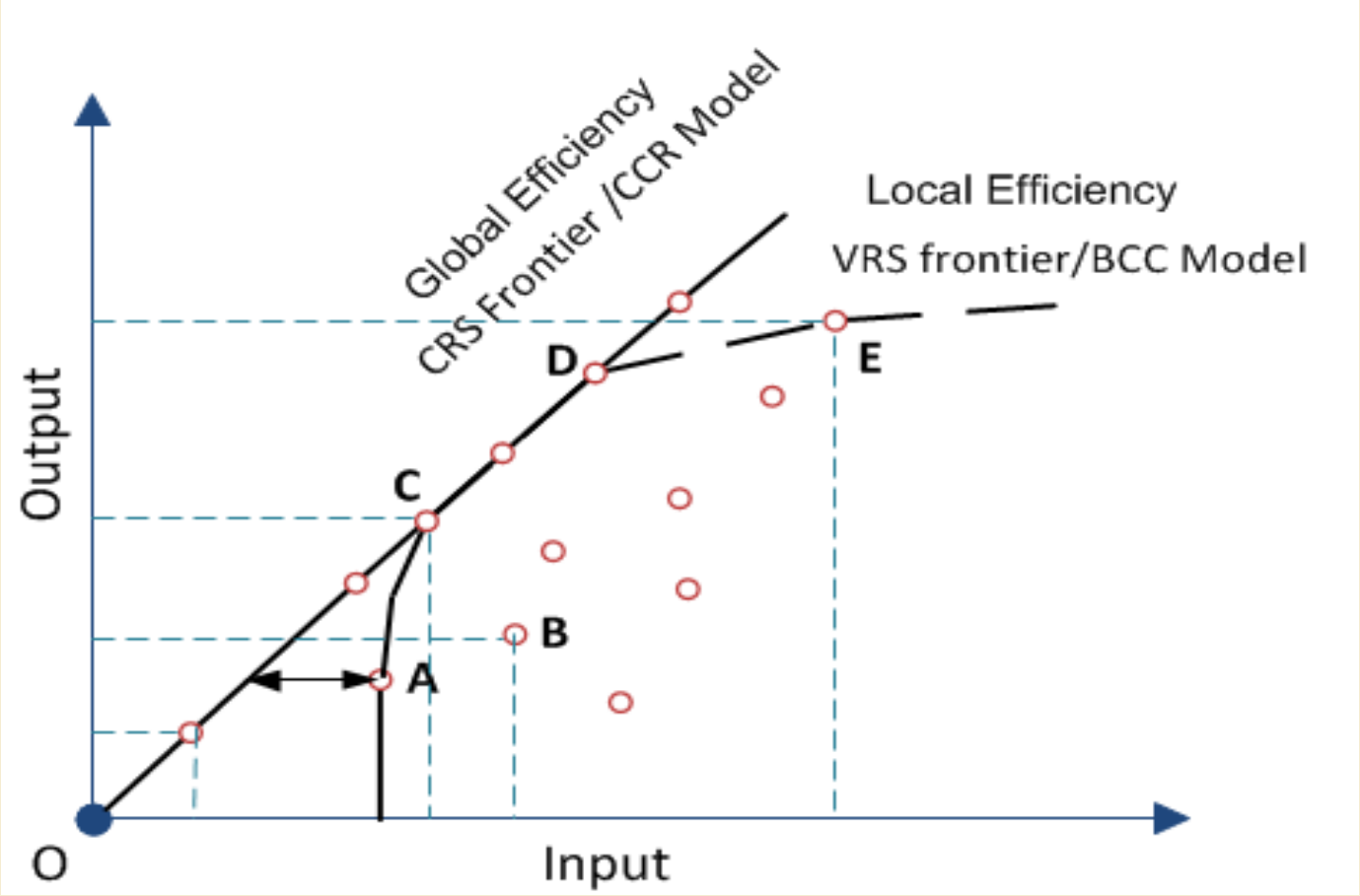
- **DEA is a mathematical programming technique that produces a single aggregate measure for each DMU in terms of its utilization of inputs to produce desired outputs (Kao and Hung, 2008).**

- **DEA offers two main possible orientations in efficiency analysis *(Charnes et al 1994)*:**
  - **Input-oriented models**
  - **Output-oriented models**

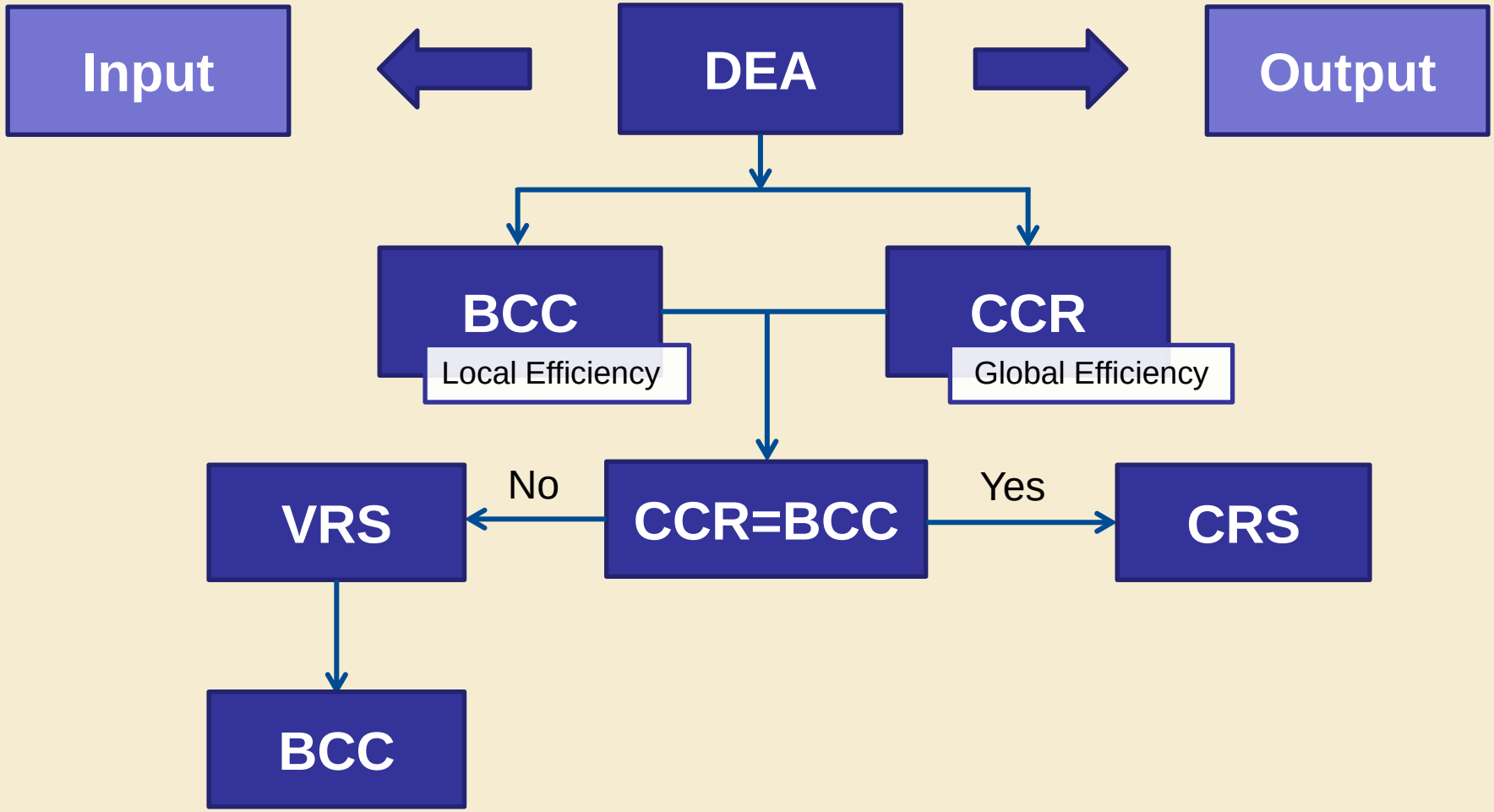


UNIVERSITÄT DUISBURG ESSEN
Open-Minded

CRS and VRS frontiers



2. Data and DEA Method



2. Data and DEA Method

- The participants of this study are 40 German universities

- For altogether **28 universities** a complete dataset with these minimum quality requirements are available and were used.

Input
- ✓ Total budget
- ✓ Staff count

Ouput
- ✓ PhD graduates
- ✓ Third-party funds
- ✓ Publications

3. Technical Efficiency Analysis

Unit name	Efficiency Score	
	CCR Model	BCC Model
Johannes Gutenberg University Mainz	100	100
Technical University of Munich	100	100
University of Freiburg	100	100
University of Kiel	100	100
University of Erlangen-Nürnberg	99.09	100
Heidelberg University	92.03	100
University of Bielefeld	86.69	100
University of Hamburg	70.78	100
Aachen University	59.35	100
University of Munster	54.89	100
Ludwig Maximilian University of Munich	46.89	100
University of Kassel	45.67	100
Friedrich-Schiller-University of Jena	75.89	97.85
Frankfurt University	61.64	94.87
Dresden University of Technology	84.94	92.71
Georg-August-University of Goettingen	64.02	84.98
University of Karlsruhe	76.52	81.14
University of Leipzig	53.6	75.76

Globally efficient

Locally efficient

UNIVERSITÄT DUISBURG ESSEN
Open-Minded

Which DEA model is more appropriate for the performance analysis of the data in this study?

BCC / Output-oriented

The results of two DEA models have revealed, that the RTS has been a variable factor, therefore BCC model should be considered. (Charnes et al. 2007)

$\theta_{CCR} \neq \theta_{BCC}$ ⟹ Variable RTS

⟹ BCC Model

1. The lack of finances for higher education programs.
2. The lack of universities' control and supervision on some of the inputs.

(Fandel 2007; Gutierrez 2005)

UNIVERSITÄT DUISBURG ESSEN

Open-Minded

Bundesministerium für Bildung und Forschung

PIM

Thank you for your attention!

HELENA

Higher Education Global Efficiency Analysis

Contact: Phone +49 201 183 6681

Golnaz.Maleki@pim.uni-due.de

http://www.helena.wiwi.uni-due.de

Förderkennzeichen 01PW11007