EWEPA'13

Helsinki
Finland

Aalto University
School of Business

13th European Workshop on Efficiency and Productivity Analysis

CONFERENCE PROGRAM

17 – 20 June 2013

Aalto University School of Business

Helsinki, Finland

Contents

WELCOME TO HELSINKI

Dear Colleague,

It is a great pleasure to welcome you to the *13th European Workshop on Efficiency and Productivity Analysis* (EWEPA"13). The term 'workshop' may seem an understatement as EWEPA has grown to a four-day conference with nearly 300 presentations and participants from all over the world. Still, EWEPA maintains casual atmosphere of a workshop that offers opportunities to discuss, debate, and exchange ideas.

While pursuing the benchmarks set by the previous EWEPA conferences, we have also introduced some new ideas. One of the innovations concerns three different types of parallel sessions: "Discuss", "Express", and "Explain". The Discuss sessions involve designated discussants who have read the paper in advance and provide thoughtful comments and feedback. The Express sessions offer an opportunity to give a shorter presentation without a full paper. The Explain sessions provide more time for the presenter without a need to submit a full paper. Based on the balanced number of submissions to each session type, there is clearly demand for different types of sessions. It is interesting to see how this works in practice.

The conference program includes several interesting plenary sessions. This year's plenary speakers are all active members of the EWEPA community. In the first plenary session on Tue 18, Robin Sickles and William Greene discuss the development of our field from the perspective of the Editors in Chief of the *Journal of Productivity Analysis*. In the second plenary session on Wed 19, the three finalists of Aalto "That's Interesting!" paper competition present their works. The third plenary session on Thu 20 honors Professor William W. Cooper, one of the original developers of DEA, with discussion on the theme "Application Driven Theory".

The conference program also includes special sessions worth noting. The afternoon of Tue 18 is devoted on regulation of electricity transmission and distribution in Europe. Representatives of regulators from Austria, Finland, Norway and Sweden discuss the practical implementation of benchmarking methods in their countries as well as open issues and challenges for the future. On Wed 19, representatives of Wärtsilä and Kone, two major Finnish manufacturing companies, will discuss how their firms pursue efficiency through innovation process. Later on Wed 19 June, Peter Bogetoft demonstrates the interactive benchmarking software that he has developed.

Social events are important opportunities for networking and exchanging ideas. On Mon 17, the City of Helsinki sponsors a reception at the City Hall. On Tue 18 we have a reception at the conference venue at Aalto University School of Business. The Conference Dinner will take place at Finlandia Hall on Wed 19. Finally, we have a Farewell reception on Thu 20. The choir of our school's student union and the band "The BTones" perform in the social events.

I wish you a very interesting and productive conference experience. Enjoy your stay in Helsinki, and see you again in 2015!

Timo Kuosmanen
General chair

COMMITTEES

Organizing Committee
Timo Kuosmanen (General Chair), Aalto University School of Business, Helsinki, Finland
Antti Saastamoinen, (Event Chair) Aalto University School of Business, Helsinki, Finland
Abolfazl Keshvari, (Program Chair) Aalto University School of Business, Helsinki, Finland
Jan Fagerström, Aalto University DIPOLI Congress Centre, Helsinki, Finland
Mika Kortelainen, Government Institute of Economic Research (VATT), Helsinki, Finland
Timo Sipiläinen, University of Helsinki, Finland
Andrew Johnson, Texas A&M University, USA

Institutional Committee
Jyrki Wallenius, Aalto University School of Business, Helsinki, Finland
Markku Kuula, Aalto University School of Business, Helsinki, Finland

Scientific Committee
Ex Officio Members:

- Timo Kuosmanen, Aalto University School of Business, Helsinki, Finland
  Representative of the current organisers of EWEPA
- Cinzia Daraio, Sapienza University of Rome, Italy
  Representative of the organisers of EWEPA XI and XII
- Kristiaan Kerstens, IESEG School of Management, Lille, France
  Representative of the organisers of EWEPA IX and X
- Meryem Duygun Fethi, University of Leicester, UK
  Representative of the Euro Working Group Efficiency and Productivity Analysis
- Tsu-Tan Fu, National Taiwan University, Tapei, Taiwan
  Coordinator from the Asia-Pacific Productivity Conference scientific committee
- C. A. Knox Lovell, University of Georgia, Athens, GA - USA and University of Queensland, Australia
  Coordinator from the North American Productivity Workshop scientific committee
- Robin Sickles, Rice University, Houston, TX - USA
  Current Editor-in-chief of the Journal of Productivity Analysis

Other Members (elected by the ex officio members):

- Alfons Oude Lansink, Wageningen University, Netherlands
- Victor Podinovski, Warwick Business School, UK
- Maria Conceição A. Silva Portela, Universidade Católica Portuguesa, Portugal
- Léopold Simar, Catholic University of Louvain-la-Neuve, Belgium
- Angelo Zago, University of Verona, Italy

SPONSORS AND PARTNERS

Financial support for EWEPA"13 from the following organizations is gratefully acknowledged:

Liikesivistysrahasto - The Foundation for Economic Education

Tieteellisten seurain valtuuskunta - Federation of Finnish Learned Societies

Yrjö Jahnsson Foundation

HSE Foundation

City of Helsinki

Aalto University School of Business

Contributions of following partners and service providers is acknowledged:

Co-organizers and partners

The Finnish Energy Market Authority

Sigma-Hat Economics Ltd

AGH Associates Ltd

Service providers:

Confedent International Ltd

Finlandia Hall

Fazer Amica

Cantina West

AALTO UNIVERSITY SCHOOL OF BUSINESS

Aalto University School of Business is part of the Aalto University. Established in 2010, the Aalto University is a new university that has centuries of experience. The Aalto University was created from the merger of three Finnish universities: Helsinki School of Economics, Helsinki University of Technology and The University of Art and Design Helsinki. The combination of three schools opens up new possibilities for strong multi-disciplinary education and research. The name "Aalto University" symbolizes change and is a tribute to a courageous, overarching renaissance man, Alvar Aalto. Aalto himself is one of our alumni as well as being the architect of the School of Science and Technology main building.

The School of Business (former Helsinki School of Economics) is both the largest and the highest ranking business school in Finland, consistently listed among the best business schools in Europe and worldwide by the Financial Times. The School was awarded AACSB accreditation in 2007. Its MBA and EMBA Programs are the first business management programs in Finland and the Nordic Countries to receive AMBA accreditation. In addition it was among the first European business schools to receive EQUIS accreditation. The Finnish Higher Education Evaluation Council (FINHEEC) has audited the Business School quality system.

Aalto University School of Business is also a member of CEMS, the Global Alliance in Management Education and PIM, Partnership in International Management. These networks provide an excellent platform to improve quality of the business education through joint programmes and by benchmarking each other's best practices.

(Photo source: Aalto archives)

PROGRAM HIGHLIGHTS

PLENARY SESSIONS

Plenary session 1: Tuesday 18 June, 9:00 - 10:30

Editors of the Journal of Productivity Analysis
Editors-in-Chief **Robin Sickles** and **William Greene** discuss recent developments and future prospects of the JPA and the field of productivity and efficiency analysis.

Plenary session 2: Wednesday 19 June, 9:00 - 10:30

Finalists of Aalto "That's Interesting!" paper competition
The prize jury has selected the following three papers as the finalists:

"Dynamics of Factor Productivity Dispersions"
Christian Bayer, Ariel Mecikovsky and **Matthias Meier**

"Room to Move: Why Some Industries Drive the Trade-Specialization Nexus and Others Do Not"
Jaap Bos and **Lu Zhang**

"Estimation and Testing of Stochastic Frontier Models using Variational Bayes"
Gholamreza Hajargasht and **William Griffiths**

The three finalists will present their works in the plenary session that takes place on Wed 19 June at 9:00-10:30 am. Each finalist should give a presentation of 20 min, followed by questions and comments from the jury consisting of Rolf Färe, Peter Schmidt, and Timo Kuosmanen. After the plenary session, the jury meets to decide the winner. The winner will be announced at the Conference Dinner at the Finlandia Hall, to be held in the evening of 19 June.

Plenary session 3: Thursday 20 June, 9:00 - 10:30

Special session in honor of Professor **William W. Cooper.**

A panel consisting of **Mette Asmild, Laurens Cherchye, Maria Portela** and **Timo Kuosmanen** will discuss the theme "Application Driven Theory" and the influence of Professor Cooper's work.

SPECIAL SESSIONS

Regulation of electricity transmission and distribution in Europe
Tuesday 18 June, 14:00 - 15:30 and 16:00 – 17:30
co-organized by the Finnish Energy Market Authority

Two special sessions focusing on recent developments in the regulation of electricity transmission and distribution in Europe. The speakers and the tentative titles are the following:

Roland Görlich (E-control, Austria): Efficiency benchmarking in Austria

Hilde Marit Kvile (NVE, Norway): Efficiency benchmarking in Norway

Matti Ilonen (EMV, Finland): Efficiency benchmarking in Finland

Göran Ek (EI, Sweden): Productivity development in electricity distribution– local grids in Sweden 2000-2011

Per Agrell (Louvain School of Management & Sumicsid): Pan-European TSO- benchmarking-project

Efficiency through innovation
Wednesday 19 June, 14:00 - 15:30

This special session provides perspectives from the industry on how the real companies seek to improve efficiency in practice. The speakers, titles and abstracts are the following:

Mikko Syrjänen, General Manager, Wärtsilä: Plant level versus system level efficiency of Smart Power Generation

Investments in power systems aim at affordable, reliable and sustainable supply of electricity. Typically alternative power generation investments, and their efficiencies in meeting these policy goals, are evaluated on power plant level. This approach does not always reflect the efficiency of the alternative technologies on the power system level. The presentation discusses the approaches used for evaluation on different levels.

Anne Stenros, Design Director, Kone: The Art of Futuring – Creating value through future foresight

In order to become a thought leader in innovation, one should sail off the map, on uncharted waters. Navigating the future is the most important asset of innovators and explorers.

Jari Hyvärinen, Senior Adviser, Tekes: Impact Analysis of Tekes Funding on Productivity and Renewing
Tekes is the most important publicly funded expert organisation for financing research, development and innovation in Finland. This presentation explains the latest methods and results concerning the impact analysis of public R&D&I funding of Tekes.

Interactive Benchmarking
Wednesday 19 June, 16:00 - 17:30

Peter Bogetoft (Copenhagen Business School & Sumicsid) has developed Interactive Benchmarking, a (Windows and) Web based software that makes state of the art benchmarking methods like Data Envelopment Analysis DEA, available to industry via a user-friendly interface. The software is routinely used by industry managers with limited knowledge of benchmarking to evaluate performance and to guide decision making. The software is used in several sectors, including Danish schools, European electricity distribution companies, Dutch hospitals and Danish waterworks. Bogetoft will present the idea of Interactive Benchmarking and give examples from applications.

SOFTWARE TUTORIALS

The following software tutorials are offered during the pre-conference day on 17 June. Note that prior registration to the tutorials is required. The R and GAMS tutorials are offered twice: note that Groups 1 and 2 have the same content.

R tutorials are provided by Professor **Arne Henningsen** (University of Copenhagen). Professor Henningsen has coauthored with Tim Coelli the 'frontier' package for R. The tutorial will cover the basics of SFA and DEA modeling in R as well as some advanced topics.

Group 1 9:00 – 10:30 & 11:00-12:30, C250 Tieto

Group 2 14:00-15:30 & 16:00:17:30, C250 Tieto

GAMS tutorials are provided by Professor **Andrew Johnson** (Texas A&M University) GAMS tutorial will mainly focus on axiomatic nonparametric least squares estimation (CNLS, StoNED) and the semi-nonparametric estimation of z-variables representing observed heterogeneity of firms and their operating environments.

Group 1 9:00 – 10:30 & 11:00-12:30, C331

Group 2 14:00-15:30 & 16:00:17:30, C331

AIMMS tutorials are provided by **Abolfazl Keshvari** (Aalto University School of Business). The AIMMS tutorial will mainly focus on data envelopment analysis (DEA) and the basics of axiomatic nonparametric least squares estimation (CNLS, StoNED).

14:00-15:30 & 16:00:17:30, Chydenia building, room G113.

Note: the morning group has been cancelled.

CONFERENCE MECHANICS

Venue: Conference venue is the main building of Aalto University School of Business. The address is Runeberginkatu 14-16.

Location and maps: The location of the conference venue and the indoors are shown in the maps at the end of this program book.

Registration: Registration takes place at the info desk which is located immediately at the main entrance of the main building.

Name Badges: Name badges are provided at the registration. The name badges must be worn at all sessions and social events throughout the conference.

Language: Official language of the conference is English. No simultaneous translation will be provided.

Internet connection: The whole conference venue is a wi-fi hotspot. There is free wi-fi network named "Aalto Open" available for use. No password is required.

Local currency: The local currency is Euro (€). In the city center, money exchange can be found for example from Central Railway Station and from the shopping mall Kamppi.

Credit cards: Common credit cards such as Visa, Mastercard, Eurocard, Diners Club and American Express are accepted almost everywhere.

Transportation: All the conference hotels are within a walking distance from the conference venue. If you want to explore Helsinki further, we would recommend to use public transportation. Probably the most convenient way of transportation is by tram (streetcar). Tram 3T stops right next to the conference venue. Single tickets can be bought from the driver. Further information about the tickets can be found from the following link: http://www.hsl.fi/EN/

The map of tram lines is at the end of this program. The Business School stop is highlighted with yellow color.

Weather: While writing this, we enjoy pleasant summer temperatures of +25 –28 C (77-82 F), and Finland is currently one of the warmest countries in Europe. According to the weather forecast the nice weather is predicted to continue. Still, it would be a good idea to pack some warmer summer clothes just in case, as there can be showers or cold wind from the Baltic Sea or from the North.

The conference package: Your conference package should include the following items:

- This program book
- Confirmation of your attendance
- Name badge
- Vouchers for the City Hall reception and the Conference Dinner (for those who registered for these events)

Conference rooms: All plenary sessions and special sessions take place in the Assembly Hall B163, which has the entrance directly from the hallway of the conference venue. The Nokia Hall B200 and room A201 are located on the 2nd floor. All other coneference rooms are located on the 3rd floor. The map of the conference venue is available at the end of this program book.

All conference rooms have a four-character alphanumeric code that can be used for locating the room. The first letter (A, B, or C) indicates the location of the room in the North side ("A-wing"), middle part ("B-wing"), or the South side ("C-wing") of the building. The next number indicates the floor. For example, the Nokia Hall B200 is located in the middle part on the second floor, whereas the Wihuri room C350 is located in the South side C-wing on the 3rd floor.

Student Assistants: Student assistants wear a blue t-shirt with the Aalto University logo. Please feel free to ask the student assistants if you need directions or assistance. During the conference student assistants can be found at the hallway or at the corridor of the A-wing on the 3rd floor. All larger conference rooms B163, B200, C350, and A201 have designated student assistants. The conference rooms in the B-wing on the 3rd floor are jointly assisted by 2-3 assistants.

Lunches: Warm self-service buffee lunch will be served in the two cantines, Rafla & Proffa, located on the 1st and 2nd floor in the C-wing. Luch is available daily during 10:30 – 15:00. The lunch breaks are scheduled during 12:30-14:00 each conference day.

There are 3-4 different lunch options available every day. The menu indicates what belongs to each option, but conference delegates are also allowed to combine items from different menus. The lunches have been pre-paid for the conference participants: please show your name badge at the cashier to identify yourself as a conference delegate.

Coffee breaks: Coffee, tea, water, and some snacks are served in the hallway and on the 2nd floor of the B-wing during the coffee breaks at 10:30 – 11:00 and 15:30 – 16:00. Coffee and tea is also available during 8:30 – 16:00 in the second floor of the B-wing (in front of the Nokia Hall B200).

Smoking: The conference venue is a non-smoking site, smoking is not permitted anywhere inside the building. Smokers should use the designated smoking areas outside the building.

Toilets: There are several female and male toilets located around the building. The nearest toilets from the hallway are found from the basement of the A-wing or the C-wing (follow the stairway down from the hallway). Toilets are also available near the conference rooms on the 2nd floor of the C-wing (in front of room C250), and on the 3rd floor at the end of the A-wing corridor.

Announcements: News, announcements, or last minute changes to the conference program will be posted on the conference website at ewepa.org and on the conference bulletin board, which is located in the hallway of the conference venue.

Changes and cancellations: Further requests to change the conference program will not be processed at this juncture as the final program has gone to print. Please inform to the event chair Antti Saastamoinen (antti.saastamoinen@aalto.fi) and the program chair Abolfazl Keshvari (abolfazl.keshvari@aalto.fi) about any last minute cancellations.

Conference hotels: The following four hotels are the official conference hotels. For any questions concerning hotel reservations, please contact the conference secretariat at the registration desk or by e-mail at EWEPA2013@confedent.fi. The addresses and telephone numbers of the conference hotels are the following:

Hotel	**Address**	**Phone**
Sokos Hotel Presidentti	Eteläinen Rautatiekatu 4	+358 20 1234 608
Radisson Blu Royal	Runeberginkatu 2	+358 20 1234 701
Hotel Helka	Pohjoinen Rautatiekatu 23	+358 9 613 580
Hostel Academica	Hietaniemenkatu 14	+358 9 1311 4334

Other important telephone numbers and addresses

The School of Business, main building information desk	+358 503667358
Helsinki City Tourist Information	+358 9 3101 3300 tourist.info@hel.fi www.visithelsinki.fi
Helsinki Airport Information	0200 14636 (0.57 €/min + local network fee)
Taxi (Taksi Helsinki)	0100 0700 (1.15 €/call+0.164/10 s+local network fee)
The conference secretariat	EWEPA2013@confedent.fi
General emergency number (police, acute medical conditions)	112

SOCIAL EVENTS

The following social events are arranged. Except for the Conference Dinner, all social events are included to the conference fee and thus are free for all conference participants. The name badge is however required for all events. For the Conference Dinner, also the **dinner voucher** is needed.

Welcome reception sponsored by the City of Helsinki
Helsinki City Hall
Monday 18:00-19:30

A welcome reception is organized at the Helsinki City Hall. The address is Pohjoisesplanadi 11-13. Note that the reception starts already at 18:00, but arrival time is flexible.

A recommended walking route from the Business School to City Hall is on the "Maps" section of this book. Alternatively, one can get almost door to door from the conference venue to the City Hall by tram 3T.

Helsinki City Hall
Source of the photo: http://commons.wikimedia.org/wiki/File:Helsingin_kaupungintalo_satamasta.jpg

Reception at Aalto University School of Business
The hallway of the conference venue
Tuesday 17:30-19:30

When the academic program ends on Tuesday, the party begins in the hallway. Wine, beverages, and snacks will be served. The quartet of the student union choir will perform contemporary songs in acapella style.

Conference Dinner
Finlandia Hall
Wednesday 18:30-00:00

The Conference Dinner takes place at the prestigious Finlandia Hall. Designed by the architect Alvar Aalto, Finlandia Hall is a unique venue for conferences, dinners and music performances. The winner of Aalto That's Inetersting! Award will be announced at the Conference Dinner. The student union choir will perform classical Finnish music as a double quartet (i.e., 8 singers).

The address is Mannerheimintie 13. A recommended walking route from the Business School to Finlandia Hall is available on the "Maps" section of this book.


Finlandia Hall seen from Töölö Bay


Finlandia Hall seen from Mannerheimintie

Source of the photos: Finlandia Hall archives

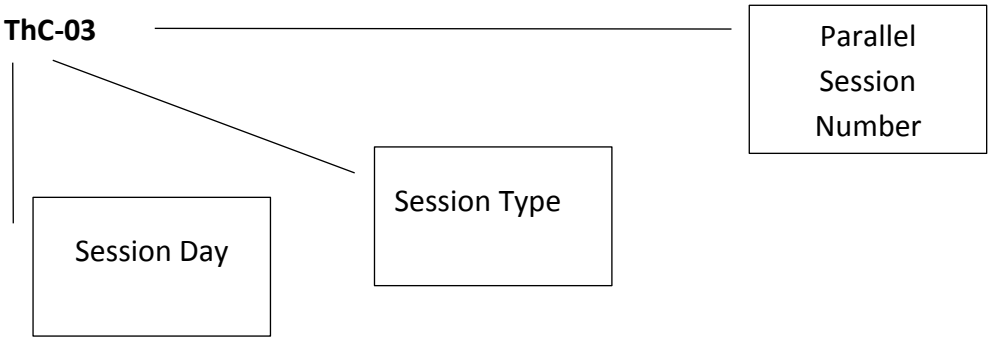
Farewell Reception
The hallway of the conference venue
Thursday 17:30-19:30

The farewell reception starts in the hallway when the academic program of the conference ends. Wine, beverages, and snacks will be served. The band Btones performs contemporary pop and rock music.

HOW TO READ THE PROGRAM

Each session has been assigned an alphanumeric session code that helps one to see immediately the time, the type of session, and the room.

The first two letters (capital letter and a lower case letter) indicate the conference day. The third capital letter indicates the session type and time. The two numbers after a hyphen indicate the parallel session number. Note that the session types run at the same time each conference day, and the parallel sessions with the same number are always in the same conference room.



Conference days:	Session Type and Time	Parallel Session Number
Mo: Monday 17	A: Plenary (9:00-10:30)	00-09
Tu: Tuesday 18	B: Discuss (11:00-12:30)	If possible, parallel sessions have been numbered such that the same topic has the same number throughout the workshop.
We: Wednesday 19	C: Express (14:00-15:30)	
Th: Thursday 20	D: Explain (16:00-17:30)	

For coauthored papers, the presenting author is indicated by asterisk *.

GUIDELINES FOR SESSION CHAIRS

As a general rule, the last presenter of each parallel session has been assigned as the session chair, unless otherwise indicated in the conference program. All session chairs should be aware of the session type as the presentation times differ across session type. In general, the session chair should arrive to the conference room at least 15 minutes before the session starts.

The session chair is responsible for keeping the session on time. For this purpose, the session chairs can show the presenters a card that indicates the remaining presentation time when there is 5 minutes or 1 minute of presentation time left.

The recommended presentation times are the following:

- **Discuss sessions** (3 papers): 20 min presentation + 5 min discussant + 5 min general discussion

- **Explain sessions** (3 papers): 25 min presentation + 5 min general discussion

- **Express sessions** (depending on the number of papers)
  5 papers: 15 min presentation + 3 min general discussion
  4 papers: 18 min presentation + 4 min general discussion
  3 papers: 25 min presentation + 5 min general discussion

In the case of last minute cancellations, the presentation times can be adjusted accordingly. It is recommended to use all the time allocated for the session and not leave gaps in the program.

GUIDELINES FOR PRESENTERS/DISCUSSANTS

PRESENTERS

Presenters are kindly asked to adhere to the following general guidelines.

1. Prepare your presentation to match the session type. Unless otherwise agreed with the session chair, the presentation times are the following:

- **Discuss sessions** (3 papers): 20 min presentation + 5 min discussant + 5 min general discussion
- **Explain sessions** (3 papers): 25 min presentation + 5 min general discussion
- **Express sessions** (depending on the number of papers)
  5 papers: 15 min presentation + 3 min general discussion
  4 papers: 18 min presentation + 4 min general discussion
  3 papers: 25 min presentation + 5 min general discussion

2. Arrive to the conference room at least 15 minutes before your session starts and identify yourself to the session chair. Bring your presentation with you on a memory stick, and keep a copy of the file accessible through the internet (e.g., in your own webmail inbox).

3. Copy your presentation to the desktop PC of the conference room before the start of the session. There are session specific folders on the desktop that should be used. These are named as TuB, TuC, TuD, WeB, WeC, WeD, ThB, ThC, ThD according to day and session type. Ask assistance from the students assistants.

DISCUSSANTS

All authors in the Discuss session are expected to discuss one paper. Please check carefully from the conference program which paper you are expected to discuss. If you have not yet received the paper you are discussant for, please contact the author/presenter directly.

Some general instructions and tips: Discussants have approximately 5 minutes to make their comments and questions. Please keep this time. Discussants can use visual aids (e.g., PPT presentation) but this is not mandatory. The discussants are not expected to summarize the paper (this is the job of the author). Present your critical comments in a constructive manner. All authors appreciate comments and questions that can help them to improve their paper. Keep focus on the contribution of the paper and avoid discussion of minor details.

EWEPA'13
Helsinki Finland
Aalto University School of Business

OVERALL SCHEDULE

Time	Track	Mon	Tue	Wed	Thu
8:00 - 17:00		Registration	Registration	Registration	Registration
9:00 - 10:30	**Plenary**	Young researcher workshop Software tutorials	Plenary session 1: JPA editors	Plenary session 2: That's Interesting Competition	Plenary session 3: Special session in honor of W.W. Cooper
10:30 - 11:00		Coffee break	Coffee break	Coffee break	Coffee break
11:00 - 12:30	**Discuss**	Young researcher workshop Software tutorials	Discuss sessions TuB	Discuss sessions WeB	Discuss sessions ThB
12:30 - 14:00		Lunch break	Lunch break (JPA Editorial Board lunch meeting)	Lunch break (EWEPA Scientific committee lunch meeting)	Lunch break
14:00 - 15:30	**Express**	Young researcher workshop Software tutorials	Express sessions TuC	Express sessions WeC	Express sessions ThC
15:30 - 16:00		Coffee break	Coffee break	Coffee break	Coffee break
16:00 - 17:30	**Explain**	Young researcher workshop Software tutorials	Explain sessions TuD	Explain sessions WeD	Explain sessions ThD
17:30-			Reception at Aalto University School of Business Music performance by KY Choir		Farewell Reception at Aalto University School of Business Music by The Btones
18:00-		Welcome reception at the Helsinki City Hall			
18:30-				Conference Dinner at Finlandia Hall Music performance by KY Choir	

EWEPA'13
Helsinki Finland
Aalto University School of Business

SESSION SCHEDULE - MONDAY

Young Researcher (YR) Workshop, Software Tutorials

Time	Young researcher workshop, Track 1, B200 Nokia	Young researcher workshop, Track 2, C350 Wihuri	Software tutorials * C250 Tieto	C331	G113 (in Chydenia building)
8:00 - 17:30	Registration, Lobby				
8:45 - 9:00	Opening Remarks, Assembly Hall				
9:00 - 10:30	MoA-01 Public Services	MoA-02 Dynamic Modelling	MoA-03 R Tutorial 1	MoA-04 GAMS Tutorial 1	
10:30 - 11:00	Coffee break	Coffee break			
11:00 - 12:30	MoB-01 Institutions	MoB-02 Environment 1	R Tutorial 1	GAMS Tutorial 1	
12:30 - 14:00	Lunch break	Lunch break			
14:00 - 15:30	MoC-01 Innovations	MoC-02 Agriculture 1	MoC-03 R Tutorial 2	MoC-04 GAMS Tutorial 2	MoC-05 AIMMS Tutorial 2
15:30 - 16:00	Coffee break	Coffee break			
16:00 - 17:30	MoD-01 Agriculture 2	MoD-02 ---	R Tutorial 2	GAMS Tutorial 2	AIMMS Tutorial 2

* Pre-registration required for software tutorials.

EWEPA'13
Helsinki Finland
Aalto University School of Business

SESSION SCHEDULE - TUESDAY

Time	Track										
8:00- 17:30	**Registration**										
9:00 - 10:30	Plenary	**Plenary Session TuA-00: The Editors of Journal of Productivity Analysis, B163 Assembly Hall**									
10:30 - 11:00	**Coffee break**										
	Session rooms										
		B163 Assembly Hall	**B200 Nokia**	**A201 Saastamoisen säätiö**	**A301 SOK**	**A304**	**A305**	**A306 YIT**	**A307**	**A308**	**C350 Wihuri**
11:00 - 12:30	Discuss	TuB-00 ---	TuB-01 DEA 1: Statistical Foundations	TuB-02 Energy 1: Electricity Distribution	TuB-03 Banking & Finance 1	TuB-04 Innovative Applications 1	TuB-05 Environment 2	TuB-06 Growth & Convergence	TuB-07 Infrastructure	TuB-08 Management & Performance	TuB-09 Public Sector & Municipalities
12:30 - 14:00	**Lunch break**										
14:00 - 15:30	Express	TuC-00 Special Session: Energy	TuC-01 Stochastic Frontiers 1	TuC-02 Conditional Frontiers	TuC-03 Banking & Finance 2	TuC-04 Food Industry	TuC-05 Environment 3	TuC-06 Innovative Applications 2	TuC-07 ---	TuC-08 ---	TuC-09 DEA 2
15:30 - 16:00	**Coffee break**										
16:00 - 17:30	Explain	TuD-00 Special Session: Energy	TuD-01 Conditional Nonparametric Frontiers	TuD-02 Inference	TuD-03 Banking & Finance 3	TuD-04 Agriculture 3	TuD-05 Environment 4	TuD-06 Index Theory 1	TuD-07 Regional Studies 1	TuD-08 Health Care 1	TuD-09 DEA 3

EWEPA'13
Helsinki Finland
Aalto University School of Business

SESSION SCHEDULE - WEDNESDAY

Time	Track									
8:00 – 17:30	**Registration**									
9:00 - 10:30	Plenary	**Session WeA-01: That's Interesting Final, B163 Assembly Hall**								
10:30 - 11:00	**Coffee break**									
	Session rooms									
		B163 Assembly Hall	**B200 Nokia**	**A201 Saastamoisen säätiö**	**A301 SOK**	**A304**	**A305**	**A306 YIT**	**A307**	**A308**	**C350 Wihuri**
11:00 - 12:30	Discuss	WeB-00 ---	WeB-01 Stochastic Frontiers 2	WeB-02 Energy 2	WeB-03 Banking & Finance 4	WeB-04 Agriculture 4	WeB-05 Environment 5	WeB-06 Manufacturing & Power Plants	WeB-07 Productivity & Aggregation	WeB-08: Education 1	WeB-09 Index Theory 2
12:30 - 14:00	**Lunch break**										
14:00 - 15:30	Express	WeC-00 Special Session: Innovation	WeC-01 Business Environment	WeC-02 Energy 3	WeC-03 Banking & Finance 5	WeC-04 Agriculture 5	WeC-05 Environment 6	WeC-06 Health Care 2	WeC-07 Innovative Applications 3	WeC-08 ---	WeC-09 Index Theory 3
15:30 - 16:00	**Coffee break**										
16:00 - 17:30	Explain	WeD-00 Special Session: Interactive benchmarking	WeD-01 Directional Distance Functions	WeD-02 Energy 4	WeD-03 Manufacturing	WeD-04 Agriculture 6	WeD-05 DEA 4	WeD-06 ---	WeD-07 ---	WeD-08 ---	WeD-09 Index Theory 4

EWEPA'13
Helsinki Finland
Aalto University School of Business

SESSION SCHEDULE - THURSDAY

Time	Track										
8:00 – 17:00		**Registration**									
9:00 - 10:30	Plenary	**Session ThA-00: Special session in honor of Professor William W. Cooper, B163 Assembly Hall**									
10:30 - 11:00		**Coffee break**									
		Session rooms									
		B163 Assembly Hall	**B200 Nokia**	**A201 Saastamoisen säätiö**	**A301 SOK**	**A304**	**A305**	**A306 YIT**	**A307**	**A308**	**C350 Wihuri**
11:00 - 12:30	Discuss	ThB-00 ---	ThB-01 Stochastic Frontiers 3	ThB-02 R&D	ThB-03 Banking & Finance 6	ThB-04 DEA 5	ThB-05 Environment 7	ThB-06 ---	ThB-07 ---	ThB-08 ---	ThB-09 Heterogeneity
12:30 - 14:00		**Lunch break**									
14:00 - 15:30	Express	ThC-00 ---	ThC-01 Axiomatic Approaches 1	ThC-02 Energy 5: Power Plants	ThC-03 Regional Studies 2	ThC-04 Agriculture 7	ThC-05 Environment 8: Water & Waste Management	ThC-06 Macro Productivity	ThC-07 ---	ThC-08 ---	ThC-09 DEA 6
15:30 - 16:00		**Coffee break**									
16:00 - 17:30	Explain	ThD-00 ---	ThD-01 Education 2	ThD-02 Axiomatic Approaches 2	ThD-03 DEA 7	ThD-04 Agriculture 8	ThD-05 DEA 8	ThD-06 Dynamic Efficiency and Organizational Knowledge	ThD-07 ---	ThD-08 ---	ThD-09 Stochastic Semi-Nonparametric Approaches

EWEPA'13
Helsinki Finland
Aalto University School of Business

SESSION PROGRAM

MONDAY 17 June

Note: the presenting author indicated by asterisk *

Opening Remarks
8:45 - 9:00, B163 Assembly Hall

MoA-01: Public sector
9:00-10:30, B200 Nokia
Session chair: Shawna Grosskopf

Evaluation and re-design of public education networks: A centralized analysis
Laura, López-Torres* and Diego Prior
Discussant: Shawna Grosskopf

Primary education efficiency in Burkina Faso: a multi-output analysis
Elise Wendlassida Miningou* and Valerie Vierstraete
Discussant: Kathy Hayes

Efficiency of Hospitals in the Czech Republic using DEA Alternative Models and DRG-Adjusted Data
Jana Votapkova* and Lenka Stastna
Discussant: Finn Forsund

MoA-02: Dynamic modeling
9:00-10:30, C350 Wihuri
Session chair: Chris O'Donnell

Dynamic Efficiency under Uncertainty: An Application to German Dairy Farms
Christina Wagner*, Silke Huettel, Rashmi Narayana, and Martin Odening
Discussant: Peter Schmidt

Bayesian Analysis of Dynamic Effects in Inefficiency: Evidence from the Colombian Banking Sector
Jorge E. Galan*, Helena Veiga, and Michael P. Wiper
Discussant: Chris O'Donnell

The Spillover Effects of Foreign Direct Investment toward Efficiency and Productivity in Indonesian Manufacturing Industry
Dyah Wulan Sari*, Nooraini Khalifah and Suyanto Suyanto
Discussant: Gudbrand Lien

MoA-03: R Tutorial 1
9:00-10:30, C250 Tieto
11:00-12:30, C250 Tieto

Arne Henningsen

MoA-04: GAMS Tutorial 1
9:00-10:30, C331
11:00-12:30, C331

Andrew Johnson

MoB-01: Institutions
11:00-12:30, B200 Nokia
Session chair: Paul Wilson

Productivity analysis of microfinance institutions (MFIs) in Bangladesh
Subir K Bairagi
Discussant: Timo Kuosmanen

Is Aid Efficient?
Audrey Menard* and Laurent Weill
Discussant: Chris Parmeter

Using the latent class approach as a supervised method to cluster firms in DEA: An application to the US electricity transmission sector
Manuel Llorca*, Luis Orea, and Michael G. Pollitt
Discussant: Paul Wilson

MoB-02: Environment 1
11:00-12:30, C350 Wihuri
Session chair: Robin Sickles

The Economic Costs of Abatement, and Environmental Regulation: An Analysis of Dairy Farming
Eric Njuki* and Boris Bravo-Ureta
Discussant: Scott Atkinson

Assessing stocks and flows of nitrogen in agriculture: An application of dynamic material balance accounting to 14 European countries
Natalia Kuosmanen
Discussant: Rolf Färe

Accounting for Water Pollution in US Agricultural Productivity: a Parametric Approach
Tshepelayi Kabata* and Richard Nehring
Discussant: Robin Sickles

MoC-01: Innovations
14:00-15:30, B200 Nokia
Session chair: Kristiaan Kerstens

A multiple objective resource allocation based on DEA models
Mojtaba Ghiyasi
Discussant: Maria Portela

The effect of competition, separation and ownership on efficiency: evidence from European TLC sector
Clementina Bruno* and Alessandro Manello
Discussant: David Saal

In Search of Patterns of Information Technology Use for the Improvement of Information Worker Productivity: A Research Proposal
Natallia Pashkevich* and Darek M. Haftor
Discussant: Kristiaan Kerstens

MoC-02: Agriculture 1
14:00-15:30, C350 Wihuri
Session chair: Mike Tsionas

Panel Data Nonparametric Estimation of Production Risk and Risk Preferences: Application to Polish Dairy Farms
Tomasz Gerard Czekaj* and Arne Henningsen
Discussant: Mike Tsionas

Technical Efficiency of Smallholder Agriculture in Developing Countries: The Case of Ethiopia
Anbes Tenaye Kidane* and Eirik Romstad
Discussant: Alan Wall

The Effect of Dairy Quota on Milk Composition
Daniel Muluwork Atsbeha
Discussant: Boris Bravo-Ureta

MoC-03: R Tutorial 2
14:00-15:30, C250 Tieto
16:00-17:30, C250 Tieto

Arne Henningsen

MoC-04: GAMS Tutorial 2
14:00-15:30, C331
16:00-17:30, C331

Andrew Johnson

MoC-05: AIMMS Tutorial
14:00-15:30, Chydenia building, G113
16:00-17:30, Chydenia building, G113

Abolfazl Keshvari

MoD-01: Agriculture 2
16:00-17:30, B200 Nokia
Session chair: Giannis Karagiannis

Is there a Slowdown in Agricultural Productivity Growth in South America?
Federico Trindade
Discussant: Giannis Karagiannis

Agricultural Productivity Gaps in Latin America and the Caribbean with Climatic Considerations: A Preliminary Stochastic Production Frontier Analysis
Michée A. Lachaud* and Boris E. Bravo-Ureta and Carlos Ludena
Discussant: Luis Orea

The Simar and Wilson's Bootstrap DEA approach: a critique
Panagiotis Tziogkidis
Discussant: Leopold Simar

EWEPA'13
Helsinki Finland
Aalto University School of Business

TUESDAY 18 June

TuA-00: Plenary session 1
Editors of the *Journal of Productivity Analysis*
9:00-10:30, B163 Assembly Hall
Session chair: Leopold Simar

Robin Sickles

William Greene

TuB-01: DEA 1: Statistical Foundations
11:00-12:30, B200 Nokia
Session chair: Paul W. Wilson

Multi-Product Differential Characteristics of Efficient Frontier in Data Envelopment Analysis
Chia-Yen Lee
Discussant: Jose Manuel Cordero-Ferrera

Dealing with the Endogeneity Problem in Data Envelopment Analysis
José Manuel Cordero-Ferrera, Daniel Santín, and Gabriela Sicilia*
Discussant: Paul W. Wilson

Balancing Bias and Variance in Testing Hypotheses within Nonparametric Models of Production
Alois Kneip, Leopold Simar, and Paul W. Wilson*
Discussant: Chia-Yen Lee

TuB-02: Energy 1: Electricity Distribution
11:00-12:30, A201 Saastamoisen säätiö
Session chair: Heike Wetzel

Dynamic Efficiency and Incentive Regulation: An Application to Electricity Distribution Networks
Rahmatallah Poudineh*, Grigorios Emvalomatis and Tooraj Jamasb
Discussant: Antti Saastamoinen

Quality Frontier of Electricity Distribution
Antti Saastamoinen* and Timo Kuosmanen
Discussant: Heike Wetzel

The Impact of Ownership Unbundling on Cost Efficiency: Empirical Evidence from the New Zealand Electricity Distribution Sector
Massimo Filippini and Heike Wetzel*
Discussant: Rahmatallah Poudineh

TuB-03: Banking & Finance 1
11:00-12:30, A301 SOK
Session chair: Markku Kallio
Cost efficiency of Kazakhstan and Russian banks: Results from competing panel data models
Subal C. Kumbhakar and Anatoly A. Peresetsky*
Discussant: Yung-Lieh Yang

Meta Cost Malmquist Productivity Index - An Application of the Bank Financial Restructurings Groups in Taiwan
Yung-Lieh Yang*, Ming-hsiang Huang , Tzu-Chun Sheng, and Kai-Ping Liu
Discussant: Markku Kallio

Likelihood ranking of decision making units
Markku Kallio* and Merja Halme
Discussant: Anatoly A. Peresetsky

TuB-04: Innovative Applications 1
11:00-12:30, A304 Mandatum Life
Session chair: Angelo Zago

'The Curse of the Caribbean?' Agency's impact on the efficiency of sugar estates in St. Vincent and the Grenadines, 1814-1829
SD Smith and Martin Forster*
Discussant: Alejandra Trejo Nieto

Economic efficiency and productivity in the Mexican metropolitan system, 1998-2008
Alejandra Trejo Nieto* and Angelica Maria Vazquez Rojas
Discussant: Angelo Zago

Large Courts, Small Justice! The inefficiency and the optimal structure of the Italian Justice sector
Antonio Peyrache and Angelo Zago*
Discussant: Martin Forster

TuB-05: Environment 2
11:00-12:30, A305
Session chair: Timo Kuosmanen

Environmental efficiency indices: towards a new approach to green-growth accounting
Chiara Peroni*
Discussant: Raushan Bokusheva

Modeling economic and environmental performance: incorporation of technological relationship between desirable and undesirable outputs within the distance function approach
Raushan Bokusheva* and Subal Kumbhakar
Discussant: Timo Kuosmanen

Assessing Green Growth in Agriculture: Dynamic Material Balance and Semi-Nonparametric Malmquist Index
Timo Kuosmanen
Discussant: Chiara Peroni

TuB-06: Growth & Convergence
11:00-12:30, A306 YIT
Session chair: Dimitris Margaritis

Sources of productivity growth in the new EU Member States and Russia
Ilya B. Voskoboynikov
Discussant: Deb Kusum Das

Total Factor Productivity Growth in India in the Reform Period: A Disaggregated Sectoral Analysis
Deb Kusum Das*, Abdul Azeez Erumban, and Suresh Aggarwal
Discussant: Dimitris Margaritis

Time Substitution and the EU Stability and Growth Pact
Rolf Färe, Shawna Grosskopf, Dimitris Margaritis* and W.L. Weber
Discussant: Ilya B. Voskoboynikov

TuB-07: Infrastructure
11:00-12:30, A307
Session chair: Linjia Zhang

Measuring and Decomposing the Productivity Impact of Mergers in the Japanese Water Industry
Michael Zschille* and David S. Saal and Pablo Arocena and Takuya Urakami
Discussant: Humberto Brea Solis

Regulatory Incentives to Water Losses Reduction: The case of England and Wales
Humberto Brea Solis* and Sergio Perelman and David S. Saal
Discussant: Linjia Zhang

Efficiency, Returns to Scale and Public Infrastructures: The Aigner and Chu Model Revisited
Pierre Ouellette, Stephane Vigeant and Linjia Zhang*
Discussant: Michael Zschille

TuB-08: Management & Performance
11:00-12:30, A308
Session chair: Aki Jääskeläinen

World-class manufacturing and productivity. An assessmento of the literature
Riccardo Leoni
Discussant: Hannes Lampe

Accrual accounting - A driver of performance?
Dennis Hilgers and Hannes Lampe*
Discussant: Aki Jääskeläinen

Applying performance measurement in service operations: analysis of contextual differences
Aki Jääskeläinen* and Harri Laihonen
Discussant: Riccardo Leoni

TuB-09: Public Sector & Municipalities
11:00-12:30, Wihuri
Session chair: Førsund, Finn R.

Conditional Efficiency Analysis of Municipal Service Provision in Germany
Maria Nieswand
Discussant: Mika Kortelainen

Break-ups of Municipal Health Centre Federations: Expenditure and Efficiency Effects
Mika Kortelainen* and Kalevi Luoma and Antti Moisio
Discussant: Førsund, Finn R.

Measuring effectiveness of production in the public sector
Førsund, Finn R.
Discussant: Maria Nieswand

TuC-00: Special Session: Energy Regulation of electricity transmission and distribution in Europe
14:00-15:30, B163 Assembly Hall
Session chair: Timo Kuosmanen

Regulation and efficiency benchmarking in Finland
Matti Ilonen (EMV)

Regulation and efficiency benchmarking in Austria
Roland Görlich (E-control)

Regulation and efficiency benchmarking in Norway
Hilde Marit Kvile (NVE)

TuC-01: Stochastic Frontiers 1
14:00-15:30, B200 Nokia
Session chair: Subal C. Kumbhakar

Self-selection into export market : Does productivity affect the entry barriers?
Xi Chen and Frédéric Olland*

Smoothing nonparametric partial frontier methods
P. Carvalho* and R. Marques

Estimation and interpretation of a production frontier with multiple time-varying individual effects
Antonio Alvarez and Carlos Arias*
SFA Pseudolikelihood – A New Way to Estimate Efficiency?
Mark Andor

Derivation of marginal effects of determinants of technical inefficiency
Subal C. Kumbhakar* and Kai Sun

TuC-02: Conditional Frontiers
14:00-15:30, A201 Saastamoisen säätiö
Session chair: Christophe Bontemps

Productivity Growth of International Tourist Hotels in Taiwan: A Global Malmquist Productivity Index
Ming-Miin Yu* and Li-Hsueh Chen

Financial Development and Macroeconomic Efficiency in Transition Countries: A Conditional Nonparametric Frontier Analysis
Anastasia Ri* and Leopold Simar

Productivity and Efficiency of World Airlines: An Empirical Application with order-m and alpha-Frontiers
Christophe Bontemps*, Steve Lawford and Nathalie Lenoir

TuC-03: Banking & Finance 2
14:00-15:30, A301 SOK
Session chair: Marta Degl'Innocenti

Input-oriented enhanced efficiency measures and Malmquist Indexes: An application to Japanese Banking
Hirofumi Fukuyama* and Kazuyuki Sekitani

Measuring Cost Efficiency in West European Banking: A New Approach to a Metafrontier Cost Function
Tai-Hsin Huang and Chi-Chuan Lee*

A geographically weighted approach to measuring efficiency in panel data: The case of US saving banks
Benjamin M. Tabak

Foreign investments, policy interventions and productivity change in the Indonesian banking sector
Dony Abdul Chalid* and Marta Degl'Innocenti

TuC-04: Food Industry
14:00-15:30, A304 Mandatum Life
Session chair: Lukas Cechura

Dynamic Productivity Growth and Investment Spikes in the Spanish Meat Industry
Magdalena Kapelko*, Alfons Oude Lansink, and Spiro Stefanou

Corporate R&D in food-processing industry
Peter Voigt and Heinrich Hockmann*

Heterogeneity in Production Structures and Efficiency: An Analysis of the Czech Food Processing Industry
Lukas Cechura* and Heinrich Hockmann

TuC-05: Environment 3
14:00-15:30, A305
Session chair: Tarmo Räty

Measuring profit and materials balance-based environmental efficiency with directional distance functions
Jef Van Meensel* and Ludwig Lauwer

Guiding improvements in human well-being and environmental quality of European cities
Andreia Zanella*, Ana S. Camanho, and Teresa G. Dias

Is land fragmentation an obstacle to adopting environmentally safer technologies in milk production? A latent class model approach
Luis Orea*, Jose A. Perez, and David Roibas

Construction Industry Performance: An International Comparison of Productivity and Environmental Efficiency in Brazil and Other Nations
Fernando Garcia*, Ana Lélia Magnabosco, and Jorge Pires

Eco-efficiency and Environmental Rating Tools for Buildings
Tarmo Räty* and Hiroki Ito

TuC-06: Innovative Applications 2
14:00-15:30, A306 YIT
Session chair: Suthathip Yaisawarng

Evaluating Performance of University Business Colleges in Taiwan using the Wage-Metafrontier Function
Tsu-Tan Fu*, SN Hu, NY Lu, and PH Kao

Measuring micro-level competitiveness: a model-based multidimensional approach
Rosa Bernardini Papalia and Annalisa Donno*

Can a government initiate an industrial reform to improve efficiency?
Ying Chu Ng* and Suthathip Yaisawarng

Multi-Media Advertising Efficiency
Preecha Asavadachanukorn, Saowaros Yaisawarng, and Suthathip Yaisawarng*

TuC-09: DEA 2
14:00-15:30, C350 Wihuri
Session chair: Jesus T. Pastor

Efficiency measurement of the projects using non-discretionary factors and imprecise DEA
Pooria Niknazar* and Mario Bourgault

Faculty Research Performance and Efficiency Evaluation in Greek University Departments of Economics Using DEA
Giannis Karagiannis

Multiplicative aggregation of variables in DEA
Mette Asmild*, Jens Leth Hougaard, and Francisco Imperatore

Optimal resource allocation to parallel subsystems by range adjusted measure
Hiroshi Morita

A BAM extended measure for the CRS partially bounded additive model
Jesus T. Pastor*, Juan Aparicio, Javier Alcaraz, Fernando Vidal, and Diego Pastor

---

TuD-00: Special Session: Energy Regulation of electricity transmission and distribution in Europe
16:00-17:30, B163 Assembly Hall
Session chair: Peter Bogetoft

Pan-European TSO- benchmarking-project
Per Agrell (Louvain School of Management & Sumicsid)

Productivity development in electricity distribution– local grids in Sweden 2000-2011
Göran Ek (EI, Sweden)

Panel discussion
Matti Ilonen, Roland Görlich, Hilde Marit Kvile, Per Agrell, Göran Ek

---

TuD-01: Conditional Nonparametric Frontiers
16:00-17:30, B200 Nokia
Session chair: Camilla Mastromarco

Assessing the Impact of Stock Volatility on the Efficiency of Listed Commercial Banks: A Conditional Nonparametric Approach
Anamaria Aldea*, Luiza Badin, and Carmen Lipara

CONDEFF: A Toolbox for Conditional Efficiency Measurement
Luiza Badin*, Cinzia Daraio and Leopold Simar

Effect of FDI and Time on Catching-up: New Insights from a Conditional Nonparametric Frontier Analysis
Camilla Mastromarco* and Léopold Simar

TuD-02: Inference
16:00-17:30, A201 Saastamoisen säätiö
Session chair: Christine Amsler

Multiple Technology Heterogeneity: Does the hierarchy reveal the latent technology?
Kostas Tsekouras, Nikos Chatzistamoulou*, Alexandra Kontolaimou, and Kostas Kounetas

Impact of the introduction of SFPs on Technical Efficiency of crop farms in Eure-et-Loir
Jean-Philippe Boussemart, Ayouba Kassoum*, and Stephane Vigeant

A Post-Truncation Parameterization of Truncated Normal Technical Inefficiency
Christine Amsler*, Peter Schmidt, and Wen-Jen Tsay

TuD-03: Banking & Finance 3
16:00-17:30, A301 SOK
Session chair: Saleem Janoudi

Why is 'too much finance' bad for productivity?
Dirk Bezemer and Lu Zhang*

The Nexus Between Efficiency and Competition in Asian Banking
Rossazana Ab-Rahim*, Dyg-Affizzah Awg-Marikan and Farhana Ismail

Efficiency and Risk in the European Union Banking System: The Effect of the World Economic Crisis 2007-2009
Saleem Janoudi

TuD-04: Agriculture 3
16:00-17:30, A304 Mandatum Life
Session chair: Loren W. Tauer

Productivity, Efficiency, and Competitiveness of the Danish Farm Sector and their Determinants
Ole Fabricius* and Kurt Nielsen

The Influence of Subsidies on Technical Efficiency in the Agricultural Sector: A Bayesian Mixed Model Approach
Daniel Castro* and Bernhard Brümmer

The Inverse Productivity Relationship in Small Agricultural Plots: A Non-Parametric Assessment using a Free Disposal Hull Order-m Approach
Loren W. Tauer* and Janet Y. Hou

TuD-05: Environment 4
16:00-17:30, A305
Session chair: Ludwig Lauwers

Optimal Directions for Directional Distance Functions: An Exploration of Potential Reductions of Greenhouse Gases
Benjamin Hampf* and Jens J. Krüger

Green supplier selection: becoming green while costless
Sumarsono Sudarto*, T.Yuri M.Z., Amar Rachman, Katsuhiko Takahashi, and Katsumi Morikawa

Eco-efficiency, -productivity and -effectiveness in a productive efficiency framework
Ludwig Lauwers*, Koen Mondelaers, and Jef Van Meensel

TuD-06: Index Theory 1
16:00-17:30, A306 YIT
Session chair: Christopher J. O'Donnell

A comparison of alternative Malmquist index decompositions
Roxani Karagiannis

Value and quantity data in economic and technical efficiency measurement
Maria S. Portela

Alternative Indexes for Multiple Comparisons of Quantities and Prices
Christopher J. O'Donnell

TuD-07: Regional Studies 1
16:00-17:30, A307
Session chair: Russel Cooper

Regional framework conditions and the efficiency of Innovation Investments
Andrea Conte

Inefficiency and Hedonic Prices: An Application to Housing Markets
Sami Pakarinen

Demographic Productivity Differentials – A Household Perspective
Wojciech Szewczyk and Russel Cooper*

TuD-08: Health Care 1
16:00-17:30, A308
Session chair: V. E. Krivonozhko

Congestion of Intensive Care Units Using an Approiriate Production Technology
Diogo Cunha Ferreira* and Rui Cunha Marques

Enhancing the productivity measurement of hospitals
Andreas J. Reuschl* and Ricarda B. Bouncken

On comparison of OECD Better Life Index and the DEA approach
V. E. Krivonozhko*, A. A. Piskunov, and A. V. Lychev

TuD-09: DEA 3
16:00-17:30, C350 Wihuri
Session chair: Kaoru Tone

Output Interdependency of Football Clubs in a Network DEA model
Thanasis Bouzidis* and Giannis Karagiannis

Malmquist Index in the Dynamic & Network DEA model
Miki Tsutsui* and Kaoru Tone

A scale and cluster adjusted DEA model that permits both convex and non-convex efficient frontiers
Kaoru Tone* and Miki Tsutsui

EWEPA'13
Helsinki Finland
Aalto University School of Business

WEDNESDAY 19 June

WeA-00: Plenary session 2
Finalists of Aalto "That's Interesting!" award
9:00-10:30, B-163 Assembly Hall
Session chair: Timo Kuosmanen

Dynamics of Factor Productivity Dispersions
Christian Bayer, Ariel Mecikovsky*, and Matthias Meier

Room to Move: Why Some Industries Drive the Trade-Specialization Nexus and Others Do Not
Jaap Bos* and Lu Zhang

Estimation and Testing of Stochastic Frontier Models using Variational Bayes
Gholamreza Hajargasht* and William E. Griffiths

Discussants: Rolf Färe, Peter Schmidt, and Timo Kuosmanen

WeB-01: Stochastic Frontiers 2
11:00-12:30, B200 Nokia
Session chair: Leopold Simar

Estimation of a Flexible Stochastic Cost Frontier Model with Environmental Factors Subject to Economic Constraints
Subal C. Kumbhakar and Kai Sun*
Discussant: Thomas Triebs

Production and Management: Does Inefficiency capture Management?
Thomas Triebs* and Subal Kumbhakar
Discussant: Leopold Simar

Measuring Firm Performance by using Nonparametric Quantile-type Distances: a New Approach
Abdelaati Daouia, Leopold Simar* and Paul W. Wilson
Discussant: Kai Sun

WeB-02: Energy 2
11:00-12:30, A201 Saastamoisen säätiö
Session chair: Massimo Filippini

Impact of energy policy instruments on the estimated level of underlying energy efficiency in the EU residential sector
Massimo Filippini, Lester C. Hunt, and Jelena Zoric*

The Effects of Compliance with the Clean Air Act on Production Cost, and Total Factor Productivity Growth in the Electric Utility Industry
Gerald Granderson* and Finn Forsund

Energy Demand and Energy Efficiency: A Stochastic Demand Frontier Approach
Massimo Filippini* and Lester Hunt

WeB-03: Banking & Finance 4
11:00-12:30, A301 SOK
Session chair: David Tripe

Measuring the Efficiency of New Zealand Banks during the global financial crisis
Paul Rouse, David Tripe*, and WenQian Song
Discussant: Francesco Aiello

On the Sources of Heterogeneity in Banking Efficiency Literature
Francesco Aiello* and Graziella Bonanno
Discussant: Diego Prior

Earnings quality and performance in the banking industry: A profit frontier approach
Manuel Illueca, Diego Prior*, Emili Tortosa-Ausina, and MaPilar García-Alcober
Discussant: David Tripe

WeB-04: Agriculture 4
11:00-12:30, A304 Mandatum Life
Session chair: Federico Garcia Suarez

Grain production potential in Russia: An application of the directional distance function
Maria Belyaeva* and Heinrich Hockmann

Technological Change and Productivity Analysis in Great Plains
Dereje B. Megeressa
Discussant: Federico Garcia Suarez

The value of irrigation in the High Plains aquifer: Spatial Effect
Federico Garcia Suarez
Discussant: Dereje B. Megeressa

WeB-05: Environment 5
11:00-12:30, A305
Session chair: Bernhard Mahlberg

Climate Risk Adjusted Efficiency of World and Regional Agricultural Sector
Saleem Shaik
Discussant: Bouali Guesmi

Technical and environmental efficiency of Catalan arable crop farms
Bouali Guesmi* and Teresa Serra
Discussant: Bernhard Mahlberg

Eco-Efficiency and Eco-Productivity change over time in a multisectoral economic system
Bernhard Mahlberg* and Mikulas Luptacik
Discussant: Saleem Shaik

WeB-06: Manufacturing & Power Plants
11:00-12:30, A306 YIT
Session chair: Arne Henningsen

Labor Compensation and Productivity at Plan Level in the European Automobile Industry
Jonathan Calleja-Blanco* and Emili Grifell-Tatjé

Measuring Firm-Level Capital Stock and Productivity in Luxembourg's Manufacturing Sector
Umut Kilinc
Discussant: Arne Henningsen

Price and Politically Induced Productivity Changes Affecting CO2 Emissions of Danish Electricity and Heat Producing Plants
Geraldine Henningsen, Arne Henningsen* and Simon Bolwig
Discussant: Umut Kilinc

WeB-07: Productivity & Aggregation
11:00-12:30, A307
Session chair: Nelli Valmari

Returns to scale, productivity, and growth: an empirical investigation from the macroeconomic and industry perspecptives
Ana Lélia Magnabosco* and Fernando Garcia de Freitas
Discussant: Rita Markovits-Somogyi

Effects of emission based road user charges on the efficiency of road haulage companies
Rita Markovits-Somogyi and Ádám Török
Discussant: Nelli Valmari

Estimating production functions of multiproduct firms
Nelli Valmari
Discussant: Ana Lélia Magnabosco

WeB-08: Education 1
11:00-12:30, A308
Session chair: Daniel Santín

Gender Differences in Faculty Research Productivity -- The Case of Taiwan
Flora F. Tien

Multi-output production efficiency: an empirical analysis of US university research
Veerle Hennebel* and Laurens Cherchye

Another brick in the wall. A new Ranking of Academic Journals in Economics using a pure output oriented FDH
Antonio García-Romero, Daniel Santín*, and Gabriela Sicilia

WeB-09: Index Theory 2
11:00-12:30, C350 Wihuri
Session chair: Valentin Zelenyuk

Quality of life in a country: Luenberger and Malmquist index generalizations of the HDI
Atakelty Hailu* and Robert G. Chambers
Discussant: Valentin Zelenyuk

Scale Efficiency and Homotheticity: Equivalence of Primal and Dual Measures
Valentin Zelenyuk
Discussant: Atakelty Hailu

Aggregation of Scale Efficiency
Valentin Zelenyuk

WeC-00: Special Session: Efficiency through innovation
14:00-15:30, B163 Assembly Hall
Session chair: Joseph Paradi

Plant level versus system level efficiency of Smart Power Generation
Mikko Syrjänen (Wärtsilä)

The Art of Futuring – Creating value through future foresight
Anne Stenros (KONE)

Impact Analysis of Tekes Funding on Productivity and Renewing
Jari Hyvärinen (Tekes)

WeC-01: Business Environment
14:00-15:30, B200 Nokia
Session chair: Efthynios G. Tsionas

Computing economies of vertical integration, economies of scope and economies of scale using partial frontier nonparametric methods
R. Marques* and P. Carvalho

Business Environment, Innovation and Productivity: Evidence from Russia's Regions
Helena Schweiger* and Paolo Zacchia

Estimation of Market Power and Efficiency: A Unified Approach
Efthynios G. Tsionas and Subal Kumbhakar

WeC-02: Energy 3
14:00-15:30, A201 Saastamoisen säätiö
Session chair: Göran Ek

How efficient are German power plants? A nonparametric performance analysis of heterogeneous electricity generation technologies in a meta frontier framework
Stefan Seifert*, Astrid Cullmann, and Christian von Hirschhausen

Static versus Dynamic Efficiency Measures: Evidence from the US Electricity Transmission and Distribution Industry
Sebastian Nick* and Heike Wetzel

Comparing grid tariffs for electricity distribution – changes in allocative efficiency with time-of-use tariffs in the light of demand response actions
Göran Ek

WeC-03: Banking & Finance 5
14:00-15:30, A301 SOK
Session chair: Eduard Nezinsky

The research on china's life insurance industry's efficiency and TFP under the constraint of claims based on the analysis of SBM directional distance function
Zhi Yan and BaiXueJie

Claims effect on profit changes in the Mexican insurance market: an undesirable output approach
Ana Maria Reyna* and Hugo Javier Fuentes Castro

Financial Innovation, Competition and Technical Efficiency Among Financial Intermediaries
Meryem Fethi and Vania Sena* and Mohamed Shaban

The sources of unit labor cost changes in EU countries and the US: the contribution of efficiency, technical changes and capital deepening
Charles-Henri DiMaria* and Chiara Peroni

Data Envelopment Analysis for Measuring of Economic Growth in Terms of Welfare Beyond GDP
Mikulas Luptacik, Martin Labaj, and Eduard Nezinsky*

WeC-04: Agriculture 5
14:00-15:30, A304 Mandatum Life
Session chair: Helen Marita Sørensen Holst
Agricultural Productivity in the EU: a Comparison between the Old and New Member States
Lajos Baráth* and Imre Fertõ

Multilateral Productivity Index and Variable Returns to Scale: An Application to Rice Sector in Korea
Katsunobu Kondo*, Jun Sasaki, Yongkwang Shin, and Yasutaka Yamamoto

Cross-sector Differences in Farm-level Productivity: The Case of Greece
Maria Vrachioli* and Giannis Karagiannis

Cost Efficiency in Norwegian Salmon Farming
Helen Marita Sørensen Holst

WeC-05: Environment 6
14:00-15:30, A305
Session chair: Alan Wall

Using data envelopment analysis to assess environmental performance in nuclear power industry
Arnaud Abad* and Olga Goncalves and Nicolas Peypoch

The efficiency of renewable energy support policies: A stochastic frontier analysis approach
Andreas Knaut* and Simeon Hagspiel

Modelling Scope Economies between Farm Enterprises and Biodiversity Outputs in the Agricultural Sector in England
Ian Bateman, Euan Fleming, David Hadley*, and Garth Holloway

Eco-efficiency among dairy farmers: the importance of socioeconomic characteristics and farmer attitudes
María Pérez Urdiales, Alfons Oude Lansink, and Alan Wall*

WeC-06: Health Care 2
14:00-15:30, A306 YIT
Session chair: Aida Isabel

Quality and productivity in Nordic hospitals
Sverre A.C. Kittelsen and Kjartan S. Anthun and Ingrid* M.S. Huitfeldt and the NHCSG group

Inefficiency and unobservable heterogeneity: Empirical evidence from pathology in the UK National Health Service
John Buckell* and Dr Andrew Smith and Dr Roberta Longo and David Holland

Interregional Performance of the Public Health System of a High-Inequality Country
Maria Cristina N. Gramani

Efficiency Analysis – on the implementation of a dentist voucher system in Portugal
Tavares, Aida Isabel* and Pinho, Joana Costa

WeC-07: Innovative Applications 3
14:00-15:30, A307
Session chair: Richard Simper

Competitive positioning and performance assessment in the construction industry
Isabel M. Horta* and Ana S. Camanho

Evaluating Performance of IC Packaging and Testing Firms by Bootstrap Data Envelopment Analysis
Kuei-Ching Yu* and Erwin T. J. Lin

Technological progress and fixed capital investment in Russia's manufacturing industries in 2003--2011: firm level analysis
Eugenia Nazrullaeva* and Gregory Kantorovich

Recidivism of Prisoners and the Efficiency of English and Welsh Adult Prisons
Richard Simper*, Marijn Verschelde, and Nicky Rogge

WeC-09: Index Theory 3
14:00-15:30, C350 Wihuri
Session chair: Bert M. Balk

Estimation of Cost Efficiency without Cost Data
Levent Kutlu* and Ran Wang

The Time Path of Startup Firm Success
Harold O. Fried* and Loren W. Tauer

A simple method for the determination of scale economies in non-parametric models
Giovanni Cesaroni* and Daniele Giovannola

Measures of productivity change: Which outcome do you want?
Mark Vancauteren, Erik Veldhuizen, and Bert M. Balk*

WeD-00: Special Session: Interactive Benchmarking
16:00-17:30, B163 Assembly Hall

Interactive Benchmarking software
Peter Bogetoft

WeD-01: Directional Distance Functions
16:00-17:30, B200 Nokia
Session chair: Scott E. Atkinson

Opening the Black Box of Efficiency Measurement: Input Allocation in Multi-Output Settings
Laurens Cherchye, Bram De Rock*, Bart Dierynck, Filip Roodhooft, and Jeroen Sabbe

Choosing the direction for directional distances: new insights
Cinzia Daraio* and Leopold Simar

Directional distance functions with optimal endogenous directions
Scott E. Atkinson* and Efthynios G. Tsionas

WeD-02: Energy 4
16:00-17:30, A201 Saastamoisen säätiö
Session chair: Per J. Agrell

Scale economies, technical change and efficiency in Norwegian electricity distribution 1998-2010
Subal C. Kumbhakar, Roar Amundsveen, Hilde Marit Kvile, and Gudbrand Lien*

The impact of changes in regulatory regime on the profits of Spanish electricity distribution firms
Leticia Blazquez*, Humberto Brea-Solis and Emili Grifell-Tatjé

Ex-ante and Ex-post Merger Analysis in Infrastructure Regulation: Evidence from Electricity Distribution in Norway
Per J. Agrell*, Peter Bogetoft, and Thor Erik Grammeltvedt

WeD-03: Manufacturing
16:00-17:30, A301 SOK
Session chair: Anthony Glass

Effect of regulatory reform on the efficiency of mobile telecommunications firms
Yan Li* and Catherine Waddams Price

A Cost Frontier Approach to Analysing Productivity Change in Ethiopian Manufacturing
Christopher J. O'Donnell and Addisu A. Lashitew*

Efficiency Spillovers and Decomposition: With an Application to State Manufacturing in the U.S.
Anthony Glass*, Karligash Kenjegalieva, and Robin Sickles

WeD-04: Agriculture 6
16:00-17:30, A304 Mandatum Life
Session chair: Boris E. Bravo-Ureta

Enhancing DEA models by the use of production trade-offs: generalizations inspired by an application of DEA in agriculture
Kazim Baris Atici* and Victor Podinovski

Multivariate decomposition of measured agricultural yield difference
Simone Pieralli

A New Look at the Decomposition of Agricultural Productivity Growth in the Face of Climate Change
Deep Mukherjee, Christopher J. O'Donnell*, and Boris E. Bravo-Ureta*

WeD-05: DEA 4
16:00-17:30, A305
Session chair: Kristiaan Kerstens

Value Efficiency Analysis for the FDH Model
Merja Halme*, Pekka Korhonen, and Juha Eskelinen

Characterizing the evolution of investors' preferences by using an adapted approach with DEA for performance measurement of financial assets
Albane C. Tarnaud*, Hervé Leleu, and David Crainich

Risk-Loving and Risk-Averse Preferences in Mean-Variance-Skewness-Kurtosis Portfolio Modeling: A Common Characterization using the Shortage Function
Walter Briec, Kristiaan Kerstens*, and Ignace Van de Woestyne

---

WeD-09: Index Theory 4
16:00-17:30, C350 Wihuri
Session chair: R. Robert Russell

Flexible aggregation in output homothetic production
Ole B. Olesen and N. C. Petersen

Technological superiority
Mette Asmild* and Jens Leth Hougaard

An Integrated Taxonomy of Efficiency Indexes and Generic Theorems on Their Properties
R. Robert Russell* and William Schworm

EWEPA'13
Helsinki Finland
Aalto University School of Business

THURSDAY 20 June

ThA-00: Plenary session 3
Application Driven Theory - Special session in honor of Professor William W. Cooper
9:00-10:30, B163 Assembly Hall
Session chair: Andrew Johnson

Mette Asmild
Laurens Cherchye
Maria Portela
Timo Kuosmanen

ThB-01: Stochastic Frontiers 3
11:00-12:30, B200 Nokia
Session chair: Christopher Parmeter

The Expected Minimum and Maximum Inefficiency in Stochastic Frontier Models
Aljar Meesters
Discussant: Abdelaati Daouia

A Gamma-moment approach to cost function estimation
Abdelaati Daouia*, Stéphane Girard, and Armelle Guillou
Discussant: Christopher Parmeter

A Laplace-Truncated Laplace Stochastic Frontier Model
William C. Horrace and Christopher Parmeter*
Discussant: Aljar Meesters

ThB-02: R&D
11:00-12:30, A201 Saastamoisen säätiö
Session chair: Gilbert Cette

The Scientific Linkage between Patents and Firm Productivity: Evidence from Taiwanese Electronics Firm Level Data
Jong-Rong Chen* and Kamhon Kan and I-Hsuan Tung
Discussant: Dolores Añón Higón

International R&D spillovers, TFP and Institutional distance
Dolores Añón Higón* and Miguel Manjón
Discussant: Gilbert Cette

Upstream Product Market Regulations, ICT, R&D and Productivity
Gilbert Cette* and Jimmy Lopez and Jacques Mairesse
Discussant: Jong-Rong Chen

ThB-03: Banking & Finance 6
11:00-12:30, A301 SOK
Session chair: Juha Eskelinen

Evaluation of Bank Branch Growth Potential Using Data Envelopment Analysis
Alex LaPlante* and J.C. Paradi

A New Approach for Measuring Market Power and Quality in the European Banking Industry
José Baños-Pino, Ana Lozano-Vivas, and Ana Rodríguez-Álvarez

Implications of variable reduction for DEA in bank branch context
Juha Eskelinen

ThB-04: DEA 5
11:00-12:30, A304 YIT
Session chair: Bram De Rock

Generalized convexity with idempotent operations and its application in production theory
Vladimir Matveenko
Discussant: Luciano Sampaio

Performance of Brazilian Business, Accounting and Tourism graduate programs: a study through data envelopment analysis and Malmquist Index
Luciano Sampaio* and Francimário Oliveira and Edward Costa and Hironobu Sano
Discussant: Barnabé Walheer

Modeling `Undesirable' Outputs In Efficiency Analysis: An Input Allocation Approach, application to US electric utilities
Laurens Cherchye, Bram De Rock, and Barnabé Walheer*
Discussant: Vladimir Matveenko

ThB-05: Environment 7
11:00-12:30, A305
Session chair: Rolf Färe

A nonparametric method to estimate a technical change effect on marginal abatement costs of U.S. coal power plants
Maethee Mekaroonreung and Andrew L. Johnson*
Discussant: Kenneth Løvold Rødseth

Axioms of a Polluting Technology: A Thermodynamic Approach
Kenneth Løvold Rødseth
Discussant: Rolf Färe

Which Bad is Worst? An Application of Leif Johansen's Capacity Model
Rolf Färe*, Shawna Grosskopf , Tommy Lundgren, Per-Olov Marklund, Wenchao Zhoud
Discussant: Andrew L. Johnson

ThB-09: Heterogeneity
11:00-12:30, C350 Wihuri
Session chair: Efthymios G. Tsionas

Firm heterogeneity and divergent patterns of productivity change in European slaughtering and meat processing companies
Jonathan Holtkamp* and Bernhard Brümmer
Discussant: Hung-Jen Wang

Within Moment Estimators for Fixed-Effect Stochastic Frontier Models
Yi-Ting Chen and Hung-Jen Wang*
Discussant: Efthymios G. Tsionas

Estimating Technical and Allocative Inefficiency Functions
Giannis Karagiannis and Efthymios G. Tsionas*
Discussant: Jonathan Holtkamp

ThC-01: Axiomatic Approaches 1
14:00-15:30, B200 Nokia
Session chair: Michael Vardanyan

Output mix efficiency: Are the Armed Forces doing the right things?
Torbjørn Hanson

Affine homotheticity and affine transitivity
Antonio Peyrache

Tropical Production Technologies
Walter Briec, Qi Bin Liang, Rabaozafy Louisa Andriamasy*, and Bernardin Solonandrasana

Parameterizing Input Distance Functions: Does the Choice of the Functional Form Matter?
Rolf Färe and Michael Vardanyan*

ThC-02: Energy 5: Power Plants
14:00-15:30, A201 Saastamoisen säätiö
Session chair: Simon Paulus

Power Utilies' Productivity Improvement Focus Needed
Nthikeng Letsoalo

Estimation of Productivity in Korean Electric Power Plants: A Semiparametric Smooth Coefficient Model
Almas Heshmati*, Subal C. Kumbhakar, and Kai Sun

Dual-technology efficiency measurement in the U.S. power sector
Christian Growitsch and Simon Paulus* and Hannah Schwind and Heike Wetzel

---

ThC-03: Regional Studies 2
14:00-15:30, A301 SOK
Session chair: Thijs Urlings

Evaluating the Role of Migration on Efficiency of the Domestic Economy
Bhanu Kiran and Saleem Shaik*

Fiscal decentralisation and regional efficiency of public service delivery: a comparison between China and the UK
Minyan Zhu* and Antonio Peyrache

Scale and cost efficiency of Dutch local administrative public services
Bart L. van Hulst * and Hans de Groot

Social safety from a multi-actor point of view
Thijs Urlings* and Jos Blank

ThC-04: Agriculture 7
14:00-15:30, A304 Mandatum Life
Session chair: Víctor H. Moreira

Yak production efficiency measurement using stochastic distance function: An application to Sanjiangyuan area of China
Wei Huang* and Bernhard Brümmer

Evaluating the influence of meteorological conditions on dairy production
Jose A. Perez, David Roibas* and Alan Wall

Investigating drivers of income and scale efficiency on Irish beef farms using Data Envelopment Analysis
Eoghan Finneran* and Paul Crosson

Technical Efficiency and Metatechnology Ratios for Cattle Farms in Argentina: A Meta-Frontier Analysis
Daniel Lema, Nicolas Gatti*, Victor Brescia

Productivity and Technical Efficiency for Chilean Dairy Farms: An Analysis of Dairy Farms Using Stochastic Frontiers and a Latent Class Model
Víctor H. Moreira*, Boris E. Bravo-Ureta, and Rodrigo A. Echevería

---

ThC-05: Environment 8: Water & Waste Management
14:00-15:30, A305
Session chair: John Walden

Measuring productivity and cost efficiency of Dutch wastewater facilities: a panel data thick frontier approach
Adrie C.M. Dumaij* and Janneke A. Wilschut

Trends in Total Factor Productivity and Technological Change in the Australian Urban Water Sector: A Bootstrap Malmquist Indices Approach
Jayanath Ananda

Competitive tendering and the cost efficiency of Dutch municipal waste management
Janneke Wilschut*, Flora Felso, and Hans de Groot

Industry restructuring and productivity change in an individual transferable quota fishery
Rolf Färe, Shawna Grosskopf, and John Walden*

ThC-06: Macro Productivity
14:00-15:30, A306 YIT
Session chair: Gaaitzen J. de Vries

To the Usage of DSGE Models on Productivity Analyse
Kristyna Vltavska, Eva Javorska, and Jan Zouhar*

Inputs and total factor productivity in manufacturing: a comparative analysis of countries performance from 1995 to 2009
Armenio de Souza Rangel and Fernando Garcia de Freitas*

Productivity and Convergence in Africa: what the long-run data show
Marcel P. Timmer and Gaaitzen J. de Vries*

Application of Data Envelopment Analysis (DEA) at Macroeconomic level: Understanding Energy-Economy Nexus, Using OECD Dataset
Reza Fathollahzadeh Aghdam

Output price deflators and the sources of productivity growth
Giannis Karagiannis, Magnus Kellermann*, and Klaus Salhofer

ThC-09: DEA 6
14:00-15:30, C350 Wihuri
Session chair: William Schworm

Identifying facets of a piecewise linear technology by adapted Fourier-Motzkin elimination method
Abolfazl Keshvari

Solving large-scale DEA problems by small samples
Wen-Chih Chen

Efficiency Measurement with Shadow Prices for Convex Technologies
R. Robert Russell and William Schworm*

ThD-01: Education 2
16:00-17:30, B200 Nokia
Session chair: Shawna Grosskopf

Costs and efficiency in the English higher education sector: an analysis using latent class stochastic frontier models
Jill Johnes* and Geraint Johnes

Assessment of Public School performance: Alternative approaches
Shawna Grosskopf, Kathy Hayes*, and Lori Taylor

School District Efficiency vs Equity: Application to Texas Schools
Shawna Grosskopf*, Kathy Hayes, Lori Taylor, and William Weber

---

ThD-03: DEA 7
16:00-17:30, A301
Session chair: Gary Ferrier

Metafrontier Cost Malmquist Productivity Index
Mei-Ying Huang* and Jia-Chin Juo and Tsu-tan Fu

Nonparametric Estimation of Education Productivity incorporating Nondiscretionary Inputs with an Application to Dutch Schools
Shae Brennan, Carla Haelermans*, and John Ruggiero

The Impact of Certificate of Need Regulation on Total Factor Productivity Growth
Gerald Granderson and Gary Ferrier*

ThD-04: Agriculture 8
16:00-17:30, A304 Mandatum Life
Session chair: Daniel Wikström

Dairy Farm Productivity and Climatic Variability in the United States: A Stochastic Production Frontier Approach
Roberto Mosheim*, Boris E. Bravo-Ureta, Lingqiao Qi

Managerial indicators and performance analysis in dairy farming
Timo Sipiläinen*, Matti Ryhänen, and Sami Ovaska

Accounting for inter-group productivity differences among conventional, transitional and organic farms in Sweden
Dennis Collentine, Giannis Karagiannis, Yves Surry, Daniel Wikström*

ThD-05: DEA 8
16:00-17:30, A305
Session chair: Joseph Atwood

Identifying suspicious efficient units in DEA models
V. E. Krivonozhko, F. R. Forsund, and A. V. Lychev*

Outlier Sensitivity of Nonparametric Methods for Efficiency Measurement
Jens J. Krueger

Quantile DEA: A Direct Linear Programming Based Approach
Joseph Atwood* and Saleem Shaik

ThD-06: Dynamic Efficiency and Organizational Knowledge
16:00-17:30, A306
Session chair: Konstantinos P. Triantis

Benchmarking for Routines and Organizational Knowledge
Mircea Epure

Measuring Dynamic Efficiency of Highway Maintenance Operations
Saeideh Fallah-Fini, Konstantinos P. Triantis, Hazhir Rahmandad, and Jesus M. de la Garza

A Complex Adaptive Systems Approach for Productive Efficiency Analysis
Francis L. Dougherty, Nathaniel P. Ambler, and Konstantinos P. Triantis*

ThD-09: Stochastic Semi-Nonparametric Approaches
16:00-17:30, C350 Wihuri
Session chair: Jos L. T. Blank

European competitiveness: a nonparametric stochastic firm-level TFP analysis
Marijn Verschelde*, Glenn Rayp, and Michel Dumont and Bruno Merlevede

Panel Data Specifications in Nonparametric Kernel Regression An Application to Production Functions
Tomasz Gerard Czekaj* and Arne Henningsen*

Iteratively Weighted Least Squares, an alternative to Stochastic Frontier Analysis
Jos L. T. Blank* and Aljar J. Meesters

2014 ASIA-PACIFIC PRODUCTIVITY CONFERENCE

THE UNIVERSITY OF QUEENSLAND, 8 - 11 JULY 2014

WELCOME

The Centre for Efficiency and Productivity Analysis (CEPA) in the School of Economics at The University of Queensland is pleased to invite you to attend the 10th Asia Pacific Productivity Conference (APPC) from 8 -11 July 2014 in Brisbane, Australia.

The conference will be open to theoretical and applied researchers who undertake productivity and efficiency measurement in economics, management science, operations research, public administration and related fields. The conference will be held at the University's St Lucia campus, located seven kilometres from the city's heart on a magnificent 114-hectare site in a bend of the Brisbane River.

To make the most of your visit, you may also consider attending the Econometric Society's Australasian Meeting in Hobart, Tasmania from 1 - 4 of July 2014. For more information visit www.econometricsociety.org.

The University of Queensland extends a warm welcome to all our speakers and guests. For more information on the APPC 2014 visit www.uq.edu.au/economics/appc2014.

CENTRE FOR EFFICIENCY AND PRODUCTIVITY ANALYSIS (CEPA)

The Centre for Efficiency and Productivity Analysis (CEPA) provides a focal point for research, consultancy and training in efficiency and productivity analysis in Australia and the Asia-Pacific region.

The staff of the Centre are involved in all aspects of efficiency and productivity analysis, including firm-level, industry-level, and international comparisons, in both private and government sectors. Measurement methods used include: index numbers, data envelopment analysis (DEA), stochastic frontiers and econometric production models. Visit www.uq.edu.au/economics/cepa.

Photograph: Aerial view of the UQ St Lucia campus and Brisbane city

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

GROUP OF EIGHT
MEMBER

School of Economics | The University of Queensland | St Lucia QLD 4072 | P: +617 3365 6570 | F: +617 3365 7299
W: www.uq.edu.au/economics/appc2014 | CRICOS Provider Number: 00025B

2014 ASIA-PACIFIC PRODUCTIVITY CONFERENCE

THE UNIVERSITY OF QUEENSLAND, 8 - 11 JULY 2014

UQ ST LUCIA

UQ's St Lucia campus is renowned as one of Australia's most attractive campuses. The 114-hectare site provides a perfect study, research, and living environment. UQ St Lucia has the best of both worlds: a vibrant modern campus with the tradition of an established university.

The gracious sandstone buildings, parklands and lakes encompass world-class teaching and research facilities — including Queensland's largest research library — plus fully equipped laboratories and lecture theatres. UQ St Lucia has excellent sporting venues, shops, banks, a post office, refectories, restaurants, and a cinema. Students can even live on campus in one of the many residential colleges.

JULY CLIMATE IN BRISBANE

The average temperature in Brisbane during July is 11 - 21°C (52 - 70°F). Generally sunny and dry, mornings are cool but the days get warm, leading into a cool evening at sun set.

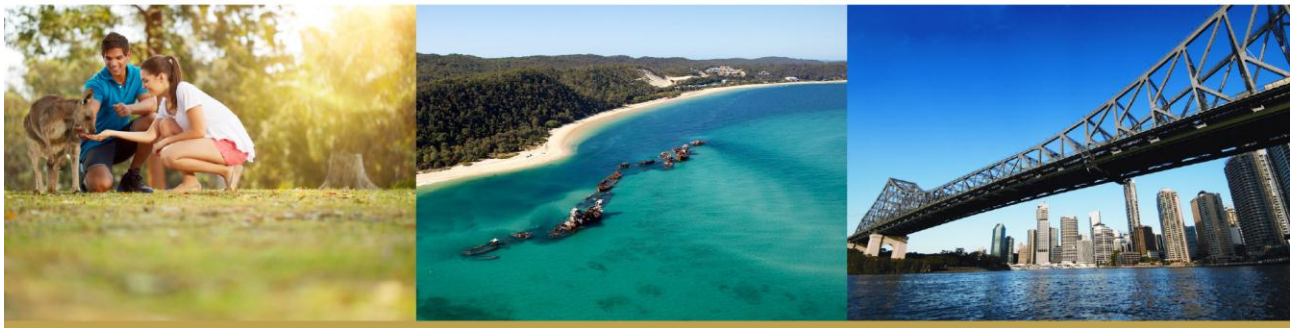
ABOUT BRISBANE, QUEENSLAND

Located on the east coast of Australia in the heart of one of the country's fastest growing regions, Brisbane is the capital of Queensland – a state well known for its natural beauty and world-class tourism attractions. Brisbane is home to almost two million people and boasts a great outdoors lifestyle and the greatest variety of native wildlife (dugongs, wild dolphins and koalas to name a few) of any capital city in Australia.

Along with its world-class shopping, restaurants, nightlife, culture and entertainment, Brisbane lives and breathes outdoor experiences. It's prime location and proximity to the marine sanctuary of Moreton Bay make it the ideal launch pad for day-trips to some of the country's most well-loved tourist attractions, including the Gold Coast, Sunshine Coast and iconic Australia Zoo.

Participants of APPC 2014 will have the opportunity to enjoy a range of unique Australian experiences outside of the academic program.

REGISTRATIONS OPEN MARCH 2014



School of Economics | The University of Queensland | St Lucia QLD 4072 | P: +617 3365 6570 | F: +617 3365 7299
W: www.uq.edu.au/economics/appc2014 | CRICOS Provider Number: 00025B

MORE IS MORE

The 14th European Workshop on Efficiency and Productivity Analysis

June 2015

Aalto University
School of Business

Further information will be posted on the conference website:

http://ewepa.org

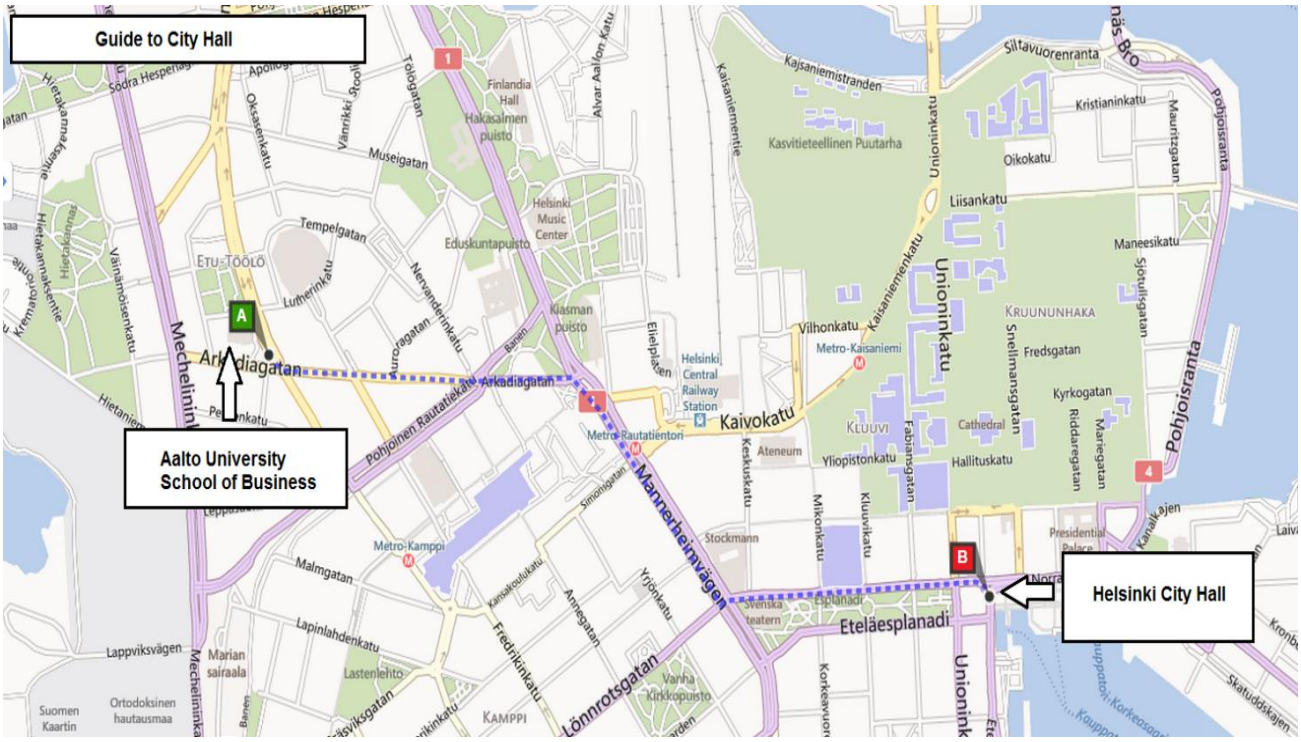
See you again in 2015!

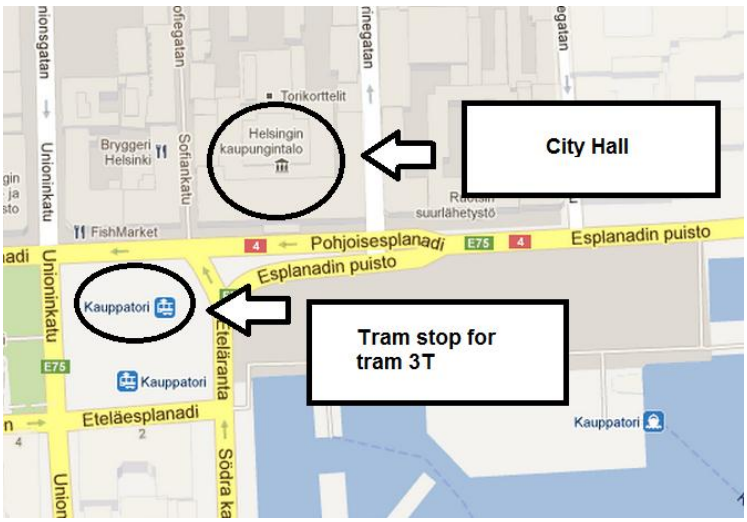
MAPS

Recommended walking route to the City Hall

Walk the street Arkadiankatu towards the Central Railway station. When you come to Mannerheimintie (the main street through the city), take right and continue all the way to Pohjoisesplanadi (North Esplanade). Go along North Esplanadi to Kauppatori (Market Square) where City Hall is located. The address of city hall is Eteläesplanadi 11-13. Walking time is around 25-30 minutes.

Another option is to take the tram 3T from “Business School” stop right next to conference venue and continue all the way to “Kauppatori” stop. The City Hall can be seen from the stop.





Recommended walking route to the Finlandia Hall

The simplest route to the Finlandia Hall is to follow the street Arkadiankatu towards the Central Railway station. In front of Hotel Presidentti, turn left to steet Pohjoinen Rautatiekatu and walk towards the Parliament House. From the Parliament House, turn left and follow Mannerheimintie. The entrance to Finlandia Hall (M4) is on the Mannerheimtie side of the building. The walking time is approximately 10-15 minutes.

Another possibility is to call a taxi cab. If you arrive by taxi, you will arrive to the entrance K4. This will lead to the same hallway as M4 entrance.

Conference Venue - Location

Aalto University School of Business

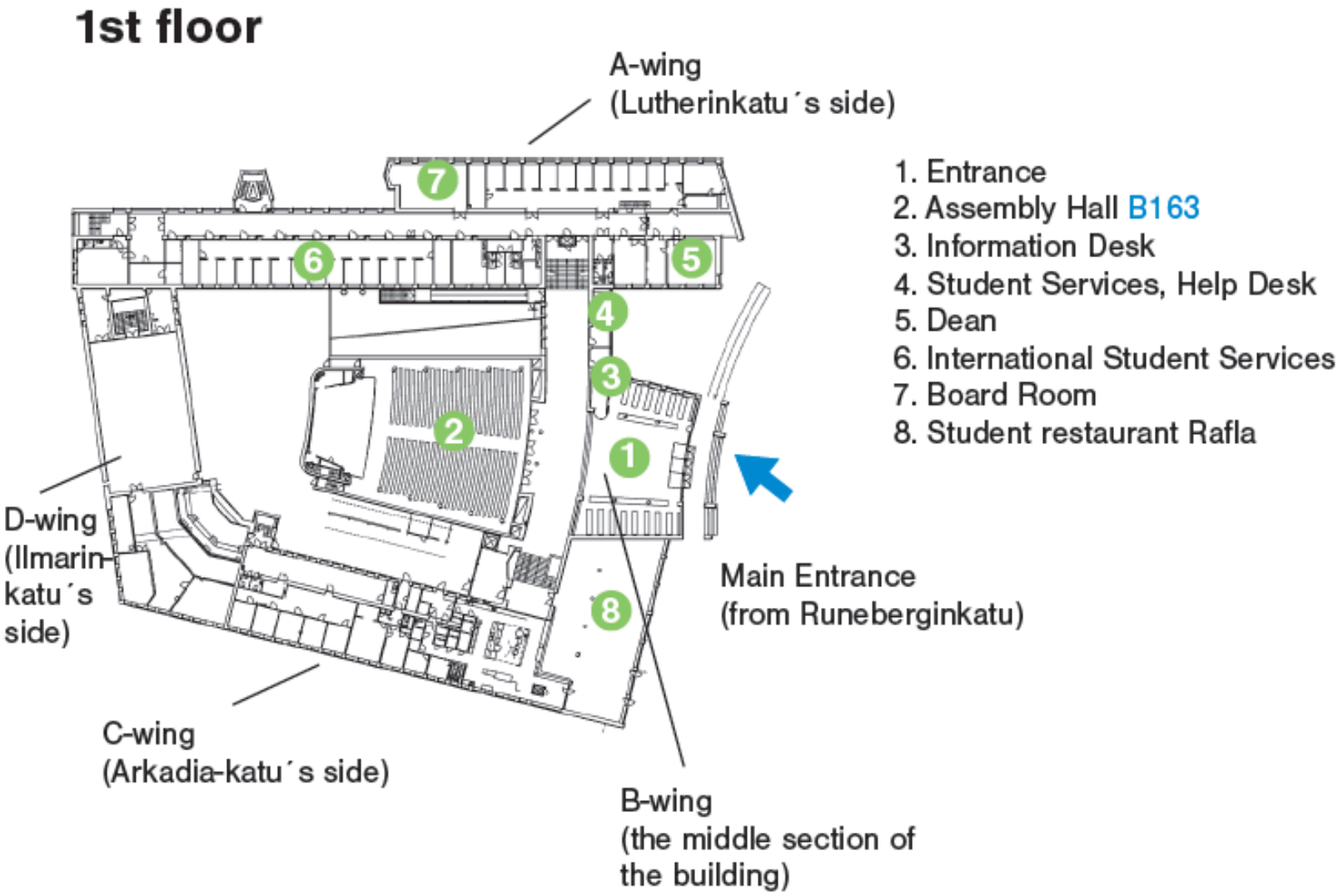
Tram stop for tram 3T is around here

Church of Temppeliaukio; one of the famous architectural sights in Helsinki is located right next to conference venue.

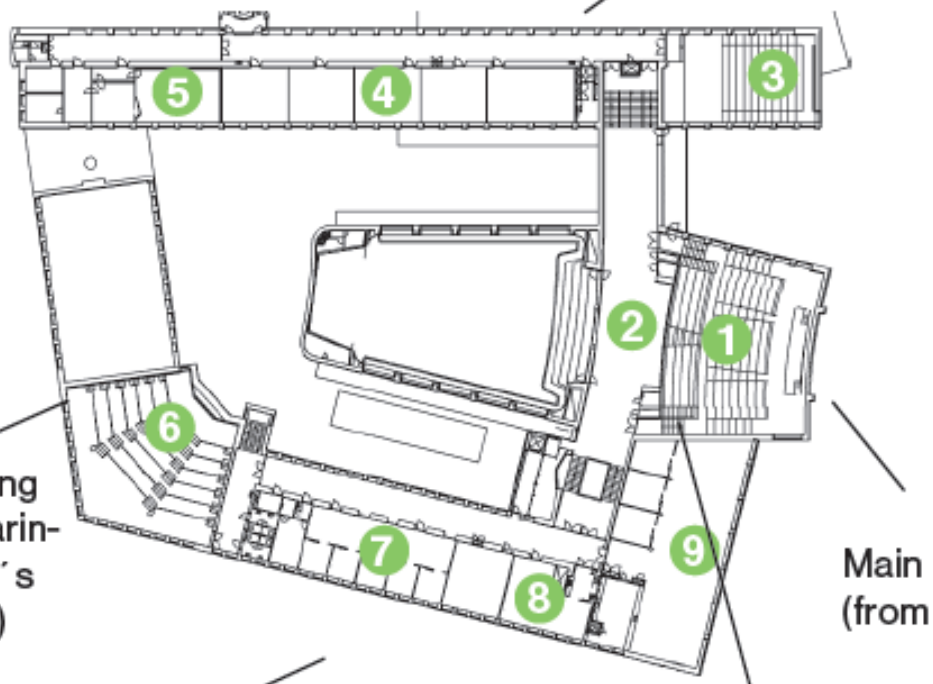
Parliament House

Train station is located in this direction

Conference Venue - Indoors



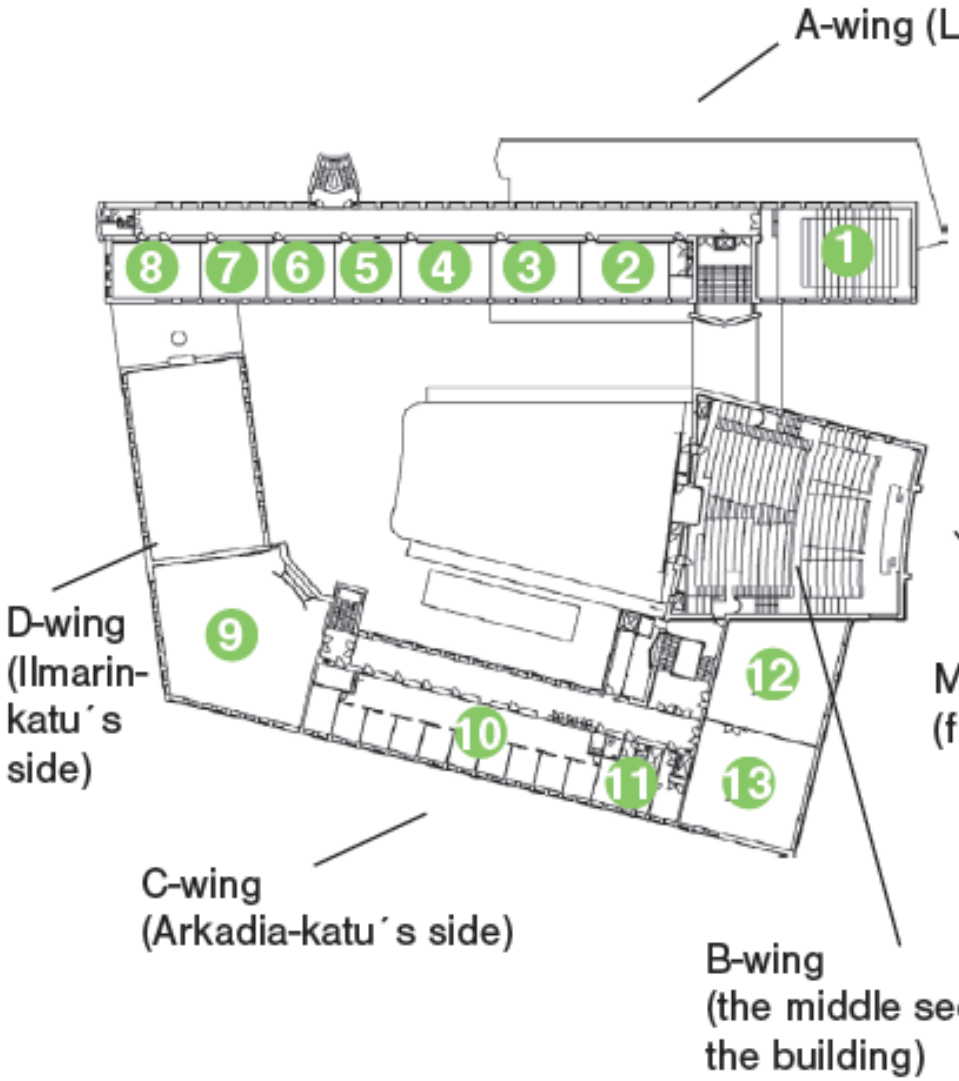
2nd floor



1. Lecture Hall Nokia B200
2. Upper Hall
3. Lecture Hall Saastamoisen säätiö A201
4. Lecture rooms A203-A207
5. Audio-visual Center/Language laboratories
6. Lecture Hall Tieto C250
7. Corporate Relations, Communications, Alumni Relations C239-C240
8. Conference Room C238
9. Staff restaurant Proffa

- Cabinets C231-C233

3rd floor



1. Lecture Hall SOK A301
2. Lecture Room Mandatum Life Rahat A304
3. Lecture Room A305
4. Lecture Room YIT A306
5.-8. Lecture Rooms A307-A310
9. Lecture Hall Jenny ja Antti Wihurin rahasto C350
10 Career Services, Service Factory C337-C348
11. Sports Services C333
12.-13. Computer labs C331-C332

EWEPA"13 Abstracts

116. The research on china's life insurance industry's efficiency and TFP under the constraint of claims based on the analysis of SBM directional distance function

Authors: Zhi Yan and BaiXueJie

Contact: zhiyan3000@yahoo.com.cn

Category: Express

Abstract: This paper applies SBM directional distance function and Luenberger productivity indicator to measure the life insurance industry¡¯s efficiency and TFP under the constraint of claims. The result shows: (1) China¡¯s life insurance industry¡¯s non-efficiency is 46.74% under the consideration of claims, Chinese companies¡¯ non-efficiency is 33.47%, foreign companies¡¯ non-efficiency is 60.01%. The former companies are better than the latter ones. (2) The products¡¯ homogeneity and investment-orient characters cause the investment profit¡¯s non-efficiency relatively high. (3) Life insurance¡¯s TFP is 23.8%, Chinese companies¡¯ TFP is 77.31%, foreign companies¡¯ TFP is 29.72%. The expansion of the growth rate is slowing down is the main reason which hampers the enhancement of TFP. The paper puts forward some suggestions according to the analysis above.

117. Assessing Green Growth in Agriculture: Dynamic Material Balance and Semi-Nonparametric Malmquist Index

Authors: Timo Kuosmanen*

Contact: timo.kuosmanen@aalto.fi

Category: Discuss

Abstract: In this paper I assessGreen Growth in Agriculture using Dynamic Material Balance and Semi-Nonparametric Malmquist Index.

118. Technical and environmental efficiency of Catalan arable crop farms

Authors: BOUALI GUESMI* First and TERESA SERRA Second

Contact: bouali.guesmi@upc.edu

Category: Discuss

Abstract: The environmental impacts of economic activities have become an important aspect in the evaluation of their overall performance. Consistently, traditional measures of technical efficiency have been extended to assess both the economic and environmental performance of firms. This study aims to use these measures to study performance of a sample of Catalan arable crop farms. Specifically, we apply the methodology recently developed by Coelli et al. (2007) and extend it to a consideration of the stochastic conditions under which production takes place as proposed by Chambers and Quiggin (1998 and 2000). Results suggest that sample farms reach technical and environmental efficiency levels on the order of 93% and 74%, respectively.

120. Estimation of Productivity in Korean Electric Power Plants: A Semiparametric Smooth Coefficient Model

Authors: Almas Heshmati (presenting author), Subal C. Kumbhakar and Kai Sun

Contact: almas.heshmati@hotmail.com

Category: Explain

Abstract: This paper analyzes the impact of load factor, facility and generator types on the productivity of Korean electric power plants. In order to capture important differences in the effect of load policy on power output, we use a semiparametric smooth coefficient (SPSC) model that allows us to model heterogeneous performances across power plants and over time by allowing underlying technologies to be heterogeneous. The SPSC model accommodates both continuous and discrete covariates. Various specification tests are conducted to compare performance of the SPSC model. Using a unique generator level panel dataset spanning the period 1995-2006, we find that the impact of load factor, generator and facility types on power generation varies substantially in terms of magnitude and significance across different plant characteristics. The results have strong implication for generation policy in Korea as outlined in this study.

121. Efficiency Analysis – on the implementation of a dentist voucher system in Portugal

Authors: Tavares, Aida Isabel* and Pinho, Joana Costa

Contact: aida.tavares@ua.pt

Category: Express

Abstract: Basic health care, particular at young ages, may be seen as a merit good which calls for some public intervention. In Portugal, the National Program for Dental Health Care was launched in 2007 and it mainly aimed to promote oral care and prevent dental caries in children.
The use of DEA for this purpose is a first approach and the working is in progress.
The DEA analysis performed is based on 2 inputs: number of dentists and number of hygienists; and on 2 outputs: number of children who started the program and number of consultations. The analysis is done for the years 2007-2010, under constant and variable returns to scale.
The results show that the change in the functioning of the National Program for Dental Health Care did not impact on the efficiency levels of the regional health administrations, which show some relevant efficiency differences between them. The inefficiency levels tend to decrease has time passes, which may indicate some economies of learning. Finally, results also indicate that there are increasing returns to scale to explore in most regional health administrations, except one, which presents decreasing returns to scale.

122. The Impact of Certificate of Need Regulation on Total Factor Productivity Growth

Authors: Gerald Granderson and Gary Ferrier*

Contact: grandegd@miamioh.edu, gferrier@walton.uark.edu

Category: Explain

Abstract: This paper analyzes the impacts of certificate of need (CON) regulation on total factor productivity (TFP) and its components. CON required hospitals to obtain permission prior to purchasing more medical equipment, expanding existing facilities, and providing additional services. Repealing the regulation, which would allow hospitals to purchase more equipment, may enhance the growth rate in capital, and contribute to a reduction in TFP growth. Second, if more technically advanced equipment is developed, then having CON regulation in place could limit the rate of diffusion of new technology (less technically advanced equipment being used, or less use of the new technically advanced procedures). Repealing CON regulation may contribute

to higher rates of technological progress over time. Also, having CON regulation in place can reduce the ability of hospitals to substitute between capital and non-capital inputs when input prices which would likely contribute to allocative and cost inefficiency. Repealing the regulation can allow for greater ability to substitute between capital and non-capital inputs when input prices change, and in turn contribute to reductions in allocative and cost inefficiency over time.

123. Know Thy E-mails

Authors: Joe Castrovera

Contact: jcastro@erank.pro

Category: Express

Abstract: Up to a while, I felt that processing company e-mails took us more time than it should. Also, the fact that the Receptors nor the Receivers had a mutual understanding over the level of importance of the e-mails resulted unsettling and generated a false notion that all of them required to be responded promptly. These issues made me to ask myself: ¿How can we order and have a common criteria for internal e-mails?

124. POWER UTILITIES' PRODUCTIVITY IMPROVEMENT FOCUS NEEDED

Authors: Nthikeng Letsoalo

Contact: letsoalnj@eskom.co.za,nthik@mweb.co.za

Category: Explain

Abstract: Provision of electricity through power utilities requires both price and volume considerations. Electricity is not a luxury choice item, but a necessity for all consumers. Often the productivity oriented approach of making this energy available is measured inappropriately.

The research aims to show that a productivity improvement oriented approach to making electricity available is what is required; as well as measuring the productivity improvement performance of the utilities. The research does this by evaluating the productivity improvement of a sample of utilities across the world, from their audited and reported business performance. It laso looks into what regulators generally do in approving for price increase applications.

The research uses the Productivity Accounting methodology to do the evaluation of the sample of utilities on the same basis.

125. In Search of Patterns of Information Technology Use for the Improvement of Information Worker Productivity: A Research Proposal

Authors: Natallia Pashkevich*, Darek M. Haftor

Contact: npa@fek.su.se, darek.haftor@lnu.se

Category: Young Researcher (YR)

Abstract: This study targets a particular theoretical gap within the “nano-level” of the IT productivity paradox discourse that is concerned with challenges in identifying a productivity increase in operations that are conducted with the support of IT. The objective is to find out how IT may be used to increase the productivity of a white collar professional, such as an accountant, an architect, a recruiter, or a journalist. The focus set of this study is on the lack of empirical data with regards to how IT-use contributes to productivity gains at the individual and task level. The proposed study differs from earlier research on the relationship between computerization and productivity by focusing on how IT-use can enhance information worker productivity based on the common set of information-processing functions from both descriptive

and normative research approach perspectives.

126. Guiding improvements in human well-being and environmental quality of European cities

Authors: Andreia Zanella* and Ana S. Camanho and Teresa G. Dias

Contact: andreia.zanella@fe.up.pt, acamanho@fe.up.pt, tgalvao@fe.up.pt

Category: Express

Abstract: The assessment of cities livability is often done using composite indicators (CIs), which are able to aggregate several indicators in an overall measure. Although CIs have benefits such as the capacity to summarize information and the facility to interpret results, they do not provide guidelines that cities should follow to improve performance. The purpose of this paper is to develop a CI that provides an overall measure of performance for each city, which can also be used for benchmarking purposes by suggesting the peers and targets that cities should look in order to search for the best practices. The assessment covers two components of livability: human well-being and environmental quality. As the assessment includes some undesirable outputs, a Data Envelopment Analysis model specified with a Directional Distance Function (DDF) was used to construct the CI. The DDF has the advantage of preserving the interpretability of the data, as no changes to the original measurement scales of the undesirable outputs are required. With this study we expect to enhance the understanding of livability of European cities, helping to promote the improvement of the factors that actually contribute for human well-being and environmental quality.

127. Directional distance functions with optimal endogenous directions

Authors: Scott E. Atkinson* and Mike G. Tsionas

Contact: atknsn@uga.edu, tsionas@otenet.gr

Category: Explain

Abstract: Fare, Grosskopf and Whittaker (2011) took up recently the problem of computing directional distance functions with endogenously determined direction vectors. Some researchers have examined the impact of arbitrarily chosen directions. We consider the problem of estimating econometrically directional distance functions under endogenous directions that are firm–specific and/or time–varying by providing a nontrivial extension of Atkinson and Primont (2012). Effectively we include a set of conditions that impose cost-minimization on the firm and optimize the associated objective function. We use Bayesian methods of inference organized around Markov Chain Monte Carlo and illustrate the practicality of the new techniques using panel data on U.S. electric utilities.

128. Estimation of Cost Efficiency without Cost Data

Authors: Levent Kutlu* and Ran Wang

Contact: levent.kutlu@econ.gatech.edu

Category: Explain

Abstract: One of the advantages of estimating a conduct parameter game, compared with the Lerner index, is that the knowledge of cost shifters is sufficient to get the Â“implied marginal costÂ” estimates. Stochastic frontier literature suffers from the same problem that it requires a detailed data set in order to estimate cost efficiencies of the Â…firms. This paper develops a model to estimate Â…firm specificÂ…c Â“implied cost efficiencyÂ” of Â…firms without using total cost data. This is done in the conduct parameter framework where the firm specificÂ… conducts are simultaneously estimated by the cost efficiencies. This enables us to examine the relationship between Â…rm conduct and efficiency. We use our methodology to estimate the market powers and efficiencies of U.S. airlines.

130. Effect of regulatory reform on the efficiency of mobile telecommunications firms

Authors: Yan Li* and Catherine Waddams Price

Contact: li.yan@uea.ac.uk

Category: Discuss

Abstract: Regulatory reform of network industries has been widely introduced to improve their productivity and economic growth. We identify the effect of such reform on firm level productivity (and its constituent parts) in the mobile telephony sector for all the major firms operating in seven countries over sixteen years. Our study enables us to analyse the institutional framework of privatisation, independent regulation and market structure on the individual firms affected by the reform process. We find robust evidence that competition and independent regulation improve firm efficiency; while privatized firms are not necessarily more efficient, they can improve productivity more quickly than their public counterparts.

131. A simple method for the determination of scale economies in non-parametric models

Authors: Giovanni Cesaroni* and Daniele Giovannola

Contact: g.cesaroni@governo.it

Category: Explain

Abstract: We propose a procedure for the determination of scale economies (cost-based returns to scale analysis), which is based on the minimization of the ray average cost and allows a more straightforward approach when compared to existing methods. In particular, for the frontier points under evaluation, we can avoid both the need to solve the NIRS problem, required in Fare and Grosskopf (1985), and that of solving the dual problem set by Sueyoshi (1999) to compute the intercept of the supporting hyperplane and the corresponding value of the cost-based scale elasticity. Therefore, our procedure allows to dispose of the indeterminacy implied by the multiplicity of solutions in the intercept method. Moreover, we conjecture that multiple solutions to the CRS cost program (i.e. multiple optimal scale sizes) are not a problem, because a result analogous to corollary 2 in Banker and Thrall (1992) holds. Another advantage of our approach is that of dispensing from assumptions regarding the differentiability of the transformation function and of the cost function. The theoretical properties of the proposed methodology are derived under the only assumption of strong disposability, so that - contrary to Sueyoshi's method - it applies to FDH models.

132. Recidivism of Prisoners and the Efficiency of English and Welsh Adult Prisons

Authors: Richard Simper* and Marijn Verschelde and Nicky Rogge

Contact: richard.simper@nottingham.ac.uk

Category: Express

Abstract: The analysis of Prisons using non-parametric methods has had little attention recently in the econometric criminological literature. This paper intends to advance the subject by analyzing the recidivism and efficiency of English and Welsh prisons using DEA. We find that by estimating multiple models focusing on different areas of prison life and how prisons are able to find employment and reduce drug taking of inmates that there are wide divergences across the sample. Finally, a current theme of the UK government is build Titan prisons holding more than 2,000 inmates is questioned as larger prisons, currently holding around 1200 inmates, are comparably more inefficient to their comparable smaller competitors.

133. Economic efficiency and productivity in the Mexican metropolitan

system, 1998-2008

Authors: Alejandra Trejo Nieto* and Angelica Maria Vazquez Rojas

Contact: abtrejo@colmex.mx, callinalli@yahoo.com.mx

Category: Discuss

Abstract: This paper deals with inter-metropolitan disparities by examining technical efficiency and productivity by means of data envelopment analysis and the Malmquist index for the 30 medium-sized and big metropolitan zones in Mexico in 1998, 2003 and 2008. Metropolises are key territorial units for analysis and action because of their economic, social and political importance. Metropolitan economic efficiency and productivity reveal effective allocation of resources, proficient management, coordinated development and strong competitiveness. The problem of a heterogeneous metropolitan distribution of productivity and efficiency brings about the challenge of extending economic benefits to all metropolises. Mexico is a Latin American middle-income country which has had a long tradition of big social and economic disparities but some argue that after the economic restructuring in the 1980s and 1990s these decreased significantly. We aim at providing information on the economic performance of metropolises and the spatial heterogeneity in this country in order to guide further analysis as well as private and public policy projects and programs that support an improved performance of individual metropolises and the whole metropolitan system.

134. Productivity Growth of International Tourist Hotels in Taiwan: A Global Malmquist Productivity Index

Authors: Ming-Miin Yu* and Li-Hsueh Chen

Contact: yumm@mail.ntou.edu.tw

Category: Express

Abstract: This paper measures the performance of international tourist hotels in Taiwan over time by using the global Malmquist productivity index. This index satisfies the circularity, immunes to linear programming infeasibility and overcomes the problem of base period dependency. Furthermore, the global Malmquist productivity index could be decomposed into efficiency change and best practice change to investigate sources of productivity change. A panel data set of 57 international tourist hotels in Taiwan over the period 2008-2011 is selected for the productivity analysis. The global Malmquist productivity index is computed by data envelopment analysis model and used to evaluate productivity changes of hotels with quasi-fixed inputs of the number of rooms and the total floor area in the food & beverage service department. The results of the global Malmquist productivity index are compared with those of contemporaneous Malmquist productivity index. The relative productivity changes base

135. Estimation of a Flexible Stochastic Cost Frontier Model with Environmental Factors Subject to Economic Constraints

Authors: Subal C. Kumbhakar and Kai Sun*

Contact: k.sun@aston.ac.uk

Category: Discuss

Abstract: This paper proposes a flexible stochastic cost frontier model where regression coefficients (of, say, outputs or input prices) are unknown smooth functions of environmental factors which non-neutrally shift the cost frontier, and the cost inefficiency is multiplicatively decomposed into a scaling function of the environmental factors and a standard truncated normal random variable. To guarantee that the estimated smooth coefficients have economically meaningful interpretation, the constraint weighted bootstrapping approach in the statistics literature is employed to impose constraints implied by

economic theory on the observation-specific estimates of the coefficients. Monte Carlo study shows that our proposed estimation procedure works well in finite sample. We then apply the proposed methodology to an Italian banking data set and investigate the estimated smooth coefficients, returns to scale, marginal effects of continuous environmental factors, including banking risks, on total cost, and cost efficiencies.

136. A Post-Truncation Parameterization of Truncated Normal Technical Inefficiency

Authors: Christine Amsler* and Peter Schmidt and Wen-Jen Tsay

Contact: amsler@msu.edu

Category: Explain

Abstract: In this paper we consider a stochastic frontier model in which the distribution of technical inefficiency is truncated normal. This distribution is affected by some environmental variables z that may or may not affect the level of the frontier but that do affect the shortfall of output from the frontier.

In standard notation, technical inefficiency u is distributed as N^+ (ì,ó^2). We will distinguish the pre-truncation mean (ì) and variance (ó^2) from the post-truncation mean ì*=E(u) and variance ó*^2= var(u). Existing models parameterize the pre-truncation mean and/or variance in terms of the environmental variables and some parameters. Changes in the environmental variables cause changes in the pre-truncation mean and/or variance, and imply changes in both the post-truncation mean and variance. The expressions for these changes are quite complicated. In this paper, we suggest parameterizing the post-truncation mean and variance instead. This leads to simple expressions for the effects of changes in the environmental variables on the mean and variance of u, and it allows the environmental variables to affect the mean of u only, or the variance of u only, or both.

137. Which Bad is Worst? An Application of Leif Johansen's Capacity Model

Authors: Rolf Färe* and Shawna Grosskopf and Tommy Lundgren and Per-Olov Marklund and Wenchao Zhoud

Contact: rolf.fare@orst.edu, tommy.lundgren@slu.se

Category: Discuss

Abstract: The production of desirable outputs is frequently accompanied by unintended production of undesirable outputs, i.e., they are jointly produced with undesirables as byproduct. If two or more of these undesirable outputs are produced as byproducts, one may ask: 'Which bad is worst?' By worst we mean which bad inhibits the production of desirable outputs the most? In this paper we develop a model based on Leif Johansen's capacity framework (Johansen 1968), which allows us to address our research question, by sequentially estimating the capacity limiting effect of the bads. Our model resembles what is referred to as the von Liebig Law of the Minimum, familiar from the agricultural economics literature. To illustrate our model we apply our approach to a firm level data set from the Swedish paper and pulp industry.

138. Effects of emission based road user charges on the efficiency of road haulage companies

Authors: Rita Markovits-Somogyi* and Ádám Török

Contact: rsomogyi@kgazd.bme.hu

Category: Young Researcher (YR)

Abstract: Environmental concerns are becoming top priority in the highest levels, just as it is an explicit goal of the European Union to move towards the "polluter pays" principle as highlighted in the White Paper "Roadmap to a Single

European Transport Area – Towards a competitive and resource efficient transport system" of 2011. One of the most direct ways of exercising the polluter pays principle is the introduction of road toll charges as based on the amount of pollutants emitted by the vehicles. Using the DEA-PC (data envelopment analysis – pairwise comparison) method, the present paper investigates the efficiency changes of road haulage companies as a result of paying a distance based environmental charge calculated from the CO2 levels emitted by the vehicle fleet.

139. Time Substitution and the EU Stability and Growth Pact

Authors: Rolf Färe and Shawna Grosskopf and Dimitris Margaritis* and W.L. Weber

Contact: rolf.fare@oregonstate.edu, shawna.grosskopf@oregonstate.edu, d.margaritis@auckland.ac.nz, wlweber@semo.edu

Category: Discuss

Abstract: See attached paper.

140. Measuring Environmental Efficiency and Productivity of the Iranian Petrochemical Plants over the period of 2007 to 2011

Authors: Ali Emami Meibodi first and Hamid amade second* and Faeze Amirhosseini third

Contact: emami@atu.ac.ir,amade@gmail.com,fae_am@yahoo.com

Category: Discuss

Abstract: Today, one of the discussable concepts is stability. The stability means the current generation should meet their needs so that the needs of future generations not to be endangered. Considering the importance of petrochemical industry and scarce and nonrenewable raw materials used in this industry, as well as due to the pollution that is one of the environmental issues of concern, this paper evaluates the performance of petrochemical plants through measuring the eco-efficiency and green productivity by date envelopment analysis (DEA) and Malmquist index. The results indicate that among the Iranian plants, Amirkabir, Bu-Ali Sina, Khorasan, Bistoon, Khuzestan, Ariasasol, Zagros, Ghadir and Esfahan Petrochemical Plants have the most efficiency in eco-efficiency. The average eco-efficiency of total petrochemical plants is 89.1 during the test period. The values of green productivity of plants during this 5-year period were varied, but ultimately have increased. This increment was arising out of the increase of management efficiency and particularly technological efficiency.

141. Inefficiency and Hedonic Prices: An Application to Housing Markets

Authors: Sami Pakarinen

Contact: sami.pakarinen@aalto.fi

Category: Explain

Abstract: We estimate a hedonic housing price model from the data consisting housing transactions for one year period in Helsinki Finland. At the first stage, these estimations are performed using convex nonparametric least squares (CNLS) method. We find that CNLS estimations outperform standard parametric estimations techniques used in the context of hedonic price functions. The heterogeneity with respect to location and apartment size is in great extent present in the data. In the second stage, we estimate an efficient price frontier for housing markets to evaluate whether sellers or buyers in aggregate are gaining at others expense. The hedonic price frontier is estimated with stochastic nonparametric envelopment of data (StoNED) method. To our knowledge both of our modeling approaches are applied at the first time in the context of housing market. Our preliminary results indicate that price formation varies with respect to location and apartment characteristics which raise the possibility of information deficiency in the

Finnish housing markets.

142. The Effects of Compliance with the Clean Air Act on Production Cost, and Total Factor Productivity Growth in the Electric Utility Industry

Authors: Gerald Granderson* and Finn Forsund

Contact: grandegd@miamioh.edu, finn.forsund@econ.uio.no

Category: Explain

Abstract: This paper investigates the impacts of firm compliance with Phase 1 of Title IV of the 1990 Clean Air Act (CAA) on production cost and Total Factor Productivity (TFP) growth for U.S. electric utilities. Phase 1, effective from 1995 to 1999 for sulfur dioxide (SO2) emissions, required 110 power plants to reduce their emissions of both sulfur dioxide (SO2) and nitrogen oxide (NOx). Enacting procedures to reduce SO2 and NOX emissions could lead to higher production cost, and in turn affect TFP growth. Second, electric utilities subject to Phase 1 were given an initial allocation of sulfur dioxide permits by the Environmental Protection Agency (EPA). With nitrogen oxide there was not a trading permit program until 1999. The paper also tests whether the cost of reducing NOX emissions to comply with Phase 1 of Title IV of the Clean Air Act was higher than the cost of reducing SO2 emissions to comply with Phase 1.
Third, we investigate whether changes in the rate in which technology occur when having to reduce SO2 emissions differs from corresponding which may have occurred when having to reduce NOx emissions.

143. Green supplier selection: becoming green while costless

Authors: Sumarsono Sudarto* and T.Yuri M.Z. and Amar Rachman and Katsuhiko Takahashi and Katsumi Morikawa

Contact: sumarsono@hiroshima-u.ac.jp, sumarsono_ti05@yahoo.com

Category: Express

Abstract: Within today's manufacturing cycle or supply chain, there is a revolution due to so many reasons, ranging from customer oriented products, shortening product life cycles, stakeholder requirements, local and international regulatory compliance, to competition among players within the industries and the global warming issue. It forces both producer and customer not to only focus on economic manner, but also on the environment impact. These premises are the basic issues behind the born thinking of green supply chain management. Thereafter, supplier is a key of success in supply chain. Therefore, green supplier selection is a must according to green supply chain management. In this paper, a sample case study of green supplier selection in an Indonesia biggest national oil company is examined. As the methodology, Green Criteria for high tech industry is used along with Analytical Hierarchy Process and Multi-Goal Programming for adopting the qualitative and quantitative manners in selection process. The results indicate the proposed methodology could select more competitive supplier, such as accommodate green issue while optimizing the procurement cost.

144. Opening the Black Box of Efficiency Measurement: Input Allocation in Multi-Output Settings

Authors: Laurens Cherchye and Bram De Rock* and Bart Dierynck and Filip Roodhooft and Jeroen Sabbe

Contact: bderock@ulb.ac.be

Category: Explain

Abstract: We develop a new Data Envelopment Analysis (DEA)-based methodology for measuring the efficciency of Decision Making Units (DMUs) characterized by multiple inputs and multiple outputs. The distinguishing feature of our method is that it explicitly includes information about output-specific inputs

and joint inputs in the efficiency evaluation. This method contributes to opening the black box of efficiency measurement in two different ways. First, including information on the input allocation substantially increases the discriminatory power of the efficiency measurement. Second, it allows us to decompose the efficiency value of a DMU into output-specific efficiency values which facilitates the identification of the outputs the manager should focus on to remedy the observed inefficiency. We demonstrate the usefulness and managerial implications of our methodology by means of a unique data set collected from the Activity Based Costing (ABC) system of a large service company with 290 DMUs.

145. Modeling `Undesirable' Outputs In Efficiency Analysis: An Input Allocation Approach, application to US electric utilities

Authors: Laurens Cherchye, Bram De Rock and Barnabé Walheer*

Contact: bwalheer@ulb.ac.be

Category: Explain

Abstract: In this paper we suggest a new DEA-based technique to deal with the presence of `undesirable' or `bad' outputs in efficiency analysis. This methodology does not consider bad and good outputs as jointly produced by the inputs. On the contrary, we model `undesirable' and `desirable' outputs separately, taking their interdependence into account, by allocating the inputs to the different outputs in an elegant way. It, consequently, yields to a more realistic approach and increases the discriminatory power of the analysis. Moreover, the technique avoids to make any specific assumption on the reference technology and is robust to any translations of the bad outputs. This methodology might be of interested on its own since it allows to allocate inputs to outputs in three different ways and provides then an analysis with a high discriminatory power.

146. Optimal resource allocation to parallel subsystems by rang adjusted measure

Authors: Hiroshi Morita

Contact: morita@ist.osaka-u.ac.jp

Category: Express

Abstract: We consider the efficiency evaluation of decision making units composed of parallel subsystems with the same inputs and outputs. If there is an efficient subsystem, the reallocation of resource may bring the improvement of inefficient subsystem. In this study, we would like to find the optimal resource allocation to improve the overall efficiency of the decision making units. Then it is necessary to evaluate the overall efficiency as well as the divisional efficiency. Wang and Li (2011) proposed the DEA models by using radial measure, where the weight for subsystem is introduced to convert it to linear form. This weight is determined from the inputs value so as to denote the relative importance of subsystem; however, it enwraps the efficiency improvement by the change of input allocation. We derive the non-radial measure for overall and divisional efficiencies by using range adjusted model to find the optimal resource allocation to improve the overall efficiency.

147. Substitute or Complement? Assessing Renewable and Non-renewable Energy in OCED Countries

Authors: Surender Kumar, Hidemichi Fujii and Shunsuke Managi

Contact: surender672@gmail.com

Category: Discuss

Abstract: Elasticity of interfuel substitution between renewable and non-renewable energy is a key to establish effective climate change policy.This is the first study estimating the elasticity of substitution between different fossil fuels

and renewable resources. We use twelve manufacturing industry level data for the OCED countries over 1995 to 2009. We find complementally relationship from non-renewable energy to renewable energy in eight industries while substitute relationship holds for four industries. In particular, food and pulp industries have strong complementally relationship.

148. Productivity and Convergence in Africa: what the long-run data show

Authors: Marcel P. Timmer and Gaaitzen J. de Vries*

Contact: m.p.timmer@rug.nl, g.j.de.vries@rug.nl

Category: Discuss

Abstract: During the golden age of Africa's independence, growth in GDP per worker was similar to that in South Asia. After a long period of falling behind the frontier, Sub-Saharan Africa is recently experiencing another surge in output per worker. This paper examines the role of technology transfer in explaining productivity growth at the sector level in Africa since 1950. To this end we use the updated and extended GGDC 10-sector database, which includes time series of value added with sector-specific PPPs as well as employment by ten broad sectors of the total economy. Innovation and technology transfer are two potential sources of productivity growth for a country behind the technology frontier. We examine the roles played by international trade and human capital in stimulating each source of growth.

149. Break-ups of Municipal Health Centre Federations: Expenditure and Efficiency Effects

Authors: Mika Kortelainen* and Kalevi Luoma and Antti Moisio

Contact: mika.kortelainen@vatt.fi

Category: Discuss

Abstract: Empirical evidence on economies of scale in healthcare is mostly based on the cost effects of hospital mergers. In contrast to earlier studies, this paper approaches the economies of scale issue by analysing the break-ups of health centre federations. We use the difference-in-difference models to evaluate the break-up impacts on costs, outputs and efficiency of health centres in Finland between 1990 and 2003. To address potential non-random or endogenous treatment assignment we also utilize propensity score difference-in-difference approach. For cost efficiency estimation we use the non-parametric order-alpha method that is more suitable for small samples than the traditional efficiency estimators. Our results show that healthcare costs have grown considerably faster for the seceded health centres than for the similar non-seceded ones, while outputs have increased more for the former than for the latter group. Interestingly, we find the impact of break-ups to be insignificant on the productive efficiency of health centres.

152. Production and Management: Does Inefficiency capture Management?

Authors: Thomas Triebs* and Subal Kumbhakar

Contact: triebs@ifo.de

Category: Discuss

Abstract: Management plays an important role in production. Since it is mostly unobserved, estimated firm-level efficiency from econometric models is often used as a proxy for management or managerial input. Recent efforts to measure management practices from surveys allow us to assess the usefulness of estimated efficiency as a proxy. We apply stochastic frontier models to estimate firm efficiency scores and examine correlation between efficiency scores from these models and observed management practices. We find that better management practices correlate with higher efficiency scores but the correlation is not very strong.

153. Nonparametric Stochastic Frontier with Nonparametrically Generated Regressors

Authors: Kien C. Tran* and Efthynios G. Tsionas

Contact: kien.tran@uleth.ca, tsionas@otenet.gr

Category: Explain

Abstract: This paper analyzes the statistical properties of nonparametric stochastic frontier regression estimators (e.g., local maximum likelihood estimator) using covariates which are not directly observable, but have been estimated from data in a preliminary step (generated regressors problem). In particular, we provide a general theory for the impact of the generated covariates on the final estimator's statistical properties. That is, we derive a stochastic expansion to characterize the influence of the generation step on the final estimator, and use this expansion to derive the convergence rate and asymptotic distributions of the final estimator. Finally, an empirical application is provided to illustrate the usefulness of our proposed approach.

154. Meta Cost Malmquist Productivity Index - An Application of the Bank Financial Restructurings Groups in Taiwan

Authors: Yung-Lieh Yang* and Ming-hsiang Huang and Tzu-Chun Sheng and Kai-Ping Liu

Contact: lyang@mail.ltu.edu.tw

Category: Discuss

Abstract: The study of this proposal focuses on two ¡§Financial Restructurings¡¨ in Taiwan.
The ¡§First Financial Restructuring¡¨ starts from August, 2002 to September, 2004 and also call ¡§The Period of 258 Financial Restructuring¡¨ . The major purpose is to improve the operating efficiency and constitution of banks in Taiwan.
The ¡§Second Financial Restructuring¡¨ is over the period from 2004 to 2008 and its major purpose focuses on the mergers between commercial banks
and between credit cooperative associations in Taiwan. The policies of ¡§Financial
Restructurings¡¨ in Taiwan make commercial banks be categorized as the groups of ¡§Participate in a merger¡¨ and ¡§Not to Participate in a merger¡¨, and
the groups of ¡§Participate in a authoritative merger¡¨ and ¡§Not to Participate
in a authoritative merger¡¨. For this reason, efficiency and productivity could be estimated between different bank groups. Compare with similar studies and
literatures about bank mergers, some apply the concept of Meta-frontier method
developed by Battese and Rao (2002) to estimate the difference of productivities
between commercial bank groups and other banks. Recently, Maniadakis and Thanassoulis (2004) provides a new method of cost Malmquist (C

155. The Spillover Effects of Foreign Direct Investment toward Efficiency and Productivity in Indonesian Manufacturing Industry

Authors: Dyah Wulan Sari* and Nooraini Khalifah and Suyanto

Contact: wlnsari@yahoo.com, khalifah@pkrisc.cc.ukm.my, suyanto@ubaya.ac.id

Category: Young Researcher (YR)

Abstract: The paper aims to examine foreign direct investment (FDI) spillover effects on the firms' efficiency level as well as on the total factor productivity (TFP)

growth and its sources. To test the FDI spillover toward firms' efficiency, the paper employs stochastic frontier approach for firm level panel data of Indonesian manufacturing industry. The technical efficiency is estimated from the stochastic frontier and simultaneously explained by firm specific characteristics which consist of FDI variables. Furthermore, the total productivity growth can be decomposed from stochastic frontier estimation into three sources: technical efficiency change (TEC), technical change (TC) and scale efficiency change (SEC). Then, we estimate the effects of FDI spillover on the TFP growth and its sources using panel data method. The results demonstrate that there are positive horizontal and forward spillovers on the firms' efficiency. Similarly results on the TFP growth and TEC, the presence of foreign firms bring positive horizontal and forward spillovers. Interestingly, positive backward spillovers are only happen on TC and no positive spillovers contributed on SEC.

156. Productivity Growth in the Shrimp Farming Industry of Bangladesh: The Luenberger Productivity Indicator Approach

Authors: Hasneen Jahan* and Tiho Ancev

Contact: hasneenjahan@gmail.com, hasneen.jahan@sydney.edu.au

Category: Discuss

Abstract: Shrimp farming is the fastest growing agricultural sector in terms of value added in Bangladesh. However, the environmental degradation is a major concern for the sustainable development of this industry. This paper studies the productivity growth of shrimp farming industry in Bangladesh. Based on directional distance function approach, Luenberger total factor productivity indices are estimated under the assumptions of weak and strong disposability of undesirable outputs. The productivity change between the year 2000 and 2010 are estimated using average farm level data. The Luenberger indices are further decomposed into efficiency change and technical change components to explain the source of productivity change. The result suggests that the productivity has decreased for shrimp farms in most of the districts except Cox's Bazar and Chittagong districts when environmental performance is considered in the analysis. The productivity on the other hand increased for the shrimp farms in most of the districts when only economic performance is taken into account. The result suggests that for effective environmental policy, undesirable outputs should be included in the productivity measurement to estimate the true productivity growth.

157. Benchmarking for Routines and Organizational Knowledge

Authors: Mircea Epure

Contact: mircea.epure@upf.edu

Category: Explain

Abstract: This paper scrutinizes firm outcomes and their relationship with organizational routines from managerial accounting perspectives. It starts from frontier benchmarking and proposes a dynamic model that steps into the micro-foundations of routines to study performance changes, which are then linked to shifts in organizational knowledge. Frontier benchmarking—the Luenberger productivity indicator and its decomposition—is employed jointly with accounting ratios and proxies for knowledge investments. Outputs and inputs capture diverse strategies and potential impacts of managerial actions. A short-run profitability approach—most common in managerial accounting—is defined using flow variables. Sensitivity analyses use stock variables, usually out of managers' reach. An empirical application considers the U.S. technology industry during 2000-2011. Results reveal that post crisis industry revival comes along with wider gaps between best and worst performers. Second stage analyses show that increasing intangibles stocks is positively

associated with fixed frontier benchmarking, while enhancing R&D spending is linked to local progress. The discussion develops managerial interpretations that are suitable for incentive and control mechanisms.

158. Impact of the introduction of SFPs on Technical Efficiency of crop farms in Eure-et-Loir

Authors: JEAN-PHILIPPE BOUSSEMART and AYOUBA KASSOUM* and STEPHANE VIGEANT

Contact: ayouba.kassoum@ed.univ-lille1.fr

Category: Discuss

Abstract: This paper analyzes the effect of Single Farm Payments (SFPs) introduced by the Luxembourg agreements (2003) on the performance of arable farms in Eure-et-Loir from 2005 to 2008.

SFPs are decoupled subsidies, i.e. subsidies linked to the surface in case of production or not keeping land in a good agricultural condition (cross-compliance). In France they are calculated as the mean of subsidies received on three base years (2000, 2002 and 2003).

To investigate the effect of this new allocation mode of subsidies on technical efficiency of arable farms of Eure-et-Loir, we proceed in two steps.

First, technical efficiency coefficients of arable farms are estimated in a non-parametric framework (Fare et al. (1994)). In order to estimate a production frontier on the whole sample, i.e. to compare 2005 farms to 2008 ones for example, a climate index has been calculated using Malmquist index. It takes into account climate variations in time in the sample.

Second, SFPs received by farmers are regressed on technical efficiency coefficients obtained following the procedure suggested by Simar and Wilson (2007).

The analysis shows that for Eure-et-Loir arable farms, SFPs positively impact their performance.

159. Decomposing technical efficiency and scale elasticity in two-stage network DEA

Authors: Biresh K. Sahoo*, Joe Zhu, Kaoru Tone and Bernhard M. Klemen

Contact: biresh@ximb.ac.in, jzhu@wpi.edu, tone@grips.ac.jp, bernhard.klemen@morganstanley.com

Category: Explain

Abstract: The constant returns to scale assumption maintained by the neoclassical theorists for justifying the black-box characterization of production technology in long run does not necessarily allow one to infer that there are no scale benefits available in sub-technologies. Since most of the real-life production technologies are multi-stage in nature, and the sources of increasing returns mostly lie in the sub-technologies, it is imperative to estimate scale economies of a firm not only for its whole technology but also for its sub-technologies. To accomplish this, two approaches are suggested. While the first approach makes use of a network technology for the two interdependent sub-technologies that allows allocative inefficiency to exist in its efficiency measures, the second approach uses two independent production technologies that assumes away allocative inefficiency. Though the network technology structure considered in the first approach is argued to be more flexible over its counterpart in the second approach, these two approaches are necessary to model any network production system so as to

know the extent of output loss of a firm suffering from allocative inefficiency.

160. Measurement of Environmentally Sensitive Productivity Growth in Korean Industries

Authors: Yeimin Chung* and Almas Heshmati

Contact: yeimin@naver.com, heshmati@korea.ac.kr

Category: Explain

Abstract: This study measures productivity growth using Metafrontier Malmquist Luenberger productivity growth index (MML index) method and decompose the index. The result is compared with those obtained from the conventional ML index. MML is able to consider undesirable output as by-product in production and it accounts for producer group heterogeneities. As a result, it enables separation and estimation of changes in the technological gap between inter-temporal and global frontier technologies. The proposed index is employed to measure productivity growth and its decomposed components in 14 Korean industrial sectors during the period 1981 to 2007. For the purpose of catching of policy effects, the study period is divided into three decades. The result shows that technology innovation can be regarded as a more important factor of productivity growth, rather than efficiency change. Chemical and Petrochemical, Machinery and Transport equipment industries are treated as global innovator in the whole period. However the result differs according to decades. It is found that the groups with higher energy efficient technology and profitability obtain a higher productivity growth rate. Policy implications of the empirical results are discussed.

161. Growth and Convergence with a Normalized CES Production Function and Additive Human Capital

Authors: Gerald Eric Daniels Jr.

Contact: gerald.daniels@email.ucr.edu

Category: Young Researcher (YR)

Abstract: Employing a neoclassical growth model with a constant elasticity of substitution production function, I examine the implications of assuming different values of the elasticity of substitution for the steady state growth path, growth threshold, and speed of convergence. Unlike earlier studies along these lines, I incorporate human capital, along with physical capital and raw labor, as a third input in the production function, thus eschewing the common assumption of ``perfect substitutability" between human capital and labor inputs. I find that a higher elasticity of substitution leads to a higher steady state level for physical capital and human capital per effective unit of labor. Also, for a high enough level, the elasticity of substitution can lead to permanent growth. Lastly, a higher elasticity of substitution will lead to a higher speed of convergence when the baseline level of capital per effective unit of labor is greater than the steady state level.

162. Efficiency, productivity and CSR certification in transport industry: evidence from Europe.

Authors: Greta Falavigna

Contact: g.falavigna@ceris.cnr.it

Category: Express

Abstract: Transports have even more relevance in countries' economy, especially considering big investments of European countries in order to develop efficient links among them. This work aims at evaluating performances of firms of this industry considering the adoption of a specific certification of corporate social responsibility (i.e., SA8000). In Italy, this certification is well known and many firms have internalized its values. Nevertheless, there are no evidence that this adoption allows firms to have benefits in their

performances. This certification has the aim to protect workers' rights and then it should have a strong impact on labor productivity as well as on efficiency of services' firms, as them of transport industry. However, in the other European countries the SA8000 certification is not so frequently adopted and this paper aims at investigating differences in efficiency/productivity performances among groups of firms taken from the transport industry, but coming from different countries.

163. Measuring productivity and cost efficiency of Dutch wastewater facilities: a panel data thick frontier approach

Authors: Adrie C.M. Dumaij* and Janneke A. Wilschut

Contact: a.c.m.dumaij@tudelft.nl, j.a.wilschut@tudelft.nl

Category: Express

Abstract: We measure productivity and cost efficiency of Dutch wastewater plants. The analysis is restricted to the purification process only; transportation of wastewater and processing of sludge are excluded. We construct a translog cost function and estimate it with a thick frontier analysis. The output of each facility is determined by a hedonic function of the amount of wastewater received and chemicals removed. The inputs are personnel, materials, energy and capital. Over the years 2002, 2006 and 2009 we have in total 705 observations. The cost efficiency of each plant is derived from the cost function and related to several technologies to explain differences between plants.

The total productivity increased by 3.2 percent. The plants have generally shifted a little more towards the best practice plant. The average cost-efficiency score in 2009 is 86 percent. A slight improvement in productivity due to scale effects can be seen in recent years. The differences in cost efficiency are explained by the type of technology used.

164. TECHNOLOGICAL CHANGE AND PRODUCTIVITY ANALYSIS IN GREAT PLAINS

Authors: Dereje B. Megeressa

Contact: d_bacha@yahoo.com

Category: Young Researcher (YR)

Abstract: Elasticity estimates obtained for aggregated land may not be accurate to use as an estimate for predicting the potential indirect land use effect of biofuel and for predicting the demand and supply for different land types. The motivation of this paper is to measure agricultural productivity growth in Great Plains, in particular in Nebraska, Kansas and Oklahoma States and to estimate own and cross price elasticities of the different land categories. The study applied normalized quadratic cost function specification. The data needed for the study were collected from USDA, covering the period 1960-2004. Zellner's estimation procedure is employed to estimate the parameters. Non parametric bootstrapping method applied to estimate standard errors for elasticities. Result shows that the elasticities for the land categories are inelastic, ranging between -0.05 and -0.74. There has been a decline in cost of production over time due to technological improvement. On average, technological change has reduced the total cost of production at a rate of 1.83%. Total Factor Productivity (TFP) growth rate was estimated at 2.06% for the region. The states exhibited different productivity growth rate.

165. Productivity Growth in GCC Banking Industry 1999-2007: Conventional versus Islamic Banks

Authors: samir srairi

Contact: srairisamir3@gmail.com

Category: Discuss

Abstract: This study examines the impact of financial liberalization on banking productivity growth in the Gulf Cooperation Council (GCC) countries during the period 1999-2007. Employing a non-parametric approach (DEA), productivity change has been measured by computing Malmquist's total factor productivity index and its components for two groups of banks, conventional and Islamic. Our findings indicate that during the period of deregulation, GCC banks have experienced a gain in productivity of about 1.8 % attributed mainly to technical progress rather than efficiency increase. We also found that for most productivity measures, conventional banks tend to outperform Islamic banks. In this paper we also investigated the determinants of bank productivity. The results show that the bank's size has a positive impact on productivity growth for all models, while capitalization is negatively related to changes in efficiency for Islamic banks only. Finally, the regression also demonstrates the strong links between bank productivity and macroeconomic & financial sector indicators.

167. Solving large-scale DEA problems by small samples

Authors: Wen-Chih Chen*

Contact: wenchih@faculty.nctu.edu.tw

Category: Express

Abstract: We present an algorithm for solving larger-scale Data Envelopment Analysis (DEA) problems by using small size samples. We are able to control the size of individual linear programming (LP) problems under a prespecified limit, e.g., no more than 50 records each time, for problem solving. While we solve the large-scale DEA problem via small-size LP problems, the optimality of the problem solving is still maintained, i.e., the efficiency obtained by the algorithm is identical to the one computed by the full scale LP problem.

168. A Gamma-moment approach to cost function estimation

Authors: Abdelaati Daouia* and Stéphane Girard and Armelle Guillou

Contact: abdelaati.daouia@tse-fr.eu

Category: Discuss

Abstract: The estimation of optimal support boundaries under the monotonicity constraint is relatively unexplored and still in full development. This article examines a new extreme-value based model which provides a valid alternative for completely envelopment frontier models that often suffer from lack of precision, and for purely stochastic ones that are known to be sensitive to model misspecification. We provide different motivating applications including the estimation of the minimal cost in production activity and the assessment of the reliability of nuclear reactors.

169. The performance of Vietnamese banking system under financial liberalization: Measurement using DEA

Authors: Dang-thanh, Ngo

Contact: t.ngo@massey.ac.nz

Category: Young Researcher (YR)

Abstract: Using time trend data from 1990 to 2010, the research applied the efficiency measurement and Data Envelopment Analysis approach to evaluate the performance changes of Vietnamese banking system under financial liberalization. The DEA time trend model is a fruitful approach to analyze the banking sector through macro level data while banking level data is unavailable, for example the case of Vietnamese banks before 2000. It showed that during the liberalization process, the Vietnamese banking system has been performed well with around 90 percent of its capacity averagely, suggesting the positive impact of financial liberalization to banking sector. While the effect of regional and global crises on Vietnamese banking

sector is insignificant, its performance is positively affected by the level of the financial liberalization process. Future research are in need in order to determine the effect of financial development (M2 variable) and other factors to the performance of the banking sector with more variables and at cross-country (regional or global) level.

170. Evaluating Performance of IC Packaging and Testing Firms by Bootstrap Data Envelopment Analysis

Authors: Kuei-Ching Yu* and Erwin T. J. Lin

Contact: erwintjlin@mdu.edu.tw, erwintjlin@gmail.com

Category: Express

Abstract: Taiwan¡¦s ICPT industry ranks first in the world, with 56% market share and three out of the global top five firms are from Taiwan. However, facing keen competition, the operating efficiency of worldwide firms deserves in-depth investigation. In this paper we adopt Bootstrap Data Envelopment Analysis (BDEA) to evaluate the operating efficiency for some selected 24 global ICPT companies in 2010. We choose gross sales as output, and select total assets, the number of employees, and operating expenses as input variables. The empirical results indicate that, 5 (8) firms are evaluated as technically efficient based on the technology of constant (variable) returns of scale. The average pure output-orientated technical efficiency is 0.894, implying that on average those inefficient firms should expand their gross sales by 11 percent or 2 billion U.S. dollars, keeping inputs unchanged, so as to be efficient. The results also show that, as expected, the average bias-corrected efficiency is slightly less than DEA efficiency and the 95% confidence interval is 0.752~0.891. Based on the results some conclusions are drawn and recommendations for improving performance and for the future study are then proposed.

171. Efficiency and Risk in the European Union Banking System: The Effect of the World Economic Crisis 2007-2009

Authors: Saleem Janoudi

Contact: smaj1@le.ac.uk

Category: Explain

Abstract: This paper aims to analyse bank cost and profit efficiencies for the EU countries over the period 2004-2010. Different factors that contribute to differences in efficiency between banks and across countries, including risk and the world crisis, are investigated. The one-step stochastic frontier approach (SFA), suggested by Battese and Coelli (1995), is utilised to measure bank efficiency and the effect of bank risk, world crisis, and other factors on efficiency. The study estimates efficiency and risks for four samples; entire EU, old and new EU countries, and the PIGS. The results show that banks in the old EU states are more cost efficient than their counterparts in the new EU countries, and bank cost efficiency is highest for PIGS countries, with a clear effect of crisis on efficiency levels. As to profit efficiency, banks in the new EU states outperform their counterparts in the old EU states, and PIGS countries show superior profit efficiency overall, with obvious effect of the crisis on efficiency levels. Finally, capital risk positively and significantly affect bank cost and profit efficiencies particularly in crisis time, while liquidity risk has a significant effect only on profit efficiency in crisis time.

172. Room to Move: Why Some Industries Drive the Trade-Specialization Nexus and Others Do Not

Authors: Jaap Bos* and Lu Zhang

Contact: j.bos@maastrichtuniversity.nl, katy821102@hotmail.com

Category: Discuss

Abstract: In this paper, we investigate which industries drive the trade-specialization nexus in the European Union over the 1997-2006 period. We follow Melitz (2003), and argue that industries need 'room to move' in order for increasing trade openness to translate into increased specialization. Our paper finds that the true drivers of the trade-specialization nexus are productive firms, who benefit from the increase in trade-openness and can appropriate resources from less productive firms. This causes the industry in which they operate to expand, at the expense of other industries, in which there is no room to make such moves. We argue and find that the potential for reallocation in industries determines whether there is a trade-specialization nexus; in industries with little potential for reallocation, increased trade openness has no or a negative effect on that industry's share of total value added. As a result, the trade-specialization nexus is driven by a small number of industries, who nevertheless have a significant impact on concentration patterns.

173. Industry restructuring and productivity change in an individual transferable quota fishery

Authors: Rolf FÃ¤re and Shawna Grosskopf and John Walden*

Contact: rolf.fare@oregonstate.edu, shawna.grosskopf@oregonstate.edu, john.walden@noaa.gov

Category: Express

Abstract: Managing fisheries is a well known common pool problem. One solution to this problem is to implement market-based mechanisms such as individual transferable quotas (ITQs). The introduction of ITQs, along with associated quota trading, is generally expected to increase overall fleet productivity as more productive vessels buy or lease quota from less productive vessels which then exit the fishery. However, few empirical studies exist have evaluated whether this hypothesis holds true through time.
We examined the impact of vessel entry and exit during 1980-2008 on fleet productivity for vessels operating in the USA Mid-Atlantic surfclam ITQ fishery. In order to capture fleet restructuring which took place before and after ITQ's were introduced in 1990, we constructed a yearly productivity index, defined as the ratio of aggregate output quantity to aggregate input quantity. The index was further decomposed into a contribution component from entering vessels, exiting vessels, and continuing vessels. Our results show that less productive vessels exited the fishery, but continuing vessels had difficulty maintaining their early productivity gains.

174. Multi-Product Differential Characteristics of Efficient Frontier in Data Envelopment Analysis

Authors: Chia-Yen Lee

Contact: cylee@mail.ncku.edu.tw

Category: Discuss

Abstract: Differential characteristics of production function represent elasticity measures and marginal rates of production technologies. This paper extends Podinovski and Førsund's (2010) study. We develop a multi-product marginal productivity (MP) by showing a consistent result of MP estimated by data envelopment analysis (DEA), sign-constrained convex nonparametric least squares (CNLS), or directional distance function (DDF). The result shows that the proposed model generalizes Podinovski and Førsund's (2010) study and provides an explicit span of MP by a tradeoff between distinct directions.

175. Derivation of marginal effects of determinants of technical inefficiency

Authors: Subal C. Kumbhakar* and Kai Sun

Contact: kkar@binghamton.edu, k.sun@aston.ac.uk

Category: Express

Abstract: In efficiency studies using the stochastic frontier approach the main focus is to explain inefficiency in terms of some exogenous variables and computation of marginal effect of each of these determinants. Although inefficiency is estimated by its mean conditional on the composed error term (the Jondrow et al. (1982) estimator), the marginal effects are computed from the unconditional mean of inefficiency (Wang (2002)). In this paper we derive the marginal effects based on the Jondrow et al. estimator and use bootstrap method to compute confidence interval of the marginal effects.

176. Total Factor Productivity Growth in India in the Reform Period:A Disaggregated Sectoral Analysis

Authors: Deb Kusum Das* and Abdul Azeez Erumban and Suresh Aggarwal

Contact: dkdas@ramjas.du.ac.in,a.a.erumban@rug.nl, sureshchag@yahoo.com

Category: Discuss

Abstract: The paper is an attempt to understand the sources of Indian growth experience
for the period 1980-2010 using a newly developed database for 26 sectors. In
particular, it examines the relative contributions of factor accumulation and productivity growth in the different sectors of the Indian economy. A sector perspective gains significance in the context of major reforms undertaken in several sectors in the past two decades. In addition, there has been significant structural transformation in the economy during the past decade suggesting a high and increasing share of service sector GDP.
We use a growth accounting framework to document and analyze the sources of
India's economic growth by industry. Following the KLEMS methodology due to
Jorgenson et.al (1987), productivity performance of each of the industrial sectors is assessed for the period 1980-2010 and sub periods. The TFP growth
measure incorporates contributions of labor-quantity and quality and capital services incorporates asset heterogeneity in its measurements.

The paper documents the evidence of service sector led productivity growth in the Indian economy as it is observed that several of the services sector industries are amongst the leading contribu

177. Dealing with the Endogeneity Problem in Data Envelopment Analysis

Authors: José Manuel Cordero-Ferrera and Daniel Santín and Gabriela Sicilia*

Contact: dsantin@ccee.ucm.es, jmcordero@unex.es, gsicilia@gmail.com

Category: Discuss

Abstract: The endogeneity problem, as well as the distortions that it causes in the estimation of economics models, is well known in the econometrics literature using regression-based techniques. However, the effects of endogeneity on the estimation of efficiency measures using linear programming techniques like DEA have not been studied in depth. In those analyses, the main decision that practitioners need to undertake is the selection of output and input variables. DEA implicitly assumes a straightforward positive causality from inputs to outputs, ignoring the existence of possible two-way causal relationships between them. However, the presence of endogeneity is quite common in several fields like economics of education. This feedback from

efficiency to inputs might mask the analysis of the relationship between school inputs and attainments. The aim of this paper is to explore to which extent DEA estimates can be biased in the presence of different levels of positive and negative endogeneity using synthetic data generated in a Monte Carlo experiment. We conclude that DEA estimations are robust to the presence of negative endogeneity; however, a high or medium positive endogeneity level causes a significant bias in DEA estimates.

178. World-class manufacturing and productivity. An assessmento of the literature

Authors: Riccardo Leoni

Contact: leoni@unibg.it

Category: Discuss

Abstract: The paper presents a literature review of the characteristics of a new form of work organization, known as world-class manufacturing (WCM), with respect to traditional Taylor-Fordist organization, and its impact on productivity. The analysis is primarily developed with reference to the world of manufacturing firms, focusing particularly on the roles established by organizational design based on processes, high-involvement work practices, positive industrial relations and ICT technologies while also considering their complementarities. The new organizational configuration that emerges as effective is in line with the lean production paradigm insofar as it is characterized by innovative bundles of different 'ingredients'; but in the pursuit of efficiency and performance it also enables the employer and/or manager to choose the ingredients and their weights in a variety of possible combinations.
While the superior performance of this new work organization is acclaimed by a number of econometric studies, this paper also highlights that some methodological questions remain open and should be resolved.

JEL code: L2, 032, 033, D24.

179. QUANTILE DEA: A DIRECT LINEAR PROGRAMMING BASED APPROACH

Authors: Joseph Atwood First* and Saleem Shaik

Contact: jatwood@montana.edu

Category: Explain

Abstract: Conventional non-parametric linear programming (LP) based DEA models have the advantage of being able to estimate multiple input-out efficiency metrics but suffer from sensitivity to outliers and statistical observational noise. Previous observation-deleting approaches to the outlier problem have been somewhat ad hoc usually requiring iterative LP problem solving and/or non-LP methods. We present a quantile-DEA (QDEA) methodology, similar in concept to quantile regression, that enables the analyst to directly use LP to obtain efficiency metrics while specifying that no more than q-percent of data points can lie external to the efficiency hull. We briefly discuss the mathematical theory underlying QDEA and then apply the procedures to generated and real-world data sets. We demonstrate the ability of QDEA to obtain efficiency metrics while addressing outlier bias and statistical noise in the observations.

180. Measuring Firm Performance by using Nonparametric Quantile-type Distances: a New Approach

Authors: Abdelaati DAOUIA and Leopold SIMAR* and Paul W. WILSON

Contact: Leopold.Simar@uclouvain.be

Category: Discuss

Abstract: With multiple inputs $X\in\R^{p}_+$ and outputs $Y\in\R^{q}_+$, the traditional quantile regression of Y conditional on $X=x$ for measuring

economic efficiency is thwarted by the absence of a natural ordering for dimensions greater than one. The article of Daouia and Simar (2007) can be viewed as the first work to actually implement the idea of using quantiles for such a purpose via the conditional distribution of Y given $X\leq x$. We propose a new formulation of the distance of a point (X,Y) to the optimal surface by considering a dimensionless transformation of the $(p+q)$-dimensional production process. This motivates a new concept of unconditional quantile frontiers inside the joint support of (X,Y) but lying close to its efficient full frontier, which corrects some of the disappointing properties of the previous conditional quantile-based approach. We derive the asymptotic distributional behavior of the resulting empirical efficiency scores (full and partial). The advantages of our new benchmarking statistics is shown from an infinitesimal and global robustness theory point of view. We suggest a diagnostic tool to find the adequate quantile order α. We apply the methodology in the US Bank Industry.

181. Labor quality growth in Taiwan

Authors: San, Gee and Chou, Meng-Hsi*

Contact: sangee827@yahoo.com.tw , monshil@mail.vnu.edu.tw

Category: Young Researcher (YR)

Abstract: Due to changes in employment alone cannot accurately reflect the labor input level and changes, labor quality reflects the number of hours per work can provide the level of labor skills. We compile labor input indices which captures both change in number of employment and improvement in quality of labor for Taiwan's economy.These measures incorporated individual data on hours worked and labor compensation from the Censuses of Population, and including the employment of the industry, gender, education, age and other basic information.

From 1994 to 2011 the average annual growth rate of labor input is mainly from the improvement of the quality of labor, and labor quality to improve the contribution of labor input growth up to 77.19%,If further decomposition of the source of the improvement of the quality of labor, found that the most important raise the educational attainment of employment, followed by the age structure of the composition, especially the high age group experience accumulated results have been very beneficial to the improvement in the quality of labor, and the proper use of agricultural labor resources released to enable the continued growth of labor input.

182. Effect of FDI and Time on Catching-up: New Insights from a Conditional Nonparametric Frontier Analysis

Authors: Camilla Mastromarco(*) and Léopold Simar

Contact: camilla.mastromarco@unisalento.it

Category: Explain

Abstract: By using a dataset of 44 countries over 1970-2007, we explore the channels under which FDI fosters productivity by disentangling the impact of this factor on production process and its components: impact on the attainable production set (input-output space), and the impact on the distribution of efficiencies. We extend existing methodological tools - conditional nonparametric efficiency measures - to examine these interrelationships. We emphasize the usefulness of smoothing over time to better analyze the potential dynamic influence of FDI on efficiency. We find that both FDI and time play an important role as influencing efficiency distribution and affecting, to a smaller extend, the production set.

By the second stage nonparametric regression of the conditional efficiencies over FDI and time we identify clearly effect of thsese variables on conditional efficiency and we determine idiosyncratic efficiency which represents " Solow

residual", measured by looking to the unexplained part of the conditional efficiencies.

183. Estimating production functions of multiproduct firms

Authors: Nelli Valmari*

Contact: n.valmari@gmail.com

Category: Young Researcher (YR)

Abstract: This paper estimates production functions of multiproduct firms when technology is product-specific but inputs are observable only at the firm-level. I provide an estimation strategy that solves for the unobservable inputs while correcting for the well-known simultaneity, collinearity and omitted price problems of production function identification. Multiproduct firms constitute a considerable share of firms, and even a greater share of production. Estimates of production functions and the implied productivity distributions serve as input for numerous economic studies.

184. Macroeconomic Instability and the Incentive to Innovate

Authors: Serena Masino

Contact: serena.masino@manchester.ac.uk

Category: Young Researcher (YR)

Abstract: This paper investigates the channels through which macroeconomic instability prevents or hinders innovative investment undertakings financed by the domestic private sector. The analysis is based on a sample of 48 countries, representing all levels of development, and it estimates various measures of macroeconomic instability, such as political, real and monetary volatility. The results suggest a negative impact of instability on the share of R&D financed by the business sector. These outcomes highlight the desirability of counter-cyclical policy interventions aiming to prevent the avoidance or abandonment of private R&D undertakings in unstable macroeconomic environments.

185. A Complex Adaptive Systems Approach for Productive Efficiency Analysis

Authors: Francis L. Dougherty, Nathaniel P. Ambler, Konstantinos P. Triantis*

Contact: fdougherty@vt.edu, nambler@vt.edu, triantis@vt.edu

Category: Explain

Abstract: We explore the conceptual associations of the basic building blocks of the complex adaptive systems (CAS) “flocking” metaphor (environments, agents, goals, rules, percepts, actions, etc.) with those of Data Envelopment Analysis (DEA) (production possibility space, decision-making units, efficient frontier, inputs, outputs, etc.). Within the framework proposed in this paper, DEA “decision-making units” (DMUs) are represented as agents in the agent-based modeling (ABM) paradigm. Guided by simple rules, agent DMUs representing business units of a larger management system, “align” with one another to achieve mutual protection/risk reduction and “cohere” with the most efficient DMUs among them to achieve the greatest possible efficiency. Analysis of the emerging patterns of behavior can provide policy insights. For this research, management systems include any enterprise in which humans using efficiency concepts actively guide the key decisions of the enterprise. By treating management systems as ecosystems, CAS recognizes the autonomous, goal-oriented, dynamic, non-linear nature of decision-making and accounts for the importance of the interactions among decision-makers in the evolution of a management system.

186. Measuring Dynamic Efficiency of Highway Maintenance Operations

Authors: Saeideh Fallah-Fini and Konstantinos Triantis and Hazhir Rahmandad and Jesus M. de la Garza

Contact: fallah@vt.edu,triantis@vt.edu

Category: Explain

Abstract: In this paper we discuss a dynamic efficiency measurement model for evaluating the performance of highway maintenance operations where the inter-temporal dependences between consumption of inputs (i.e., maintenance budget) and realization of outputs (i.e., improvement in road condition) are explicitly captured. We build on a micro representation of pavement deterioration and renewal processes and study the impact of the allocation of scarce maintenance budgets over time. We provide a measure of efficiency that contrasts the optimized budget allocations to the actual ones. The developed model is then applied to an empirical dataset of pavement condition and maintenance expenditures over the years 2002 to 2007 corresponding to seventeen miles of interstate highway that lay in Roanoke county in the state of Virginia. The policies that were found through optimization showed that road authorities should give higher priorities to preventive maintenance than corrective maintenance. In essence, by applying preventive maintenance, the road authorities can effectively decrease the need for future corrective maintenance while spending less overall. Our results also show that highway maintenance performance measures obtained independently at

187. Climate Risk Adjusted Efficiency of World and Regional Agricultural Sector

Authors: Saleem Shaik

Contact: Saleem.Shaik@ndsu.edu

Category: Discuss

Abstract: The competitiveness of agriculture in the world market is affected by its rate of efficiency and productivity improvement, internal pricing policies and to a larger extent by unpredictable climate. The World and regional agriculture sector, for the most part, has been evolving and adapting to the prevailing socioeconomic conditions and policies in their own way. Climate change however, is an additional factor that will affect the evolution and adaptation of the agriculture sector not only in the short but in the long run. Climate change due to temperature and precipitation variability or risk is hypothesized to directly affect crop and livestock trends leading to potential impacts on efficiency and productivity. Variability in production and climate risk results in the inability to achieve agriculture growth across regions of the world. In this paper I estimate long and short-run climate risk adjusted efficiency measures for world and regional agriculture sector using graphic distance function. This study is based on 162 country level data from 1961-2009. An aggregate output quantity index, four inputs, and observed climate (temperature and precipitation) data is used to develop climate index.

188. Evaluating the Role of Migration on Efficiency of the Domestic Economy

Authors: Bhanu Kiran* and Saleem Shaik

Contact: kbkiran7@gmail.com, Saleem.Shaik@ndsu.edu

Category: Express

Abstract: Studies on the political dimensions of international migration has been the focus of numerous research based on neoclassical economic theory (Sjaastad 1962; Todaro 1969), segmented labor-market theory (Piore 1979), and world-systems theory (Sassen 1988). These theories suggest international migration depends on the global supply and demand for labor, intensive labor (farm labor), and natural product of world development respectively. Alternatively, studies have also examined the importance of migration on

technical efficiency using stochastic frontier analysis and also two-step process linear programming-tobit model using survey data (Wouterse, 2008). In this paper, we digress to examine the importance of migration on technical efficiency using 76 countries from 1961-2010. Specifically, we examine the importance by treating migration as an undesirable output for domestic country. The following two propositions correspond to the two objectives of the paper:
1: Quantifying importance of migration on efficiency using hyperbolic distance function under CRS and VRS.
2: Differential impact of migration across regions and income groups.

189. Scale Efficiency and Homotheticity: Equivalence of Primal and Dual Measures

Authors: Valentin Zelenyuk

Contact: v.zelenyuk@uq.edu.au

Category: Discuss

Abstract: We address the issue of equivalence of primal and dual measures of scale efficiency in general production theory framework. We find that particular types of homotheticity of technologies, which we refer to here as scale homotheticity, provide necessary and sufficient condition for such equivalence. We also identify the case when the scale homotheticity is equivalent to the homothetic structure from Shephard (1970).

190. Aggregation of Scale Efficiency

Authors: Valentin Zelenyuk

Contact: v.zelenyuk@uq.edu.au

Category: Discuss

Abstract: In this article we extend the aggregation theory in efficiency and productivity analysis by deriving solutions to the problem of aggregation of individual scale efficiency measures, primal and dual, into aggregate primal and dual scale efficiency measures of a group (e.g., industry). The new aggregation result is coherent with aggregation framework and solutions that were earlier derived for other related efficiency measures and can be used in practice for estimation scale efficiency of an industry or other groups of firms within it.

191. Multi-output production efficiency: an empirical analysis of US university research

Authors: Veerle Hennebel* and Laurens Cherchye

Contact: Veerle.Hennebel@kuleuven-kulak.be, Laurens.Cherchye@kuleuven.be

Category: Express

Abstract: We build on the recently developed methodology for measuring the efficiency of decision making units in the case of multiple inputs and outputs. This method concentrates on dealing with joint inputs that are simultaneously used for the production of several outputs. Following a nonparametric approach, we do not need to specify the exact production technology, which is typically unobserved. Another attractive feature of our approach is that it can account for cooperative as well as non-cooperative use of joint inputs in multi-output settings. We extend the existing methodology by implementing specific assumptions related to the prevailing returns-to-scale underlying the observed production behavior. An interesting feature of our methodology is that it allows for imposing returns-to-scale assumptions that are specific to individual outputs. We illustrate the methodology through an empirical application in which we analyze the research conducted at US universities. University research forms a prime example area to illustrate our methodology as it involves multiple outputs. Next, the production of research at universities requires not only academic staff but also technical and

administrative staff, which figure as joint inputs.

192. Sustainable nutrient management in agriculture: nitrogen flows and stocks in OECD countries

Authors: Natalia Kuosmanen

Contact: nataliya.kuosmanen@mtt.fi

Category: Express

Abstract: This study presents one of the first empirical applications of the dynamic material balance accounting in the international comparison of nitrogen use in agriculture. The dynamic model used in the study allows to analyze the developments in the nitrogen stocks and flows over time and to assess how countries perform in terms of nitrogen-efficiency. Using publicly available data of agricultural production in 14 OECD countries in 1961 – 2009, we first estimate national stocks of nitrogen, which provide new insights on national trends in nitrogen use. We then calculate nitrogen efficiencies and compare economic performance of countries per unit of nitrogen pollution.

193. Ascertaining of the Holistic Service Productivity of Hospitals' Customer and Supplier Relationship Management

Authors: Mario Alexander Pfannstiel

Contact: mario.pfannstiel@uni-bayreuth.de, mario_pfannstiel@hotmail.com

Category: Explain

Abstract: Customer relationship management (CRM) and supplier relationship management (SRM) presents a means for hospitals to successfully acquire new customers and suppliers and become acquainted with already existing ones. Despite CRM's and SRM's increasing popularity, it has so far not been explored to what extent customer and supplier acquisition and retention activities are productive. The general concept of service productivity and suitable indices to assess the productiveness of a hospital's relationship management are discussed. A method with which hospitals can measure the extent to which they achieve their goals in terms of aggregate productivity from the customer and suppliers' relationship management perspective is lacking. The service productivity analysis in this paper provides one solution to this problem because it uses 12 key indices to ascertain productivity at the hospital's CRM and SRM. Twelve key indices were included (6 CRM indices and 6 SRM indices). The 12 key indices consist of 4 categories (individual activity, individual satisfaction, individual loyalty and individual value). One indice describes a factual situation that is relevant to productivity and services so that it makes a contribution to overall productivi

194. Computing economies of vertical integration, economies of scope and economies of scale using partial frontier nonparametric methods

Authors: R. Marques* and P. Carvalho

Contact: rui.marques@ist.utl.pt, pedro.c.carvalho@ist.utl.pt

Category: Express

Abstract: In the nonparametric literature mainly full frontier nonparametric methods have been applied to search for economies of scope and scale, particularly the data envelopment analysis (DEA). However, the full frontier nonparametric methods present some drawbacks. They are particularly sensitive to extreme data and outliers and suffer from the problem of the "curse of dimensionality" and thereby might lead to biased results. This paper applied a methodology based on more robust partial frontier nonparametric methods to look for scope and scale economies. This methodology makes it possible to assess the robustness of these economies, to assess the influence of extreme data or outliers and to assess the influence of the imposition of convexity on the production set of firms. This methodology was applied to the

water utilities that operated in Portugal between 2002 and 2008. The results show that there are economies of vertical integration and economies of scale in the utilities operating mainly in the retail segment. Economies of scale and some diseconomies of scope were found in the wholesale segment. Through this methodology we also observed that the existence of some smaller utilities makes the minimum optimal scales go down.

195. Smoothing nonparametric partial frontier methods

Authors: P. Carvalho* and R. Marques

Contact: pedro.c.carvalho@ist.utl.pt, rui.marques@ist.utl.pt

Category: Express

Abstract: The nonparametric methods have revealed themselves extremely useful and advantageous compared to the parametric methods. The nonparametric methods do not require the choice of a functional form to represent the cost or production functions neither so many assumptions and are easier to compute. However, the traditional nonparametric methods (full frontier nonparametric methods, such as the data envelopment analysis - DEA) have some drawbacks. They are particularly sensitive to outliers and extreme data and suffer from the problem of the “curse of dimensionality”. Fortunately with the appearance of new and robust partial frontier nonparametric methods (order-a and order-m), a large part of the problems of the traditional full frontier methods were mitigated. However, these robust partial frontier nonparametric methods have discontinuous frontiers, which is a major drawback that has prevented their application in certain situations, such as in the search for economies of scope and in the efficiency comparison of different groups of firms. To eliminate this problem, this paper proposes a procedure to linearize the frontiers of the order-a partial frontier nonparametric method, thus making it one of the most powerful methodologies.

196. Outlier Sensitivity of Nonparametric Methods for Efficiency Measurement

Authors: Jens J. Krueger

Contact: jjk@vwl.tu-darmstadt.de

Category: Explain

Abstract: In this paper we follow Kr$\"u$ger (EJOR 222 (2012), pp. 137-148) focusing on the comparison of frequently used nonparametric models of efficiency measurement, including both deterministic (DEA, FDH, SBM) and stochastic variants (order-m, order-α). The substantial extension of Kr$\"u$ger (2012) is two-fold. On the one hand, the simulated production environment is made more heterogeneous and erratic by letting the production function parameters be random draws specific to the respective DMUs. This lets the simulation environment be more favorable to the nonparametric-stochastic methods. On the other hand, the effects of outlying observations is investigated in much more detail. These outlying observations are induced into the simulation as a controlled fraction of the sample which is varied over a fine grid of fractions.
The results obtained so far strengthen the previous findings of Kr$\"u$ger (2012) showing that the greater robustness of the nonparametric-stochastic methods shows up only for larger fractions of outlier in the data. Moreover, FDH proves to be a very robust method also in this more erratic and heterogeneous simulation setting. DEA, however, suffers the most from the introduction of the outliers.

197. Applying performance measurement in service operations: analysis of contextual differences

Authors: Aki Jääskeläinen* and Harri Laihonen

Contact: aki.jaaskelainen@tut.fi

Category: Discuss

Abstract: This paper analyzes the contextual differences of service operations with the aim to widen understanding about performance measurement in services. Recent research considers service management from many viewpoints like marketing and operations management, and also the importance of performance management in this particular context has been recognized. The literature illustrates the variety of service environments and operations with classifications that differentiate management concerns in different types of services. However, the practical implication of service contingencies on performance measurement practice is less studied. To address the gap in literature, this paper studies empirically the different contexts of knowledge-intensive services, public services and industrial services. Qualitative multiple-case approach is applied. As a result, the paper shows how service contingences affect performance measurement in service operations.

198. A test for measuring the too big to fail effect in the European banks over the financial crisis.

Authors: Rossi Stefania and Mattana Paolo

Contact: stefania.rossi@unica.it, mattana@unica.it

Category: Express

Abstract: This paper aims at investigating the role of bank size in the observed risk/profitability combination operated by European banks over the extant financial crises. In order to analyze the existence of moral hazard conducts, we model a strong and week form of TBTF behavior. A robust quadratic estimate is employed to provide empirical backing on the joint behavior of credit risk and profitability retention over the crisis using a large sample of European banks. Additionally, because of the well-known agency problems, we distinctly investigate managers and ownersâ€™ perspectives.

When the managerâ€™s perspective is concerned, we assess that there is no empirical support for the neither form of TBTF hypothesis. The ownerâ€™s behavior seems consistent with the weak form TBTF activity. However, a closer look to our data leads us to infer that the observed size-induced increase in risk could more likely be explained by a diverse de-leveraging intensity at different class sizes.

199. Nonparametric Estimation of Education Productivity incorporating Nondiscretionary Inputs with an Application to Dutch Schools

Authors: Shae Brennan and Carla Haelermans* and John Ruggiero

Contact: carla.haelermans@maastrichtuniversity.nl

Category: Express

Abstract: In this paper we developed a public sector Malmquist productivity index useful for production environments characterized by nondiscretionary inputs. Johnson and Ruggiero (2011) showed how the environment can influence productivity measures. Their model assumed constant returns to scale. In this paper, we extended their approach to further decompose the Malmquist productivity index into technical, efficiency, scale and environmental change. The decomposition allows an analysis of changes under the assumption that a given production unit faces the most favorable environment under variable returns to scale. We applied our model to analyze productivity of Dutch schools using 2002-2007 data. The results indicate that the environment indeed influences the productivity index, as well as the technical, efficiency, scale and environmental change. We see that schools with a moderate

classification of environment have the highest productivity numbers. In line with expectations, schools with the worst environment also perform worse and would perform lot better when they would have a different environment.

200. Evaluation of Bank Branch Growth Potential Using Data Envelopment Analysis

Authors: Alex LaPlante* and J.C. Paradi

Contact: alex.laplante@mail.utoronto.ca, paradi@mie.utoronto.ca

Category: Explain

Abstract: Given the current market volatility and continuous entry of new competitors, it has become increasingly difficult for banks to maintain the fiscal growth required to remain viable and competitive. In order to cut costs, improve operational efficiency and locate underperforming areas, banks use frontier efficiency analyses to objectively identify best practices. Data Envelopment Analysis (DEA) is one of these approaches and has been successfully employed in many bank branch performance evaluations using traditional intermediation, profitability and production approaches. However, there has been little focus on assessing the growth potential of branches. This research presents six DEA models that examine three perspectives of branch growth; namely yearly growth, branch churn and market efficiency. Each model was applied to the branch network of one of Canada's top five banks to gauge the growth potential of individual branches and to provide tailored recommendations. Using various analysis techniques, the results and functionality of the models were assessed. It was concluded that three of the models produced significant results, while the remaining three failed to adequately discriminate between efficient and inefficient branches.

201. Trends in Total Factor Productivity and Technological Change in the Australian Urban Water Sector: A Bootstrap Malmquist Indices Approach

Authors: Jayanath Ananda

Contact: j.ananda@latrobe.edu.au

Category: Express

Abstract: This paper empirically analyses the total factor productivity of the Australian urban water sector during the period of 2005-06 to 2010-11. Recent developments in bootstrapping techniques are used to obtain unbiased total factor productivity estimates and to assess the uncertainty surrounding such estimates. Findings indicate that the Australian urban water sector experienced a slight technological regress. The overall total factor productivity of the sector has plateaued during the study period with urban water utilities serving more than 100,000 customers experiencing a decline in productivity over the period. A record drought, an extreme climate variability and water rationing may have contributed to the poor total factor productivity results for the sector.

202. A Laplace-Truncated Laplace Stochastic Frontier Model

Authors: William C. Horrace and Christopher Parmeter*

Contact: cparmeter@bus.miami.edu

Category: Discuss

Abstract: We propose a Laplace-truncated Laplace stochastic frontier model. Despite the non-diff
erentiable points in the individual distributions, the composed error is smooth and the likelihood well-behaved. The model does not appear to su
ffer from the wrong skew issue that plagues frontier models with normally distributed two-sided errors. An interesting feature of the model is that the conditional mean of ineffi

ciency is constant for positive values of the composed error, but varies for negative values. Therefore, it may be ideally suited for analyzing industries with many firms on or close to the efficient frontier. A simulation study suggests that the model performs well relative to the normal-exponential model when the two-sided error is misspecified. A brief application to US Airlines is provided.

203. Multilateral Productivity Index and Variable Returns to Scale: An Application to Rice Sector in Korea

Authors: Katsunobu Kondo* and Jun Sasaki and Yongkwang Shin and Yasutaka Yamamoto

Contact: kondo@live.asahikawa-u.ac.jp, j-sasaki@bioindustry.nodai.ac.jp, ykshin22@hotmail.com, yamay@agecon.agr.hokudai.ac.jp

Category: Express

Abstract: The multilateral productivity index has been applied in empirical studies on index number approach since introduction by Caves, Christensen and Diewert (1982a). A major advantage of using the index number approach including the Tornkvist and multilateral productivity indexes is that these indexes can be measured even though the number of observations in the cross section is small relative to the total number of inputs and outputs. A distinct feature of the multilateral productivity index compared to the Tornkvist productivity index is to satisfy circularity requirement. However, many empirical studies using the multilateral productivity index have assumed that producers operate under constant returns to scale (CRS) technology.
In this study, we relax such a restrictive assumption of CRS and propose a new multilateral productivity index taking into account variable returns to scale (VRS). This new multilateral productivity index yields the multilateral input-based productivity (MIBP) index and the multilateral output-based productivity (MOBP) index analogous to Caves, Christensen and Diewert (1982b). In this study, we also apply both the MIBP and MOBP indexes to panel dataset for rice sector in Korea as a case study.

204. Why is 'too much finance' bad for productivity?

Authors: Dirk Bezemer and Lu Zhang*

Contact: katy821102@hotmail.com

Category: Express

Abstract: A vast literature shows that financial development is good for growth. Recent studies however postulate an optimal size of the financial system, with a threshold beyond which financial development may harm growth and stability. This paper aims to provide empirical evidence of why financial development can be a drag on growth – specifically, productivity growth. We argue that (mis-)allocation of bank credit in the economy may play a role. Specifically, credit flows to the real sector have systematically different effects from those to the financial and property sectors. The former may support investment and productivity growth, while the latter may inflate property and other asset prices, with a number of possibly detrimental effects on growth. Using a unique dataset of credit flows in OECD countries over 1980-2005, we find that countries experience higher productivity growth when a larger proportion of credit flows to the real sector. While previous research suggests that more finance is not always better and may be worse, our analysis suggests that a qualitative distinction in credit flows helps understand this finding.

205. Multiple Technology Heterogeneity: Does the hierarchy reveal the latent technology?

Authors: Kostas Tsekouras and Nikos Chatzistamoulou* and Alexandra Kontolaimou and Kostas Kounetas

Contact: tsekour@upatras.gr, chatzist@upatras.gr, akonto@upatras.gr, kounetas@upatras.gr

Category: Explain

Abstract: Inappropriate handling of technology heterogeneity in efficiency analysis may cause the augmentation of noise component distorting the estimated distribution of efficiency scores in terms of the DMUs ranking and absolute efficiency scores. Thus, technology heterogeneity presents itself due to heterogeneous levels of the available resource endowments, economic infrastructure, and differential characteristics of the physical, social, institutional and economic environment in which production takes place exhibiting a multidimensional pattern related with multiple-ordered levels. In this paper we introduce the notion of hierarchical or ordered technologies and showcase the analytical derivation of solid approaches which allow the identification of the hierarchy which minimizes the absolute distance between the true, although latent, technology hierarchy and the employed hierarchy employed under different assumptions employing the notion of metafrontier. Our dataset consists of 17 European countries and 13 industries putting emphasis in the most energy intensive consumer, that of transportation which is further analyzed in land, water, air transport, and supporting transport activities.

206. Comparing grid tariffs for electricity distribution – changes in allokativ efficiency with time-of-use tariffs in the light of demand response actions

Authors: Göran Ek

Contact: goran.ek@ei.se

Category: Explain

Abstract: The importance of demand response even for residential customers (households) and other small users of electricity have been stressed by the targets 202020 for the EU. Targets on energy efficiency, electrical cars and renewable generation of electricity have been set. One important way to handle these goals is by more active customers of electricity - so called demand response. A concrete measure to make customers more active (sensitive to changes in electricity prise and price on grid services) is automatic meter reading which give possibility to get hourly metering of the load (kWh/h). A complicating factor is that there are two markets involved: the generation and sales of electricity (energy) and the transport of this energy to the customers. The markets are complementary and one can say that the generation part is about energy (and capacity) to produce and the other part on capacity to distribute.

With hourly metering it´s possible to implement tariffs based on actual power load for residential customers a price per kW times the highest hourly mean power during a time period (usually each month). Households/residential customers pay today normally a fixed fee for the possibility to a certain load in kW. The power charge

207. European competitiveness: a nonparametric stochastic firm-level TFP analysis

Authors: Marijn Verschelde* and Glenn Rayp and Michel Dumont and Bruno Merlevede

Contact: marijn.verschelde@ugent.be, glenn.rayp@ugent.be

Category: Explain

Abstract: This paper analyses total factor productivity at firm-level to obtain insights

that are of use for the recent competitiveness debate in Europe. Noise is non-negligible in any large scale firm-level dataset, making the use of deterministic frontier based approaches not advisable. To include inefficiency in a nonparametric fashion into the competitiveness debate when using firm level data, we advocate a nonparametric stochastic alternative that simultaneously i) allows for market imperfections and inefficiency, ii) does not impose a priori restrictions on the functional form of the input-output relation, and iii) allows for noise. We obtain insight in technical innovation and efficiency dynamics by decomposing a nonparametric stochastic TFP index using AMADEUS firm-level data of more than 1 million firms covering 20 manufacturing sectors in the EU-15.

208. Productivity development in electricity distribution– local grids in Sweden 2000-2011

Authors: Göran Ek

Contact: goran.ek@ei.se

Category: Explain

Abstract: A review of the productivity development in the electricity distribution industry in Sweden is undertaken to give information to the regulator on deciding on the efficiency target (the X-factor) for the local distributions grids in Sweden for the next regulatory period (the revenue frames for 2016-2019). Productivity development was measured for the period 2000-2008 as an input for deciding the efficiency target in the first regulatory period 2012-2015. Only a general target (same for all DSOs) was decided for the first period.

Besides adding data for three years to the panel to get more information, two questions are addressed:
1. The impact of including the losses in the cost variable (OPEX)
2. The impact of using a monetary assessment of the capital base instead of using two indicators for capital (capacity of transformers and length of lines and cables).

Three models are applied for the study. The first model for the measuring productivity consists of four variables. Operative cost as input and number of customers, installed capacity of transformers (kVA) and total length of the lines and cables. In the second model the grid losses included in the operative cost and in the third model the two physical variables o

209. Carbon prices and incentives for technological development

Authors: Tommy Lundgren and Per-Olov Marklund* and Eva Samakovlis and Wenchao Zhoud

Contact: tommy.lundgren@slu.se, pelle.marklund@econ.umu.se

Category: Discuss

Abstract: How to significantly decrease carbon dioxide emissions has become one of the
largest challenges faced by modern society. The standard recipe prescribed by
most economists is to put a price on carbon, either through a tax or through emissions trading. Such measures can reduce emissions
cost-effectively and create incentives for technological development. There is, however, a growing concern that the carbon prices generated through the European Union emission trading system (EU ETS) have been too low to create the incentives necessary to stimulate technological development. This paper empirically analyzes how the Swedish carbon dioxide tax and the EU ETS have affected productivity development in the Swedish pulp and paper

industry 1998-2008. A Luenberger total factor productivity (TFP) indicator is computed using data envelopment analysis. How the policy measures affect TFP is assessed using a system generalized method of moments estimator. The results show
that climate policy had a modest impact on technological development in the pulp and paper industry, and if significant it has been negative. The price on fossil fuels, on the contrary, seems to have created important incentives for technological development. Hence, result

210. Energy Demand and Energy Efficiency: A Stochastic Demand Frontier Approach

Authors: Massimo Filippini* and Lester Hunt

Contact: mfilippini@ethz.ch

Category: Explain

Abstract: The promotion of energy efficiency policy is seen as a very important activity by the Energy Information Agency (EIA). Generally, the level of energy efficiency of a state is approximated by the energy intensity, commonly calculated as the ratio of energy use to GDP. However, energy intensity is not entirely an accurate proxy for energy efficiency, because changes in energy intensity are a function of changes in several factors including the structure of the economy, climate, efficiency in the use of resources and technical change. The aim of this paper is to measure the 'underlying energy efficiency' for the US total sector across 49 'states' using a stocastic frontier approach (Filippini and Hunt (2011, 2012)). For this purpose, we estimate a stocastic total energy demand frontier function using panel data for 48 US states. The following models for panel data has been used: the pooled model, the random effects model (Pitt&Lee(1981), the random effects model with Mundlak adjustment, the TRE and TFE models proposed by Greene (2005). Generally, the analysis suggests that energy intensity is not necessarily a good indicator of energy efficiency, whereas the measure of energy efficiency obtained using a SFA approach is.

211. The Simar and Wilson's Bootstrap DEA approach: a critique

Authors: Panagiotis Tziogkidis

Contact: tziogkidisp@cardiff.ac.uk, tziogkidisp@gmail.com

Category: Young Researcher (YR)

Abstract: In this paper we provide a critique on certain aspects of Simar and Wilson's methodologies on bootstrap DEA. In particular, we argue that the bootstrap bias has a completely different nature compared to the DEA bias. This imposes a question about the validity of the twice "bias-corrected" efficiency scores of Simar and Wilson (1998) as well as about the consistency of Simar and Wilson's (2000) confidence intervals which both use this assumption. Moreover, we examine the extent to which the complicated procedure of smoothing the empirical distribution is necessary. We provide evidence by performing an extensive Monte Carlo experiment over three different populations and three different model dimensions. We follow an approach of moment comparison which has not been used in previous studies as the less reliable "coverage probabilities" have been used instead. Our results offer a deep insight on the workings of bootstrap DEA, while they confirm our arguments and suggest that the practice of smoothing the empirical distribution should be avoided.

212. The Effect of Dairy Quota on Milk Composition

Authors: Daniel Muluwork Atsbeha

Contact: daniel.atsbeha@umb.no

Category: Young Researcher (YR)

Abstract: Under incentive schemes encouraging better milk composition, quota-restricted dairy farms may improve profitability by increasing proportions of high-value milk components (e.g., protein). A theoretical model of such quota-induced substitution effects is developed. Predictions from the model with respect to effects of quota change on milk composition are ambiguous and critically
depend on cost complementarity between milk quantity and its composition. Empirical results from Norwegian dairy farms show that quota-induced substitution effects are positive for protein and negative for fat. This implies that Norwegian dairy farms do not substitute towards the high-value milk component in the market (namely protein) as the quota regime gets restrictive.
Instead, unlike other similar cases such as in international trade, where quantity restrictions led to quality improvements; quota restrictions in Norwegian dairy production resulted in reduced milk quality in the form of relatively lower concentration of high-value milk components. A combination of low financial incentives, high over production penalties, and cost complementarity between protein concentration and milk quantity are likely explanations of the result.

213. The Scientific Linkage between Patents and Firm Productivity: Evidence from Taiwanese Electronics Firm Level Data

Authors: Jong-Rong Chen* and Kamhon Kan and I-Hsuan Tung

Contact: jrchen@cc.ncu.edu.tw, kk@sinica.edu.tw, 954404002@cc.ecu.edu.tw

Category: Discuss

Abstract: Using a unique panel data of the electronics firms listed on the Taiwan Stock Exchange, this paper explores the scientific linkages between patents held by the firm and its productivity performance. We adopt the non-patent references found in the ISI-Web of Science as the scientific linkages; we then add conference proceedings, books, and university publications to the definition step by step. Furthermore, the backward citation variable includes the references to scientific publications (e.g., scientific linkages), U.S. patent citations and non-U.S. patent citations. There are five citation variables defined in this study according to different citation information so as to examine in details how different levels of scientific linkages affect firms¡¦ total factor productivity. As for the econometric consideration, we use a two stage least square (2SLS) method with instrumental variables to reduce the bias caused by the endogenous problem of patent citation data. The empirical results confirm that the firms¡¦lagged internal liquidity constraints are good instrumental variables and that the scientific publications in the ISI-Web of Science database cited by the patents contribute significantly to the firms¡¦ productivity.

214. Measuring the research performance of Swiss higher education institutions using data envelopment analysis

Authors: Djily DIAGNE, Department of Education, University of Fribourg, Switzerland

Contact: Djily.Diagne@unifr.ch

Category: Express

Abstract: Measuring the research performance of Swiss higher education institutions using data envelopment analysis
The main objective of this paper is to develop a framework for measuring and explaining the performance of research activities in the Swiss higher education context. The measurement of the performance of public research units is crucial to promote academic excellence and make the country's research internationally competitive. Unfortunately, evaluating complex and dynamic organizations like scientific institutions is not an easy task and there

are important conceptual and methodological difficulties to overcome. In particular, the methods currently used (bibliometrics and peer review) present some drawbacks and may not be sufficient to measure all the main aspects of public research activities. Within this context, the present project proposes to develop a framework based on the application of Data Envelopment Analysis (DEA), a linear programming technique initially proposed to investigate the performance in the public sector. DEA is emerging as a leading method for measuring and comparing performance of research institutions (see Agasisti et al. 2012; Abramo et al. 2011; Johnes and Yu, 2008; Johnes 2006; Kocher et al., 2006)

215. Measuring effectiveness of production in the public sector

Authors: Førsund, Finn R.

Contact: f.r.forsund@econ.uio.no

Category: Discuss

Abstract: The distinction between the concepts outputs and outcomes can be made operational based on the degree of control a public service producer has over its production activity. Resources are transformed into service outputs under the control of the service provider while outcomes represent some higher social goals than outputs and are determined by the outputs and exogenous variables. Production of outcomes is outside the control of the organisation. Transformation of resources into service outputs are modelled traditionally way, but the transformation of service outputs to outcomes is modelled by factorially determined multioutput production functions. Outcomes range from private goods produced by the individual consumers as in a household production function approach, to pure public goods. The link to efficiency measurement is provided by introducing the concept of a benchmark frontier technology for the type of production in question. A new measure of overall preference efficiency is introduced and its decomposition into output-oriented technical efficiency and output mix efficiency is shown. The rather monumental task of providing the necessary information for calculating mix efficiency is highlighted.

216. Cost efficiency of Kazakhstan and Russian banks: Results from competing panel data models

Authors: Subal C. Kumbhakar and Anatoly A. Peresetsky*

Contact: kkar@binghamton.edu, apereset@gmail.com

Category: Discuss

Abstract: In this paper, we estimate cost efficiency of the Kazakhstan and Russian banks. A stochastic frontier (SF) approach based on a panel data for 2002–2006 is used. The Kazakhstan banking system is traditionally assumed to be more advanced compared to the Russian system. In 2003 Kazakhstan adopted the International Accounting System, and in 2005 Basel-2 norms were introduced. None of these happened in Russia during the period of our study. Given these differences, our objective is to examine whether there is a systematic difference in bank efficiency between them. For this we use two sets of SF panel models, viz., models which do not separate and do separate bank effects from inefficiency. Within each set we also consider models with a single and multiple outputs as well as alternative distributional assumptions on inefficiency. Empirically we do not find any significant differences in the cost efficiency scores of banks between these two countries during the period of our study. This result is found to be quite robust across several alternative and competing models. We also find that many of the banks in both countries operate below their optimal size.

217. The Economic Costs of Abatement, and Environmental Regulation: An Analysis of Dairy Farming

Authors: Eric Njuki* and Boris Bravo-Ureta

Contact: eric.njuki@uconn.edu, boris.bravoureta@uconn.edu

Category: Young Researcher (YR)

Abstract: In 2009 the Environmental Protection Agency announced plans to impose strict reporting standards on greenhouse gas emissions across all sectors of the U.S. economy. The intent of the guidelines was to improve the effectiveness of the design of programs, voluntary or mandatory, so as to reduce emissions. Any attempt to limit emissions, and hence undesirable outputs, imposes additional constraints on firms by requiring that inputs be diverted away from good production and towards abatement. This study proposes to estimate the economic costs of the foregone desirable output associated with abatement activities and environmental regulations in dairy farming. Using a stochastic directional distance function and a Bayesian framework we calculate the shadow price of the undesirable output, and establish the value of the foregone desirable output associated with environmental regulation and abatement activities. The dataset used consists of U.S. Department of Agriculture county-level census data across 7 census years: 1978, 1982, 1987, 1992, 1997, 2002 and 2007. The dataset includes the top 136 dairy counties across the US for a total of 952 observations spanning a 30 year period.

218. Assessment of Public School performance: Alternative approaches

Authors: Shawna Grosskopf and Kathy Hayes* and Lori Taylor

Contact: shawna.grosskopf@oregonstate.edu,khayes@smu.edu,ltaylor@bushschool.tamu.edu

Category: Explain

Abstract: In response to requirements of No Child Left Behind, there is increasing interest in data driven assessments of the performance of America's public schools. Here we provide a guide to some of the major challenges, beginning with what to measure and how to measure it. Regardless of analytic technique, any analysis of school district performance is highly sensitive to modeling choices about how to measure student outcomes, resource usage, input prices and family and peer inputs, etc. The first part of our analysis illustrates this sensitivity.

The next problem is how to estimate school performance once these data issues are addressed. We propose estimating frontier models, which capture performance as the ability of the school to achieve best practice, given their resources. We apply our preferred specifications to a sample of Texas public schools. This analysis focuses on public schools in Texas during the 2010-11 school year. We also explore a variety of approaches to endogeneity issues. Our results will provide some guidance to policy analysts as to the effects of alternative assumptions about functional form and specification of key variables on outcomes.

219. Demographic Productivity Differentials – A Household Perspective

Authors: Wojciech Szewczyk and Russel Cooper*

Contact: wojtek.szewczyk@yahoo.com

Category: Explain

Abstract: It is now well recognised that aggregative measures of productivity levels and productivity growth hide a good deal of disparate industry level detail. There is also growing recognition that interest in productivity has its foundation in a more fundamental concern – economic well-being. Yet the composite implication of these two facets of productivity – the fact that productivity growth may be impacting differently on households that have different

consumption needs – has not yet been very thoroughly explored. This paper takes evidence from the authors' own research on household-level variations in consumer demands due to differential demographics and derives a 'household oriented productivity' (HOP) measure from this. The HOP measure can be compared with a standard aggregative production-oriented measure of productivity such as 'total factor productivity' (TFP). On the theoretical front, the paper explores the relationship between HOP and TFP. Empirically, estimates of the differences in HOP for some demographic groups are presented. The results illustrate the importance of distinguishing between the effects on different demographic groups of what otherwise might be thought to be relatively neutral advances in productivity.

220. Modeling input demand in Bangladesh rice sector: Incorporate technical inefficiency

Authors: Bingxin Yu* and Akhter Ahmed

Contact: b.yu@cgiar.org

Category: Express

Abstract: Following Arnade and Trueblood (2002), this paper incorporates technical inefficiency into the profit function based on the relationship between cost and distance function. This approach follows economic theory to determine how technical inefficiency can be integrated into a profit function. A two-stage procedure is used in the empirical application. First, technical inefficiency scores are calculated using Data Envelopment Analysis. The inefficiency scores are specified as an exogenous explanatory variable in a profit function setting, producing a system of output supply and input demand equations using Hotelling's Lemma. This approach avoids statistical inconsistency in sequential econometric estimation.

Using household survey data from Bangladesh in 2010/11, this study examines the effect of technical inefficiency in estimating the output and input functions. Rice production information at 17,472 plots is extracted from the agricultural module. We consider four quasi-fixed inputs (land, family labor, draft animal, and farm machinery) and three variable inputs (fertilizer, irrigation, and hired labor), along with some exogenous nonprice factors including policy, in the production of four types of rice.

221. Measuring the Efficiency of New Zealand Banks during the global financial crisis

Authors: Paul Rouse and David Tripe* and WenQian Song

Contact: D.W.Tripe@massey.ac.nz

Category: Discuss

Abstract: This study uses New Zealand bank data to explore alternative approaches to the treatment of bad and doubtful debts in efficiency studies. These are generally regarded as undesirable outputs. The study covers the period from March 2006 to March 2012, which also included the global financial crisis, but this provides us with the opportunity to look at significant variations in the levels of bad and doubtful debts.
Unsurprisingly, bank efficiency was found to be lowest during the period 2008-2009, when the crisis was having its most profound effects on the New Zealand banking system, with the impact greater on larger banks.
It was found that the inclusion of weight restrictions in the DEA analysis accentuated the decline in efficiency during the crisis period. The weight restrictions are also shown to have a realistic interpretation using production tradeoffs between lending policy and interest income.

222. An Integrated Taxonomy of Efficiency Indexes and Generic Theorems on Their Properties

Authors: R. Robert Russell* and William Schworm

Contact: rcubed@ucr.edu, b.schworm@unsw.edu.au

Category: Explain

Abstract: We show how all efficiency indexes can be characterized (equivalently) in terms of additive or proportional slacks and classify these indexes into two types according to the restrictions placed on the set of slacks. Those that place no restrictions on these sets (other than minimal regularity conditions) we refer to as multiple-path efficiency indexes. Those that constrain the slacks to follow a unique path from a production vector to a reference vector we refer to as unique-path indexes. (A third group, multiple-stage indexes, is treated separately.) Each of these two classes of indexes can be further dichotomized into two subgroups: those that optimize over slacks in the full dimensional space of inputs and outputs and those that optimize over slacks in a subspace. This taxonomy, along with regularity conditions on the generic mapping from production vectors to reference vectors and on the generic measure of distance between these two vectors, allows us to prove generic (possibility and impossibility) theorems on the properties of robust groups of indexes. These theorems subsume many of the axiomatic results in the literature as special cases.

223. Can a government initiate an industrial reform to improve efficiency?

Authors: Ying Chu NG* and Suthathip YAISAWARNG

Contact: ycng@hkbu.edu.hk, yaisawas@union.edu

Category: Express

Abstract: In 1990s, the Chinese Government implemented the enterprises and industrial reforms. Several former state-owned enterprises (SOEs) had been privatized. If the government could indeed stimulate an improvement in efficiency through its policy designs, we expect that SOEs that become privatized are more efficient than those non-privatized SOEs. These newfound ownership structures provide the enterprises with different ability to access investment funds, advanced technology and better management skills.

This paper examines the effect of the industrial reforms using non-privatized SOEs and privatized SOEs in 2004 and calculates input-oriented DEA meta-frontier efficiency scores. The meta-frontier method accounts for heterogeneity in technology across groups and enables us to test whether one group's technology dominates the other. A measure of additional input saving if these enterprises have access to the unrestricted meta-technology is also provided. Data construction issues and preliminary analysis of the Chinese pharmaceutical industry will be discussed. Our finding would be helpful for policy makers in formulating public policies to further enhance enterprise performance as well as industrial development.

224. Financial Development and Macroeconomic Efficiency in Transition Countries: A Conditional Nonparametric Frontier Analysis

Authors: Anastasia Ri* and LÃ©opold Simar

Contact: ri@unice.fr, leopold.simar@uclouvain.be

Category: Explain

Abstract: This paper contributes to a better understanding of the finance-growth nexus mechanism by investigating the impact of financial development on macroeconomic technical efficiency in 25 transition countries of Central and Eastern Europe and the former Soviet Union in the period from 1995 to 2009. We do so by using a new two-stage type approach to conditional nonparametric efficiency analysis developed by BÄƒdin, Dario and Simar (2012). This approach is very advantageous as it enables the analysis of the

impact of environmental factors on the production process avoiding the shortcomings of the traditional two-stage analysis.
The results show that a better financial development, measured by different indicators, is positively associated with a better macroeconomic productive efficiency in transition countries. However, the relationship appears to be non-linear. While examining a larger sample including developed EU countries along with transition economies, we find that credit to private sector does not affect macroeconomic efficiency any more when the domestic credit to private sector ratio is greater than 120% of GDP.

225. Is Aid Efficient?

Authors: Audrey Menard* and Laurent Weill

Contact: amenard@unistra.fr, laurent.weill@unistra.fr

Category: Young Researcher (YR)

Abstract: The aim of this paper is to investigate the relation between aid and macroeconomic efficiency. It contributes to the understanding of the puzzling aid-growth linkage. We apply stochastic frontier approach to estimate macroeconomic efficiency for a panel of 67 countries over the period 1985–2010. We use a GMM dynamic panel technique to analyse the relation between aid and macroeconomic efficiency. We find that aid fosters efficiency. This beneficial effect is in particular driven by multilateral aid. We also observe that the positive role of aid on efficiency is reduced in autocratic countries and in countries with higher macroeconomic instability.

226. Foreign investments, policy interventions and productivity change in the Indonesian banking sector

Authors: Dony Abdul Chalid and Marta Degl'Innocenti (*)

Contact: m.deglinnocenti@soton.ac.uk

Category: Express

Abstract: Over the last decades, the joint forces of globalization, competition, financial crisis and deregulation have changed the patterns of ownership in the banking industry in Indonesia. Following a period of massive intervention policies to reconstruct the banking industry after the economic crisis in 1997, the Indonesian banking sector has experienced a significant transformation with several nationalized and bailout banks that were privatized, and opening itself up more to foreign private capitals. Working from these considerations, this paper provides new empirical evidences on the effects of policy interventions and changes in ownership structure on productivity growth in the Indonesian banking industry, using a detailed dataset provided by the Indonesian Central Bank over the period 2000-2009. To compute the efficiency frontier and productivity change we employ the non-parametric model DEA, the Malmquist index of Total Factor Productivity (TFP) and the sub-sampling bootstrap techniques (Simar-Wilson, 2011). Our preliminary results indicate that the Indonesian banking industry saw a growth in productivity in the period analyzed mainly due foreign investments and the privatization of nationalized banks.

227. Regulatory Incentives to Water Losses Reduction: The case of England and Wales

Authors: Humberto Brea Solis* and Sergio Perelman and David S. Saal

Contact: ha.brea@ulg.ac.be, sergio.perelman@ulg.ac.be, d.s.saal@aston.ac.uk

Category: Explain

Abstract: In recent years, England and Wales have suffered droughts. This unusual situation has prompted the regulatory authorities to impose bans on superfluous uses of water. In addition, the possibility that water scarcity may increase with climate change has encouraged the search for a new regulatory

framework that provides incentives to value water more appropriately and reduce water losses. Our study therefore estimates the shadow price of water using a panel of data from reports published by the Office of Water Services. We use SFA, linear programming and Bayesian econometrics in order to validate our results and overcome the shortcomings of each method. Our estimations offer guidance for imposing penalties and provide an assessment of how the water distribution companies deal with water losses under the current regulatory regime. The approach used in this study follows the trend of treating a bad output as an input, which is more intuitive, if we consider the trade-off between a negative externality and lack of investment. The relevance of the study is quite general as water scarcity is a problem that will become more important with population growth, and the impact of climate change.

228. Value Efficiency Analysis for the FDH Model

Authors: Merja Halme*, Pekka Korhonen and Juha Eskelinen

Contact: merja.halme@aalto.fi

Category: Explain

Abstract: We have employed Value Efficiency Analysis (VEA) in numerous applications and met frequently with the phenomenon that Decision Makers wish to provide preference information related to existing not virtual units. This motivated us to develop the approach introduced that results in the Free Disposal Hull (FDH) model supplemented with preference information. We assume that a Decision Maker (DM) compares units using an implicitly known value function that reaches its maximum at his/her most preferred (efficient) unit. The unknown value function is assumed to be quasi-concave in outputs and quasi-convex in inputs. We also assume that a DM provides, on the basis of the implicitly known value function, preference information that leads to pairwise comparison information. The main purpose – as in the original VEA - is to approximate the distance of each unit from the contour of the value function passing through the most preferred unit. The approach is illustrated with examples. Finally, we describe a real application in which Value Efficiency Analysis was used to produce information for bank managers wishing to evaluate the performance of bank branches.

229. A multiple objective resource allocation based on DEA models

Authors: Mojtaba Ghiyasi

Contact: mog@sam.sdu.dk

Category: Young Researcher (YR)

Abstract: There are no usually unlimited resources, so in presence of limited resources and more demand for resources, the problem is how to allocate the resources to the different units. Assuming an organization or production system with some Decision Making Units (DMUs) that uses inputs to produce outputs, resource allocation problem deals with assigning a given amount of inputs among different DMUs. Data envelopment analysis (DEA) has been used as a robust tool for resource allocation problem from different perspectives. In many applications like banks, police stations, hospitals, universities, etc. there is manager on the top of the system who is interested in (i) maximizing the efficiency of each individual unit (ii) minimizing total input consumption or maximizing total output production at the same time. In some case quality might be important for the manager as well. This work proposes a centralized resource allocation model that minimizes the total amount of inputs that is capable to produce a certain amount of outputs. In current paper we are interested in some situations where the overall efficiency of all the units does not change as a consequence of resource allocation. Thus freezing the technical and allocative efficiencies,

230. Balancing Bias and Variance in Testing Hypotheses within Nonparametric Models of Production

Authors: Alois Kneip and Leopold Simar and Paul W. Wilson*

Contact: pww@clemson.edu

Category: Discuss

Abstract: Data envelopment analysis (DEA) and free disposal hull (FDH) estimators are widely used to estimate efficiencies of production units. In applications, practitioners use DEA estimators far more frequently than FDH estimators, and thereby assume, at least implicitly, that production sets are convex. Moreover, use of the constant returns to scale (CRS) version of the DEA estimator requires an assumption of CRS. While several bootstrap methods have been developed for making inference about the efficiencies of individual units, to date no methods for consistent testing or inference regarding hypotheses about model structure such as differences in mean efficiency across groups of producers, constant versus variable returns to scale (VRS), or convexity versus non-convexity of the production set have been available. This paper builds on central limit theorem results of Kneip et al. (2013) to provide additional theoretical results permitting consistent tests of model structure. Monte Carlo results illustrating the performance of the tests in terms of size and power are also presented. In addition, the VRS version of the DEA estimator is proved to attain the faster convergence rate of the CRS-DEA estimator under CRS.

232. Output mix efficiency: Are the Armed Forces doing the right things?

Authors: Torbjørn Hanson

Contact: tbh@ffi.no

Category: Express

Abstract: The public sector decision makers' ability to prioritize has a huge impact on the effectiveness of public service provision. Public services can take the form of final outputs demanded by consumers or as intermediate outputs to a process realizing higher goals of society. Decision makers choose a mix of intermediate outputs maximizing their preference value for public service outcomes. The effectiveness of decision makers' priority of output mix is evaluated by the measure of overall preference efficiency; decomposed into technical output efficiency and the mix efficiency of reallocating the use of resources reaching the optimal mix of outputs. We develop a model for evaluating effectiveness in the provision of defense outcomes. The military outcomes are modeled as fulfilling a set of scenarios. The link between military outputs and outcomes is captured by a list of required capacities and capabilities for each scenario. Preferences for defense objectives in Norway are estimated before the link between outcomes and the outputs of The Armed Forces is modeled. For a sample of 12 combat units producing different outputs we find overall preference inefficiency as a result of both technical inefficiency and output mix inefficiency.

233. CORPORATE R&D IN FOOD-PROCESSING INDUSTRY

Authors: Peter Voigt and Heinrich Hockmann*

Contact: peter.voigt.1@gmail.com,hockmann@iamo.de

Category: Express

Abstract: In this study corporate R&D investments will be investigated in order to analyse the role and impact of corporate R&D activities on firm performance in the food-processing industry and whether recently shifts towards higher R&D-intensity are observable. To this end, DEA techniques will be used on an unbalanced longitudinal dataset comprising micro level data of 358 food-

processing companies headquartered in one of the three country groups EU, US/CAN, and Japan, covering the period 1991–2009. The study quantifies technical inefficiency of individual firms as well as technological progress in the sector and is, in this regard, particularly focussing on the question whether R&D is evolving to be a driver of company trajectories in a sector commonly characterized as medium- or low-tech. In fact, evidence from the descriptive analyses indicates that the (formerly) rather as low-tech sector considered food-processing industries are in transition towards becoming medium-high-tech.
The preliminary results of this study suggest that policy emphasis should go beyond the high-tech sectors. Indeed, there are some medium- and eventually even low-tech sectors due to emerge as drivers in terms of leveraging productivity and innovativeness.

234. The Time Path of Startup Firm Success

Authors: Harold O. Fried* and Loren W. Tauer

Contact: friedh@union.edu, lwt1@cornell.edu

Category: Explain

Abstract: The Malmquest index is typically used to measure changes in the productivity of well-established firms, decomposed into technical and efficiency change components. In contrast, we apply Malmquist to a panel of heterogeneous firms that all started in 2004 and ranges from service to high technology firms. We model the typical startup as transforming total expenses and owner hours (a measure of commitment) into revenue. In our context, the technology component has a non-traditional interpretation. The technology component reveals the leading firms as usual, but this Malmquist application to firms that all started at the same time renders the interpretation of the pattern of the leading firms over time to be of particular interest, since it is driven by the nature of the industry the firm is in. A service startup (restaurant) is expected to generate revenue faster than a high tech, engineering startup. The specific pattern is an empirical question. This pattern serves as a guide to investors and public policy makers as they strive to understand different industries. Investors need to know when to pull the plug on an investment; policy makers need to know how long to subsidize a startup.

236. A nonparametric method to estimate a technical change effect on marginal abatement costs of U.S. coal power plants

Authors: Maethee Mekaroonreung and Andrew L. Johnson

Contact: ajohnson@tamu.edu

Category: Discuss

Abstract: The literature usually assumes that technical change reduces marginal abatement cost; however, recent results suggest that precisely the opposite occurs. This paper proposes a nonparametric method to determine the effect of technical change on marginal abatement cost. The method decomposes NOx marginal abatement cost changes in 2000-2004 and in 2004-2008 for 325 boilers operating in 134 U.S. bituminous coal power plant boilers into technical and non-technical change effects. We find that technical change reduces the NOx marginal cost about 28.3 percent in 2000-2004 and 26.5 percent in 2004-2008. However, more stringent regulations enacted when the NOx budget program result in lower NOx emission levels as plant operators install more advanced NOx abatement equipment which in turn cause an overall increase in marginal abatement cost.

237. CONDEFF: A Toolbox for Conditional Efficiency Measurement

Authors: Luiza Badin* and Cinzia Daraio and Leopold Simar

Contact: luiza.badin@csie.ase.ro, daraio@dis.uniroma1.it, leopold.simar@uclouvain.be

Category: Explain

Abstract: Recent theoretical developments and empirical applications have shown the usefulness of conditional efficiency models for comparing the performance of DMUs facing different external-environmental conditions. Nonparametric conditional efficiency models allow for a complete and general handling of heterogeneity, without relying on strong parametric or semi-parametric assumptions, many times unrealistic.
Latest contributions in this area propose a general two-stage approach, which does not rely on the separability condition (the input-output space is independent from the external-environmental factors that can influence only the distance of DMUs towards the efficient frontier and not the efficient frontier itself). Up to now, none of the existing software available has implemented conditional efficiency scores. We fill this gap by proposing in this paper a toolbox which implements the most updated research on conditional efficiency analysis. It is suitable for applied researchers in order to perform the computations and obtain rigorous empirical evidence. Some illustrations are provided on simulated and real datasets. The comprehensive CONDEFF Toolbox will be developed in Matlab and in Octave and will be freely available.

238. A BAM extended measure for the CRS partially bounded additive model

Authors: Jesus T. Pastor* and Juan Aparicio and Javier Alcaraz and Fernando Vidal and Diego Pastor

Contact: j.aparicio@umh.es

Category: Express

Abstract: Additive measures in Data Envelopment Analysis (DEA) have only been used under Variable Returns to Scale (VRS) until Cooper, Pastor, Borras, Aparicio and Pastor (2011, Journal of Productivity Analysis) introduced the Constant Returns to Scale (CRS) range bounded additive model. Additive-type measures have the advantage of taking into account all sources of technical inefficiency (slacks) in contrast to the usual radial and directional measures. However, the CRS range bounded additive model assumes that all the variables of the problem, inputs and outputs, are bounded (e.g. rates and percentages). In this paper, we extend the use of CRS bounded additive models allowing considering a more general setting where some variables may be naturally bounded and some others do not.

239. Dynamic Productivity Growth and Investment Spikes in the Spanish Meat Industry

Authors: Magdalena Kapelko* and Alfons Oude Lansink and Spiro Stefanou

Contact: magdalena.kapelko@ue.wroc.pl, Alfons.OudeLansink@wur.nl, ttc@psu.edu

Category: Express

Abstract: The economics literature on efficiency and productivity has recently proposed dynamic Luenberger productivity growth measures based on the dynamic directional distance function. Dynamic productivity measures, unlike static measures, account for the costs of investments in quasi-fixed inputs to their long-run equilibrium levels.
Inspection of micro data often reveals a pattern of years with substantial investments (investment spikes) followed by years with no or small investments. In case investments are installing new technologies, investment spikes may result in an initial drop of productivity growth, followed by years in which the firm improves its productivity by learning by doing. In the absence of a clear theory of the impact of investment spikes on productivity,

the exact impact of investment spikes on productivity growth is an empirical question.
This paper estimates dynamic Luenberger productivity growth and decomposes it into the contributions of technical efficiency change, scale and technical change. Next, dynamic productivity growth and its components are regressed on investment spike variables.
The empirical application uses firm level data on the Spanish meat processing industry over the period 2001-2010.

240. School District Efficiency vs Equity: Application to Texas Schools

Authors: S. Grosskopf* and K. Hayes and L. Taylor and William Weber

Contact: Shawna.grosskopf@orst.edu

Category: Explain

Abstract: In an earlier effort we model school districts as effectively networks in which central administration determines how much of the school district budget to allocate to district campuses and how much to keep to cover overhead or shared services. The goal of the earlier study was to endogenize the allocation of the central resources across individual schools in a way that maximizes the performance of the sum of the school district schools. This was essentially a large DEA type problem which allows reallocation across individual schools.
Here we extend that work and employ the network model to solve for the allocation in which equity is an objective. We operationalize equity by presuming that school districts seek to equalize output (per pupil) across all schools, rather than seeking only to maximize total output of the district as a whole. This additional objective is then applied to the same sample of Texas public schools and the resulting allocations and aggregate performance are compared. All of the data for this analysis come from the Texas Education Agency (TEA) and Texas' State Board for Educator Certification (SBEC). This analysis focuses on urban, public schools in Texas during the 2004-05 school year.

Fare, R. and

241. Multivariate decomposition of measured agricultural yield difference

Authors: Simone Pieralli

Contact: pierallisubmitted@gmail.com

Category: Explain

Abstract: The typical measure of productivity used in the empirical literature on land size and productivity is yield or the natural logarithm of yield. Yield is easily recognized as a partial productivity measure. This is a valid measure of partial productivity but not of total productivity. In this study we address directly this problem.
This paper addresses this question directly by taking into account a multi-output, multi-input production technology using nonparametric methods
without a-priori returns to scale or e
fficiency assumptions. In particular,
for Kenyan households, we decompose an index of yield, a crude measure of productivity difference, into components attributable to (1) e
fficiency difference, to (2) soil quality, to (3) land size, and to (4) other inputs
and outputs. Methods already used by F□aere, Grosskopf, Norris, and Zhang (1994)
and Kumar and Russell (2002) to analyze changes in macroeconomic context are

here adapted and generalized to the multi-output case study of Kenyan households.

243. Accounting for Water Pollution in US Agricultural Productivity: a Parametric Approach

Authors: Tshepelayi Kabata* and Richard Nehring

Contact: tshepelayikabata06@fulbrightmail.org

Category: Young Researcher (YR)

Abstract: Agriculture has been a very successful sector of the U.S. economy in terms of productivity growth over the last six decades. Over this period, productivity increased annually by nearly 2% reflected by a growth in output of 1.88 % a decline in inputs of 0.06 %(Ahearn, et al. 1998). But, most studies ignore byproducts and environmental impacts. The few studies that account for water contamination have essentially used non-parametric approaches (Ball et al 2004, 2001). This paper aims at accounting for water pollution in US agricultural productivity using a parametric and stochastic distance function and contrasting the results with those obtained earlier from nonparametric approaches. To reach this objective this study uses a parametric and stochastic hyperbolic distance function developed by Cuesta, Lovell and Zofio (2009) Preliminary results suggest an even slower growth compared to the 0.98% estimated previously by Ball et al. 2004 and the 2% unadjusted growth mentioned above. Further results reveal an average hyperbolic productive efficiency of 0.9263 suggesting room that on average, states could expand desirable outputs by 8% and contract inputs and water pollution by 7% by emulating the most efficient states.

244. Modelling Scope Economies between Farm Enterprises and Biodiversity Outputs in the Agricultural Sector in England

Authors: Ian Bateman and Euan Fleming and David Hadley* and Garth Holloway

Contact: dhadley@une.edu.au

Category: Express

Abstract: Interest has been growing in the nature of synergies in agroecosystems, prompted in part by growing concerns about the effects of environmental degradation on agricultural productivity and interrelations between agricultural outputs and ecosystem outputs. Most productivity analyses focus on technology, technical inefficiency and scale effects on productivity; yet scope economies derived from synergies can also have substantial effects that are likely to increase in the future. Scope economies take on special importance when farms diversify to halt declining biodiversity and other forms of environmental degradation. We present the preliminary results of an empirical case study based on panel data on farms in England that uses the estimation of scope economies to explore the extent of trade-offs between farm outputs and the production of countryside assets - in this instance biodiversity, in the form of the size and diversity of farmland bird populations.

245. Estimation and Testing of Stochastic Frontier Models using Variational Bayes

Authors: Gholamreza Hajargasht* and William E. Griffiths

Contact: har@unimelb.edu.au, b.griffiths@unimelb.edu.au

Category: Explain

Abstract: We show how a wide range of stochastic frontier models can be estimated relatively easily using variational Bayes. We derive posterior distributions and point estimates for (a) time invariant models with several alternative inefficiency distributions, (b) models with time varying effects, (c) models incorporating environmental effects, and (d) models with more flexible forms

for the regression function and error terms.
Despite the abundance of stochastic frontier models, there have been few attempts to test them against each other, probably due to the difficulties of such testings. One advantage of the variational Bayes approximation is that it facilitates the computation of marginal likelihoods that can be used to compare models. We apply this idea to test stochastic frontier models with different inefficiency distributions. Estimation and testing of some of these models is illustrated using three data examples.

246. The innovation efficiency of German regions

Authors: Tom Broekel and Nicky Rogge* and Thomas Brenner

Contact: Nicky.rogge@hubrussel.be

Category: Express

Abstract: In the literature on regional innovation processes it is often crucial to distinguish between highly innovative and less innovative regions. Given such differentiation the reasons for a region belonging to the one or to the other category can be analyzed. Fritsch (2000) introduced the concept of regional innovation efficiency whereby regions are compared with respect to their firms' abilities to transform certain input factors into innovative output. Brenner & Broekel (2011) argue that the empirical estimation of meaningful regional innovation efficiency measures is far from being easy. The paper proposes a particular version of the DEA-method (i.e., the Benefit of the Doubt model) to construct an economy-wide regional innovation efficiency measure that explicitly takes into account inter-regional variations in regions' industrial structure. We apply this method to the 270 German labor market regions for which we estimate innovation efficiency measures for multiple years.

247. Output Interdependency of Football Clubs in a Network DEA model

Authors: Thanasis Bouzidis* and Giannis Karagiannis

Contact: bouzidis_thanasis@hotmail.gr, karagian@uom.gr

Category: Explain

Abstract: In this paper, we adjust the Network DEA model of Lewis et al. (2009) for output interdependency in order to measure the overall efficiency of Greek football clubs participated in the league season 2005-06. The league performance (production process) of a team consists of three internal activities (sub-processes) that function together aiming at the best final ranking. Specifically, the on-field (offensive and defensive) operations consume players¢ skills to provide goals scored and prevention of goals conceded that are used as inputs in the athletic activity, which produces accumulated points. This structure can be sufficiently evaluated by Network DEA that has never been applied in soccer, which is strictly competitive in the sense that anything won by a team, it is lost by all others. This parameter had been neglected by network-type DEA models that being unable to account for output interdependency yielded unrealistic efficient frontiers. Our contribution is to adapt the evaluation of both league performance and internal activities of teams to the procedure suggested by Collier et al. (2011) for equal output reduction that corrects the downward biased efficiency scores taking account of output interdependency in DEA.

248. Efficiency, Returns to Scale and Public Infrastructures: The Aigner and Chu Model Revisited

Authors: Pierre Ouellette and St¨¦phane Vigeant and Linjia Zhang*

Contact: ouellette.pierre@uqam.ca,stephane.vigeant@univ-lille1.fr, linjia.zhang1984@gmail.com

Category: Discuss

Abstract: Public infrastructures play a crucial role in the operation of firms and traditional road infrastructure is very important for the performance of transportation firms. As a consequence, the government invests in roads to foster economic activity. In this paper, we try to answer the question whether the stock of public infrastructure is enough. Returns to scale measurement are the key to answer this question. We propose to implement a version of the Aigner and Chu model in the dual space in order to measure returns to scale and efficiency. Despite the fact that it is a deterministic cost frontier model, it has been shown that the procedure is a maximum likelihood estimator under some conditions. We show that the estimator is consistent and we also propose a method to conduct statistical inference on the estimated parameters of the model. By examining the relationship between a set of infrastructure indicators and the economic performance of French transportation firms, we show that infrastructures are responsible for increasing returns to scale in the transportation industry and that these returns to scale are significantly different than one. The results will be used to extract some policy considerations for the French authority.

249. Fiscal decentralisation and regional efficiency of public service delivery: a comparison between China and the UK

Authors: Minyan Zhu* and Antonio Peyrache

Contact: minyan.zhu@uea.ac.uk, a.peyrache@uq.edu.au

Category: Express

Abstract: We consider government efficiency in delivering public services for UK and China by using a production model where one input (government expenditure at regional level) produces outputs in main service areas including housing, education, health services, transport, social benefits and employment. We use two regional-level datasets separately for the UK and China from 2000 to 2010.

The reason for choosing these two countries is that they show very different levels of fiscal centralisation/decentralisation.

In the UK local authorities, expenditure accounts for around a quarter of total government expenditure and public services in each region are mainly funded and delivered by the central government. On the contrary in China, local governments (financed mainly by local tax revenue) are the key provider of public services in each region.

We compare the dispersion (and the distribution) of government efficiency scores at regional level across the two countries. An analysis of the potential overall efficiency gains that could be realised through re-allocation of government expenditures across regions is also conducted. The aim of the analysis is to identify the pattern and main sources of inefficiency in the two systems over time.

250. Firm heterogeneity and divergent patterns of productivity change in European slaughtering and meat processing companies

Authors: Jonathan Holtkamp* and Bernhard Brümmer

Contact: jholtka@gwdg.de

Category: Discuss

Abstract: The European meat industry is highly export-oriented, and characterized by dynamic firm growth. However, at an aggregate level TFP change seems to be modest (USDA 2011; Kapelko et al. 2012). Although relevant at all stages of the meat supply chain, efficiency and productivity studies can hardly be found.

The most appropriate scale for gaining insights on the dynamics at this stage of the supply chain is the firm level. An empirical challenge might be caused by heterogeneity. Starting from the frequently used ‘true’ fixed effects model,

Wang & Ho (2010) propose an extension to overcome the incidental parameters problem. In addition to the standard results of such an approach, the availability of the individual effects allows a more refined economic interpretation of the industry dynamics.
In our study, we use an unbalanced panel of meat firms in the EU which have different specializations. We apply the fixed effects SF model proposed by Wang & Ho (2010) and estimate a translog production frontier for each type of specialization. Our results reveal that firms are working efficiently but their growth paths are highly divergent. Furthermore, we explore how the individual firm effect is related to productivity change.

251. On the Sources of Heterogeneity in Banking Efficiency Literature

Authors: Francesco Aiello* and Graziella Bonanno

Contact: francesco.aiello@unical.it,graziella.bonanno@unical.it

Category: Discuss

Abstract: The evaluation of bank efficiency has received a growing attention by economists during 90s'. This is mainly due to national regulations of banking industries that have been deeply modified in order to increase the efficiency on how banks should work. This sector has become, therefore, an interesting case-study to evaluate the effectiveness of new norms and, in this respect, it also suits well for applying all the estimation methods proposed by scholars over time. One lesson learnt from studying this subject is the difficulty in understanding the main sources of variability in the estimated efficiency scores. This paper fills this gap by examining 156 efficiency scores and applying a MA. We restrict our sample to the papers analyzing banks' costs and profits efficiency. After controlling for many factors, we demonstrate that bank-efficiency does not depend on the method used to estimate the frontier. We conclude that the most influential source of variability in efficiency banking literature comes from comparing the intermediation and the production approaches. The provided evidence seems to be a good reference for future research.

252. Input-oriented enhanced efficiency measures and Malmquist Indexes: An application to Japanese Banking

Authors: Hirofumi Fukuyama* and Kazuyuki Sekitani

Contact: fukuyama@fukuoka-u.ac.jp

Category: Express

Abstract: Fare and Lovell (1978) proposed three fundamental axioms (FL axioms) for an input-oriented efficiency measure, which are indication, strong monotonicity and homogeneity. Bol (1986) showed that there does not exist any measure that satisfies the FL axioms for all general class of technologies. Taking this fact into account, Dmitruk and Koshevoy (DK, 1991) characterized a measure that fulfills the FL axioms by introducing quasi-requirement sets. Russell (1985, 1990), Hougaard and Keiding (1998), and Christensen et al. (1999) further studied axiomatic characterizations of efficiency measures. Recently, Russell and Schworm (2009) showed that standard DEA measures do not satisfy one or more of the FL axioms. Under the positive observed data assumption, Fukuyama and Sekitani (2012) developed a DEA measure, called eCCR (enhanced Charnes-Cooper-Rhodes 1978), based on the DK criterion. The eCCR measure satisfies not only the FL axioms but also units invariance and continuity. Preserving the desired features of eCCR, the present paper develops input-oriented Malmquist indexes, whose standard versions are presented by Fare et al. (1994), and provides an empirical application to Japanese banks.

253. Measures of productivity change: Which outcome do you want?

Authors: Mark Vancauteren and Erik Veldhuizen and Bert M. Balk*

Contact: bbalk@rsm.nl

Category: Explain

Abstract: In this paper we discuss a number of choices that play a role in the construction of multi-factor productivity (MFP) measures. More specifically, we look at five input-output models, respectively based on gross output, gross and net value added, and gross and net cash flow. These models are extended with variations in the construction of capital input cost, which in turn lead to different profit concepts. In the net-value-added and net-cash-flow based models, depreciation, unexpected asset revaluation, and taxes less subsidies are treated as intermediate input cost categories. With respect to the measurement of capital input cost, we pay specific attention to the role of endogenous versus exogenous interest rates, the treatment of unexpected holding gains/losses, and the utilization ratio of capital. To test the sensitivity of MFP growth, each of the models is applied to input-output data for Dutch industries over the years 1995-2008.

254. Dynamic Efficiency under Uncertainty: An Application to German Dairy Farms

Authors: Christina Wagner* and Silke Huettel and Rashmi Narayana and Martin Odening

Contact: chr.goetze@gmx.de

Category: Young Researcher (YR)

Abstract: The existing literature on dynamic efficiency is deterministic and ignores uncertainty when deriving dynamic efficiency measures, even though it is known that uncertainty affects the optimal adjustment path and the optimal use of quasi-fixed factors. Here, we contribute to closing this gap by developing a model that takes dynamic efficiency measurement and optimal investment under uncertainty jointly into consideration. We apply this model to German farm-level panel data to investigate whether West German dairy farms use their variable and quasi-fixed factors in a technically and allocative efficient way in the long run, and to explore the role of uncertainty within the optimal factor allocation process. We find empirical evidence for the importance of considering uncertainty when deriving (dynamic) efficiency measures: neglecting uncertainty within the estimation procedure will overestimate the average inefficiency score. This is not only interesting from an academic point of view; it has further implications for the analysis of the relative performance of specific farm types like cash crop or other livestock farms.

255. Bayesian Analysis of Dynamic Effects in Inefficiency: Evidence from the Colombian Banking Sector

Authors: Jorge E. Galan* and Helena Veiga and Michael P. Wiper

Contact: jegalan@est-econ.uc3m.es, mhveiga@est-econ.uc3m.es, mwiper@est-econ.uc3m.es

Category: Young Researcher (YR)

Abstract: Firms face a continuous process of technological and environmental changes that implies making managerial decisions in a dynamic context. However, costs and other constraints prevent firms from making instant adjustments towards optimal conditions and may cause inefficiency to be persistent in time. In this work, we propose a novel specification that models the dynamics of inefficiency through an autoregressive component in the parameters of the one-sided error distribution and allows inefficiency persistence to be firm specific. This permits us to distinguish dynamic effects from inefficiency heterogeneity and to capture differences in the adjustment

process among firms. The new model is fitted to a ten year sample of Colombian banks and the results are compared to those obtained with dynamic stochastic frontier models in the literature. Our findings suggest that separating the dynamics of inefficiency from heterogeneity factors improves model fit and lets us identify the effects of firm specific characteristics on efficiency. In particular, Colombian banks present high inefficiency persistence and mergers and foreign capital acquisitions are found to have an important effect on increasing efficiency during the sample period.

256. Accrual accounting - A driver of performance?

Authors: Dennis Hilgers and Hannes Lampe*

Contact: dennis.hilgers@jku.at, hannes.lampe@wiso.uni-hamburg.de

Category: Discuss

Abstract: The stressed financial situation in the public sector and the resulting need of municipalities for austerity is omnipresent. One instrument to enable this is the implementation of accrual accounting in local governments. Due to missing aggregate targets of performance in the public sector, especially in municipalities, maximizing the efficiency moves into focus. We therefore analyze the cost- and productive- efficiency of German local governments in the state of North Rhine-Westphalia using a stochastic frontier approach. Furthermore we account for exogenous influences when estimating municipalities' efficiency scores. We implement public financial management factors, especially the adoption of accrual accounting and calculate their influence on municipalities' performance, defined as efficiency. Results show that an increase of productive efficiency as a consequence of the implementation of accrual accounting is achieved. Furthermore the influence of a municipality's immigration and its debt are estimated as well as results of earlier studies, implying other influential variables, are tested.

257. Measuring and Decomposing the Productivity Impact of Mergers in the Japanese Water Industry

Authors: Michael Zschille* and David S. Saal and Pablo Arocena and Takuya Urakami

Contact: mzschille@diw.de, d.s.saal@aston.ac.uk, pablo@unavarra.es, pushang@gmail.com

Category: Discuss

Abstract: In response to local government consolidation, the Japanese water supply industry faced a mandatory consolidation wave in the years after 2003. In order to analyse the productivity impacts of these mergers we employ conditional efficiency Data Envelopment Analysis to analyse a panel of 1500 large predecessor water supply systems in 2003 and 1143 post consolidation observations in 2009. As standard decompositions of the Malmquist productivity growth index yield biased estimates of technical change and efficiency change in the presence of a merger, the paper first proposes an alternative decomposition of the Malmquist productivity growth index that is appropriate in the presence of mergers. However, in the absence of mergers, the proposed decomposition collapses back to the standard decompositions. The results suggest a considerable impact of our alternative approach on the resulting productivity decompositions, and also suggest that the estimated productivity benefits of mergers are reduced when differences in operating environments are controlled for with conditional efficiency DEA.

258. Measuring Cost Efficiency in West European Banking: A New Approach to a Metafrontier Cost Function

Authors: Tai-Hsin Huang and Chi-Chuan Lee*

Contact: 95352502@nccu.edu.tw, mailcc7@gmail.com

Category: Express

Abstract: This paper aims to provide new insights of cost efficiency with a newly developed metafrontier Fourier flexible cost function based on a stochastic frontier framework for banking industries across 10 West European nations during the period 1996-2010. Unlike Battese et al. (2004) and Oâ€™Donnell et al. (2008), SFA model is formulated and applied to obtain the estimates of the metafrontier. Furthermore, the technology gap can be specified as a function of some exogenous variables to take account of group-specific environmental differences. Empirical results show that both TGR and MCE are underestimated by using the programming techniques. The TGR and MCE exhibit a gradual upward trend during 1996 to 2000 and then accompanied by a downward trend. This suggests that a more integrated financial market induced by financial deregulations is indeed able to improve banking efficiency. Finally, Smaller banks tend to be more cost efficient than larger ones. Higher profitability banks and conservative banks are related to greater efficiency.

259. Enhancing the productivity measurement of hospitals

Authors: Andreas J. Reuschl* and Ricarda B. Bouncken

Contact: andreas.reuschl@uni-bayreuth.de, bouncken@uni-bayreuth.de

Category: Explain

Abstract: While parametric and non-parametric productivity measurement approaches are continuously used for hospitals, the underlying TFP concept is neglected in the current research. However, a simple application of industry specific productivity ratios falls far short of measuring real service productivity. We argue that it is inevitable to take a step back and to focus research on the development of an adequate TFP measurement for hospitals. This paper presents a TFP measurement for hospitals. Based on a literature review, the requirements are constituted and a method is developed, considering specific attributes of hospital services e.g. the process orientation and the importance of quality delivered. By employing compulsory documented quality, performance, and structure indicators, the method facilitates nationwide hospital comparisons on process, organization or state level. Moreover, a strategic benchmarking matrix is presented, allowing for direct interpretation of the results and the recommendation of productivity enhancing actions. The presented method is illustrated by a hospital benchmarking at the German state level. The paper concludes with a critical evaluation and suggestions for further research on hospital productivity.

260. Implications of variable reduction for DEA in bank branch context

Authors: Juha Eskelinen*

Contact: juha.p.eskelinen@aalto.fi

Category: Explain

Abstract: DEA is a common technique for bank branch efficiency evaluations. If the number of branches is small compared to number of services produced and resources needed the discrimination power of “value free” DEA suffers. In such a case the results may not be useful for the purpose. Usually the analyst needs to select a representative set of inputs and outputs, aggregate them or introduce weight restrictions to improve discrimination. Several statistical approaches have been introduced if required expert knowledge is not available. Two approaches, variable reduction of Jenkins and Anderson and PCA-DEA, were compared for efficiency evaluation of the branches of Helsinki OP Bank. Even though these approaches assume variables initially equal, in practice they give very different importance to services bank branches provide. Understanding the implications of the approaches for the specific case and purpose is vital for the organizational acceptance of the application.

261. Measuring profit and materials balance-based environmental

efficiency with directional distance functions

Authors: Jef Van Meensel* and Ludwig Lauwers

Contact: jef.vanmeensel@ilvo.vlaanderen.be, ludwig.lauwers@ilvo.vlaanderen.be

Category: Express

Abstract: Incorporating pollution as additional input or output into standard production efficiency models violates the law of mass conservation. Considering the materials balance (MB) outcome similar to the economic outcome deals with this problem and opens perspectives for economic-environmental trade-off analysis. Empirical evidence, however, shows that transparent trade-off analysis gets vanished when multiple inputs or outputs are considered. Possible reasons are leverage effects between changes in cost and mass input minimization and final economic and environmental outcomes, wrongly-defined frontiers and large differences between technical and allocative efficiencies.

The aim of the paper is to derive profit and MB-based environmental efficiency measures with directional distance functions. We estimate a production frontier that complies with the Baumgartner conditions, which set upper bounds for marginal and average products of material resource inputs. We derive a Nerlovian type of MB-adjusted environmental efficiency for 60 typical pig-finishing farms, with marketable pig as output and feed, piglets, pig places, labor and other costs as inputs. We introduce alternative ways of measuring economic-environmental trade-offs.

262. To the Usage of DSGE Models on Productivity Analyses

Authors: Kristyna Vltavska and Eva Javorska and Jan Zouhar*

Contact: kristyna.vltavska@vse.cz

Category: Express

Abstract: Dynamic stochastic general equilibrium models (DSGE models) present the last stage of econometric development and therefore the discussion about the usage of DSGE models is quite vivid. This paper presents DSGE models as a tool of economic analyses. The aim of this paper is to examine the possible use of DSGE models beyond their typical application areas, for example in the national accounts of the Czech Republic. We concentrate on the usage of DSGE models in the input-output tables and derived indicators such as labour productivity and total factor productivity which allow us to estimate the effects of partial changes in economy. As an example we are using DSGE models to investigate what the change of taxes does with the input-output tables and – via the change – with labour productivity and total factor productivity in the Czech Republic.

263. Parameterizing Input Distance Functions: Does the Choice of the Functional Form Matter?

Authors: Rolf Färe and Michael Vardanyan*

Contact: m.vardanyan@ieseg.fr

Category: Express

Abstract: Two recent simulation studies comparing the ability of distance functions to represent production technology have concluded that quadratic directional output distance function [Chambers et al. (1998)] fares better than translog Shephard (1970) output distance function. Färe et al. (2010) performed this comparison in the quantity space, whereas Chambers et al. (2013) did it in the price space. As a possible explanation, both papers mention translog distance function's intrinsic propensity to produce frontier estimates that possess convex curvature—a problem when modeling output distance functions, but a useful feature for parameterizing input distance functions [Shephard (1953)]. In this paper we perform a series of Monte Carlo

experiments to compare a quadratic directional input distance function to a translog Shephard input distance function in terms of their ability to approximate different families of true production technologies. We rely on the first- and second-order derivatives of these functions in order to determine which of them performs best.

264. Identifying suspicious efficient units in DEA models

Authors: V. E. Krivonozhko and F. R. Forsund and A. V. Lychev*

Contact: Lytchev@mail.ru

Category: Explain

Abstract: In this paper, we propose tools for discovering units which may cause inadequate results in the DEA models. It is shown that terminal units constitute “suspicious” points in the first place. We also propose how to deal with inadequacies in the DEA models with the help of incorporating artificial units and rays interactively on the screen of the computer by experts into some BCC model. It is shown by establishing theorems how terminal units can be identified and how different definitions of suspicious units, which were introduced by some other authors, are related. Our theoretical results are based on some theorems and illustrated by a number of graphical examples.

265. Optimal Directions for Directional Distance Functions: An Exploration of Potential Reductions of Greenhouse Gases

Authors: Benjamin Hampf* and Jens J. Krüger

Contact: hampf@vwl.tu-darmstadt.de

Category: Express

Abstract: In this paper we address the problem of selecting optimal directions for directional distance functions (DDF) endogenously. We propose a static approach that extends the model by Färe et al. (2011) to the case of multiple inputs as well as multiple good and bad outputs. Therefore, we focus on the DDF as proposed by Chung et al. (1997) for an efficiency analysis accounting for environmental factors. Moreover, we present a dynamic approach that identifies the direction of shifts in the frontier between two periods caused by innovating decision making units (DMUs). For each non-innovating DMU the direction of the closest innovator is selected. Both approaches are applied to an efficiency analysis of major greenhouse gas emitting countries. Comparing the results for the static approach with those for a given grid of directional vectors shows that the endogenous optimization of the directions can reveal further potentials to increase efficiency and therefore to reduce the emissions. The dynamic approach shows whether the innovating countries have focused on technological enhancements with regard to the production of good or the abatement of bad outputs or on a combination of both targets.

266. On comparison of OECD Better Life Index and the DEA approach

Authors: V. E. Krivonozhko* and A. A. Piskunov and A. V. Lychev

Contact: KrivonozhkoVE@mail.ru

Category: Explain

Abstract: Your Better Life Index, developed by the OECD, enables experts to compare well-being across 36 countries, using 11 dimensions, by giving their own weight to each of the dimensions. However, Your Better Life Index is a rating function from ratios. We have shown in our previous papers that, using a rating function as the performance assessment, experts may obtain a distorted image of the production units’ behavior. Moreover, the following assertions can be substantiated for the rating functions. Proposition 1. Rating functions are insensitive to large errors in some original data. Proposition 2. Some small errors in certain ratios of the rating function may increase the value of the function significantly. Our theoretical results on comparison of

the Your Better Life Index and the DEA approach are illustrated by graphical examples and documented by computational experiments.

267. The effect of competition, separation and ownership on efficiency: evidence from European TLC sector

Authors: Clementina Bruno* and Alessandro Manello

Contact: clementina.bruno@libero.it, a.manello@ceris.cnr.it

Category: Young Researcher (YR)

Abstract: The European fixed telecom (TLC) sector has been involved, during the last years, in major reforms aimed at fostering competition, whose potential effects on firm efficiency have been rarely considered in the empirical literature. Moreover, the technological progress has introduced more advanced services, such as the broadband, which are becoming the core of the industry thanks to their potential expansion.
Our article proposes an efficiency evaluation of European fixed telecom operators, implemented in a Directional Distance Function (DDF) framework, which allows to treat asymmetrically outputs characterized by different degree of desirability: broadband lines (a market still in expansion, related to a welfare-improving service) and narrowband lines (an almost saturated market, corresponding to a “minimal” TLC service in developed countries). Finally, applying a battery of parametric and non-parametric tests, we investigate the effect on technical efficiency of set of variables representing the competitive environment, the ownership structure and the degree of vertical separation

268. Characterizing the evolution of investors’ preferences by using an adapted approach with DEA for performance measurement of financial assets

Authors: Albane C. TARNAUD* and Hervé LELEU and David CRAINICH

Contact: a.tarnaud@ieseg.fr

Category: Explain

Abstract: In a forthcoming article "Data Envelopment Analysis applied to the performance measurement of financial assets" we explore the extent to which Data Envelopment Analysis (DEA) can be used to measure the performance of financial assets and propose a methodology adapted from the approach used in the field of production. In this second paper we intend to characterize the preferences of mutual or hedge funds managers and the evolution of these preferences before and after the financial turmoil of 2008, its subsequent regulation measures on the financial markets and call for prudence from the providers of funds. One main contribution of our work is to include various preferences for variability, skewness or kurtosis in the analysis and build a frontier that does not exclude any kind of preference for the chosen risk measures at various orders.

269. International R&D spillovers, TFP and Institutional distance

Authors: Dolores Añón Higón* and Miguel Manjón

Contact: madoahi@uv.es

Category: Discuss

Abstract: This paper analyses the extent to which domestic fi
rms can reap productivity gains
from R&D spillovers due to the innovation activities of foreign affi
liates in the same industry. Foreign R&D spillovers are measured as a
weighted sum of the R&D
conducted by foreign a
ffiliates, where the weights reflect the institutional distance between the

home country of the a
ffiliates and the host country. Results from a sample of UK innovative fi
rms show the presence of positive FDI-transmitted R&D spillovers. Our findings suggest that UK fi
rms benefi
t more from the innovation conducted by institutionally close foreign enterprises. Moreover, UK MNCs seem to benefi
t more from foreign R&D spillovers than local
firms, which may imply that the internationalization of fi
rms impact on their absorptive capacity.

270. Scale and cost efficiency of Dutch local administrative public services

Authors: Bart L. van Hulst * and Hans de Groot

Contact: b.l.vanhulst@tudelft.nl

Category: Express

Abstract: Efficiency of organizations and its determinants is a key topic in public administration research. Economies of scale are an important instrument for policy makers to reduce costs, while maintaining public service levels. However two pitfalls are often neglected. First, economies of scale are not an inexhaustible source of cost savings, eventually diseconomies of scale occur. Secondly, economies of scale are often obtained by merging,causing short or mid-term cost inefficiencies. This paper uses stochastic frontier analysis to estimate a cost function for local administrative public services. From the cost function we derive scale-effects and the cost efficiency. The results indicate economies of scale for small municipalities (< 17,000 inhabitants) and diseconomies of scale for large cities (> 65,000 inhabitants). We simulated cost savings for both small municipalities as well for large cities. We find savings of 1.5% by consolidating small municipalities and 12.9% by splitting the administration of big cities. Analysis of the cost efficiency reveals that recently merged municipalities have on average significant lower cost efficiency. It takes about ten years before the negative effects of merging on the cost efficiency extinct.

271. EVALUATION AND RE-DESIGN OF PUBLIC EDUCATION NETWORKS: A CENTRALIZED ANALYSIS

Authors: López-Torres, Laura* and Prior, Diego

Contact: Laura.Lopez.Torres@uab.es, Diego.Prior@uab.es

Category: Young Researcher (YR)

Abstract: The vast number of studies on school efficiency confirms that it is a topic of interest for researchers. While existing literature has focused on determining the features of educational centers and environmental factors that influence students' results, this study aimed to assess and re-design a sample of schools in the public education network in Catalonia (north-eastern Spain) based on post-New Public Management, through the use of a specific non-parametric frontier technique. This stream has received less attention in the research and evaluates the overall efficiency of a set of units controlled by a central authority. The approach proposed involves the creation of an internal performance-based scheme that encourages an effective level of accountability and efficiency for state schools. In this regard, three theoretical models are proposed in order to improve the efficiency of the network. The results indicate the network could be improved to redistribute optimally the resources devoted to education. The study provides useful information for accountability and decision making, regarding the implementation of improvement programs in state schools. Therefore it uses a pioneering theoretical approach to analyze school efficiency.

272. The value of irrigation in the High Plains aquifer: Spatial Effects

Authors: Federico Garcia Suarez

Contact: fgarcias@huskers.unl.edu

Category: Young Researcher (YR)

Abstract: The High Plains aquifer provides water for crop production among other uses in a vast region of the U.S. Midwest. In some areas the water table has dropped to levels that make agricultural production economically infeasible. Depletion of the aquifer might impose a threat to food security as this region contributes largely to national and international markets. Among other crops 15% of total US wheat, 24% cotton, 14% corn and 31% sorghum were grown in this region in 2008. The use value of the water provided by the aquifer to agricultural producers is an important piece of information needed for optimal management of this resource. A production function for agriculture in the HP aquifer region was estimated to obtain the use value of water. The aim of this paper is to investigate how the decision on irrigation and production varies along the aquifer region as a function of potential neighborhood effects across counties. We estimate a stochastic production function (translog functional form) for biomass yield in this geographical area using county level data for the period 1960-2007. Spatial effects will be incorporated to this model to capture more accurately the potential cross county effects.

273. A New Look at the Decomposition of Agricultural Productivity Growth in the Face of Climate Change

Authors: Deep Mukherjee and Christopher J. O'Donnell* and Boris E. Bravo-Ureta*

Contact: deepb4u@gmail.com, c.odonnell1@uq.edu.au, boris.bravoureta@uconn.edu

Category: Explain

Abstract: A rising concern in the policy arena is the adverse impact of climatic change on agricultural productivity. Surprisingly, almost no attention has been placed on the relationship between Total Factor Productivity (TFP) and climatic effects. This paper presents a model that accounts for these climatic effects on TFP while also including the public investment in agricultural research and development (R&D), and irrigation. Stochastic Production Frontier (SPF) models have been used to decompose TFP growth into various sources including technological progress, technical efficiency change and scale effects. In this paper we extend the SPF framework to decompose productivity growth to derive climate adjusted TFP indexes. These indexes satisfy all economically-relevant axioms from index number theory. This methodology is applied to U.S. Department of Agriculture (USDA) panel data on outputs and inputs for 48 states over a 45 year period (1960–2004). This data has been utilized recently by several researchers. The empirical model consists of an aggregate output and the three inputs (land, capital, labor) reported in the USDA data set along with temperature, rainfall, irrigation and R&D variables obtained from various sources.

274. Choosing the direction for directional distances: new insights

Authors: Cinzia Daraio* and Leopold Simar

Contact: daraio@dis.uniroma1.it, leopold.simar@uclouvain.be

Category: Explain

Abstract: In efficiency analysis the assessment of the performance of Decision Making Units (DMUs) relays on the selection of the direction along which the distance from the efficient frontier is measured. Directional Distance Functions (DDFs) represent a flexible way to gauge the inefficiency of DMUs. Permitting the selection of a direction towards the efficient frontier to gauge the inefficiency may be reasonable in many empirical applications. As a matter of fact, many papers in the literature have proposed specific DDFs suitable for different

contexts of application. Nevertheless, the selection of a direction implies the choice of an efficiency target which is imposed to all the analysed DMUs. Moreover, there exist many situations in which there is no a priori economic rationale to impose a subjective efficiency target. In this paper we propose a data-driven approach to find out an “objective” direction along which to gauge the inefficiency of each DMU when there are not specific reasons to impose a particular direction. Our approach permits to take into account for the heterogeneity of DMUs and their diverse environmental contexts. We describe how to implement our framework and illustrate its usefulness on a real dataset.

275. Flexible aggregation in output homothetic production

Authors: Ole B. Olesen and N. C. Petersen

Contact: ole@sam.sdu.dk, ncp@sam.sdu.dk

Category: Explain

Abstract: The standard approach for estimation of cost efficiency of hospitals based upon a system of common tariffs often involves a drastic aggregation of a large number of outputs. The sector is often characterized by units of different size and different scope with large university hospitals versus small hospitals providing treatments within most versus only few specialties. The differences with respect to scale and patient mix mean that the use of a common tariff system may not be appropriate to generate aggregated output quantity indexes.

This paper suggests the use of more than one set of tariffs designed for the estimation of a number of homothetic sub-technologies in the relevant subspaces of the full output space. Different sub-technologies are allowed to be characterized by different sets of relative tariffs. Methods for combining these homothetic sub-technologies into a meaningful homothetic overall technology are suggested. Assuming homothetic structures with a common scaling law (not necessarily CRS) is shown to provide a link between the sub-technologies and hence a meaningful homothetic overall-technology.

276. THE INFLUENCE OF SUBSIDIES ON TECHNICAL EFFICIENCY IN THE AGRICULTURAL SECTOR: A BAYESIAN MIXED MODEL APPROACH

Authors: Daniel Castro* and Bernhard Brümmer

Contact: d.castromedina@stud.uni-goettingen.de, bbruemm@gwdg.de

Category: Explain

Abstract: The Common Agricultural Policy of the European Union has undergone substantial changes in the nature of subsidies granted to farms. The nature of each subsidy depends on the activity of the farm, the environmental and natural restrictions that the farm faces and others related to particular activities. The way in which subsidies influence efficiency and productivity has been studied in different perspectives, all of them with the underlying question of how to model subsidies by means of a production function. The fundamental idea of this work is that a subsidy is not an input; this means that a subsidy itself cannot produce any output but might have an influence on the performance of the farm as exogenous variable in the efficiency. We use a panel on England that allows distinguishing among agricultural sector and location, the later modeled as a mixed model to take into account regional correlations. The Bayesian approach allows modeling a stochastic frontier taking into account the mixed model, the influence of every subsidy on efficiency while producing efficiency estimators. Preliminary results show differences at the regional scale, and heterogeneous results regarding the influence of the different subsidies on efficiency.

277. `The Curse of the Caribbean?' Agency's impact on the efficiency of sugar estates in St. Vincent and the Grenadines, 1814-1829

Authors: SD Smith and Martin Forster*

Contact: simon.smith@bnc.ox.ac.uk,mf8@york.ac.uk

Category: Discuss

Abstract: This study estimates agency's impact on the efficiency of sugar plantations on St. Vincent and the Grenadines during the early 19th century. Using a panel data set covering the years 1814 - 1829, a series of stochastic frontier models are estimated to investigate whether estates employing agents were more efficient than those managed by the owners themselves. Multiple imputation methods are used to deal with missing data problems. There is no evidence, in any of the models estimated, to suggest that estates under agency were less efficient than those directed by their owners. Estimates from a number of models suggest that agent-operated estates were more efficient.

278. Dairy Farm Productivity and Climatic Variability in the United States: A Stochastic Production Frontier Approach

Authors: Roberto Mosheim*, Boris E. Bravo-Ureta, Lingqiao Qi

Contact: RMOSHEIM@ers.usda.gov, boris.bravoureta@uconn.edu, lingqiao.qi@uconn.edu

Category: Explain

Abstract: Despite the increasing interest on the effect of climatic change on agriculture and the abundance of productivity studies focusing on technical efficiency (TE) it is surprising that these two areas of research have had minimal convergence. The objective of this paper is to present some preliminary evidence of the connection between TE and climatic conditions on US dairy farms. The data is from the 2005 USDA ARMS survey for dairy farms which includes 24 states and 1116 producers. The ARMS data set is merged with temperature and precipitation data from PRISM (Parameter-elevation Regressions on Independent Slopes Model) based on zip-codes. To get climatic variables that are consistent with the dairy production cycle we define a hot (May-August) and a cold season (December-March). We then calculate 30 year averages for temperature and precipitation (normals) for both the hot and the cold seasons for each zip-code region. Stochastic production frontiers are estimated incorporating milk as the output and several inputs including cows, labor, capital, concentrate feed and other purchased inputs. Alternative specifications are estimated using different combinations of the climatic variables.

279. Static versus Dynamic Efficiency Measures: Evidence from the US Electricity Transmission and Distribution Industry

Authors: Sebastian Nick* and Heike Wetzel

Contact: sebastian.nick@ewi.uni-koeln.de

Category: Express

Abstract: Extended abstract attached as pdf-file.

280. Adoption of New Technology, Efficiency, and Productivity Measurement

Authors: Minling Pan

Contact: Minling.Pan@noaa.gov

Category: Express

Abstract: Productivity change has been identified as one of the key indicators in measuring economic performance of catch share fisheries in the United States. Various methods were recommended to measure productivity change in the fishing industry. This empirical study is conducted to select a proper method to measure productivity change in the Hawaii-based longline pelagic

fleet. First, this study examines the economic characteristics and active factors that contribute to the production function of the Hawaii pelagic longline fisheries, especially those factors that examine the fishing technological changes and their impact to fishing capacity and fisheries' performance. Second, this study investigates the availability of time-series data to construct the economic aggregators for measuring productivity change for the fleet. Finally, this study evaluates the feasibility of these approaches based on analysis that measure productivity change in the Hawaii-based longline pelagic fleet.

281. The Inverse Productivity Relationship in Small Agricultural Plots: A Non-Parametric Assessment using a Free Disposal Hull Order-m Approach

Authors: Loren W. Tauer* and Janet Y. Hou

Contact: lwt1@cornell.edu, janet.hou@jmail.com

Category: Explain

Abstract: A pervasive puzzle in development economics is why small agriculture plots in developing countries tend to yield more output per area than do larger plots. Using data from 288 rice plots from small farmers from Madagascar, we employ a non-parametric approach to the relationship, by estimating order-m FDH efficiencies of the plots and deriving the ratio of unconditional to conditional values to obtain the impact of plot size on the frontier and efficiency. The three primary production inputs were labor used in the plot, the quantity of animal traction used in the plot, and the size of the plot. To measure the impact of incomplete specification of inputs, added to these three basic inputs in a further analysis were the four soil fertility nutrients of nitrogen, carbon, phosphorus and potassium. The average FDH efficiency score over the plots with three defined inputs was 0.69, and the average order-m25 FDH efficiency score was greater at 0.86, reflecting the impact that order-m mutes the impact of outliers. When the 4 nutrients are added as inputs, the average FDH efficiency score over the plots with seven defined inputs was 0.88, and the average order-m25 FDH efficiency score was 1.00. Unconditional to conditional scores (conditio

282. Claims effect on profit changes in the Mexican insurance market: an undesirable output approach

Authors: Ana Maria Reyna* and Hugo Javier Fuentes Castro

Contact: ana.reyna@gnp.com.mx,amreynab@hotmail.com

Category: Express

Abstract: Deregulation made through NAFTA in 1994 allowed the gradually entrance of Canadian and North American capital in the Mexican insurance market. Since then, the number of insurers expanded 72%, however, the participation of the insurance activity in the GNP has grown slowly. What we propose is to examine the performance of the Mexican insurance sector in the last fifteen years with a model and a methodology adapted to the circumstances of this industry. Claims typically have been considered outputs of insurance companies, notwithstanding it contravenes the association between productivity and profitability when catastrophic events cause losses and high scores of productivity at the same time. Our analytical method differs from this approach as long as we suggest treating claims as undesirable outputs of the insurance industry. We extend Grifell-Tatjè and Lovell (2007) model to measure the magnitude of claims effect on profit changes, besides five more sources of variation of the former. Empirical frontiers are estimated from insurance firms grouped according to their specialization, a DEA slack-based models are applied, and an analysis based on bootstrap will be perform to test the statistical significance of relevant estimators.

283. Green Revolution in Ghana: Looking for the key under the lamp post

Authors: Alejandro Nin-Pratt* and Linden McBride

Contact: a.ninpratt@cgiar.org

Category: Express

Abstract: While there are several valid reasons for seeking the model for African agricultural productivity growth in Asian Green Revolution, the fact that Africa is a natural resource abundant region compared to Asia means that the Asian lessons might have limited application across Africa. We take an empirical approach to the question of factor constraints by using a methodology that allows the decomposition of profit efficiency into price and technical efficiency (Badunenko, O., M. Fritsch and A. Stephan. 2008, Economic Modelling 25: 1093-1109). Technical efficiency is further decomposed into scale efficiency and pure technical efficiency.
Data used are from the fifth round (GLSS 5) of the Ghana Living Standards Survey and include information on 5,069 rural households across the three major agro-ecological regions in the country in terms of rainfall/climate, vegetation, soil, and growing seasons. We find that agriculture in Ghana is labor constrained and highly inefficient, and that the limited increase in the production and productivity of staple crops appears to be related to labor and land constraints in the forest region and to labor constraints in the savannah region. Most of the identified inefficiency results from inadequate sc

284. Scale economies, technical change and efficiency in Norwegian electricity distribution 1998-2010

Authors: Subal C. Kumbhakar, Roar Amundsveen, Hilde Marit Kvile and Gudbrand Lien*

Contact: kkar@binghamton.edu, roam@nve.no, hkv@nve.no, gudbrand.lien@hil.no

Category: Explain

Abstract: In this paper we investigate scale economies, technical change and efficiency in Norwegian electricity distribution companies during 1998-2010. The Norwegian Minister of Petroleum and Energy has recently questioned whether the structure and organization of the electricity distribution companies contribute to low distribution tariffs. We used a panel data from the Norwegian Water Resources and Energy Directorate to address this issue. More specifically, we focused on scale economies, technical change and technical efficiency of the distribution companies using input distance functions. In modeling technically inefficiency we separated company-specific effects from inefficiency. We also used a quantile input distance function to address technological heterogeneity. Our results show that the potential scale economies were generally highest among the high cost (small) companies. This finding is related to the structure of some of the small companies and is likely to have future policy implications.

285. Assessing the Impact of Stock Volatility on the Efficiency of Listed Commercial Banks: A Conditional Nonparametric Approach

Authors: Anamaria Aldea* and Luiza Bădin and Carmen Lipară

Contact: anamaria_aldea@csie.ase.ro, luiza.badin@csie.ase.ro, carmen.lipara@fin.ase.ro

Category: Express

Abstract: The end of 2008 represents a turning point for banking system structure in US, as well as everywhere else in the world. Investors, regulators and interested third parties started to pay more attention to the financial soundness of the banks as they play a major role in the economic development of a specific country.
We analyze listed commercial banks from FactSet database, as their reduced

activity on financial markets is usually associated with lower risk, and we excluded listed investment banks as their large activity on financial markets associated with higher risk translate to a significant differentiation of their financial statements and fund raising activity.
In this paper we employ nonparametric conditional methodology to assess the impact of external factors like stock volatility on the efficiency of listed commercial banks. The approach allows decomposing the impact of external factors in impact on the attainable set in the input - output space, and/or impact on the distribution of the efficiency scores.
The results provide a perspective on how listed commercial banks performed in 2009, after the crisis materialize in almost all the countries where the analyzed listed banks run their operations.

286. Enhancing DEA models by the use of production trade-offs: generalizations inspired by an application of DEA in agriculture

Authors: Kazim Baris Atici* and Victor Podinovski

Contact: phd09ka@mail.wbs.ac.uk, victor.podinovski@wbs.ac.uk

Category: Explain

Abstract: Production trade-offs are the dual terms induced in the envelopment DEA models by weight restrictions stated in the multiplier forms. The structural simplicity of trade-offs allows their unambiguous interpretation as permissible simultaneous changes to inputs and outputs within the VRS or CRS technology. This provides a straightforward and reliable tool for the incorporation of additional knowledge about the production process in the DEA model. This paper gives an overview of the theoretical properties of trade-offs, including new results. It also looks into some lessons arising from a recent practical use of this technique in a comparative evaluation of agricultural farms. These results are generalizable, and equally extend to applications of DEA to other sectors.

287. Alternative Indexes for Multiple Comparisons of Quantities and Prices

Authors: Christopher J. O'Donnell*

Contact: c.odonnell@economics.uq.edu.au

Category: Explain

Abstract: Many statistical agencies (e.g., Eurostat, Statistics Canada, the U.S. Bureau of Labor Statistics) measure quantity and price changes using indexes that fail an identity and/or a transitivity property. In the context of quantity indexes, the identity property says that if two quantity vectors are equal then the index should take the value one. The transitivity property says that a direct comparison of two quantity vectors should yield the same result as a comparison that is made indirectly via a third quantity vector. This paper constructs indexes that satisfy nine common sense properties: weak monotonicity, identity, commensurability, proportionality, time-space reversal, transitivity, circularity, and two homogeneity properties. A numerical example is used to illustrate that indexes widely used by national statistical agencies are biased. For example, chained Tornqvist and EKS indexes indicate that two identical quantity vectors differ by more than 2%. Three alternative indexes (Lowe, geometric Young and Diewert-Fare-Primont) plausibly take the value one.

288. Modeling Rational Inefficiency

Authors: Monica Roa

Contact: mroa@psu.edu

Category: Express

Abstract: The literature related to efficiency focuses considerable attention on defining and measuring efficiency levels, with less emphasis on the sources driving

inefficiency. In the line of Bogetoft and Hougard, inefficiency is a rational decision. We present a model in which the firm faces an imperfect factor market and as a result the DMU has to reorganize the input vector requirement, this behavior induces the firm to an apparent waste of resources. Instead, this potential improvement is a reorganizational rational decision among the units to adapt the firm to the less costly efficiency path. The focus in this paper is on the role of deposits in financial institutions. Deposits play a dual role in banking; they can be inputs for the production of bank loans, or outputs provided to the depositors. In the former case, banks pay interest on deposits and in the latter depositors pay for the services. The net difference can be positive or negative depending on banking market power, depositorsâ€™ characteristics and factor market structure. The input market is characterized as monopsonistic competition, while the output market is viewed as Bertrand competition.
The case study is the Colombian financial system from 1995 to 2012.

289. Value and quantity data in economic and technical efficiency %measurement

Authors: Maria S. Portela

Contact: csilva@porto.ucp.pt

Category: Explain

Abstract: This paper calls attention to the implications of using cost or revenue data in efficiency measurement through Data Envelopment Analysis (DEA). In many empirical settings this issue arises, since frequently input and/or output quantities or prices are not available, and only value measures are available. When value data are used in technical efficiency models it is clearly questionable what sort of efficiency measure is being computed, since it cannot be a productive efficiency measure (that takes into account only quantities of inputs and outputs), and it cannot be either a traditional cost or revenue efficiency measure (that considers prices of factors disagregated from quantities).
In this paper we call the attention for this fact and address situations where only value data are available, and situations where for some inputs (outputs) there is quantity information and for others there is value information.
The main contribution of this paper is a reconciliation of previous literature on analysing these issues and on providing some guidelines on what to do and not do, when these issues arise in a data set.

290. Is there a Slowdown in Agricultural Productivity Growth in South America?

Authors: Federico Trindade

Contact: ftrindade@huskers.unl.edu

Category: Young Researcher (YR)

Abstract: This article uses parametric and nonparametric methods to update estimates of agricultural productivity growth in 10 South American countries in 1969-2009 with the objective of checking if the slowdown being measured in other countries is present in the region. Results show that the increase in agricultural output during the period analyzed is explained by factor accumulation, but also by higher Total Factor Productivity (TFP) growth. The slowdown present in the U.S. and some European economies does not seem to be present in South America. The region's yearly average TFP growth increased from 1.24 percent during the 1970s to 1.79 percent in the 1980s, 1.90 percent in the 1990s and 2.04 during the 2000s. This growth is not uniform across countries. Differences in performance can be associated to different environmental and institutional conditions.

291. Returns to scale, productivity, and growth: an empirical investigation

from the macroeconomic and industry perspecptives

Authors: Ana Lélia Magnabosco* and Fernando Garcia de Freitas

Contact: analelia@usp.br, fernando.garcia.freitas@gmail.com

Category: Discuss

Abstract: This article analyzes the occurrence of returns to scale and their effects on productivity and economic growth for a sample of 39 countries, for the period from 1995 to 2009. We per-form an econometric analysis considering the theoretical possibility of having countries with economic activity subject to increasing, constant, or decreasing returns to scale. We analyze the occurrence of returns to scale on a macroeconomic level and on less aggregate levels – the production of primary goods, manufacturing, construction, retail, etc. This represents an innovation in relation to the literature that evaluates returns to scale on the macroeconomic level and adds new information that enables a more accurate assessment of the returns to scale phenomenon.

292. Accounting for inter-group productivity differences among conventional, transitional and organic farms in Sweden

Authors: Dennis Collentine and Giannis Karagiannis and Yves Surry and Daniel Wikström*

Contact: dennis.collentine@slu.se, karagian@uom.gr, yves.surry@slu.se, daniel.wikstrom@slu.se

Category: Explain

Abstract: We use the multilateral panel data index approach to account for productivity differences between conventional, transitional and organic farms in Sweden. To do this, we employ three alternative productivity measures (land, labor and total factor productivity) and explicitly account for inter-group productivity differences. The resulting farm-level productivity consists of three components: the first one reflects intra-group productivity differences; the second one concerns productivity differences between the average farm of the group that the farm belongs to and the average farm in the sample; and the third component captures productivity growth of the average farm in the sample. These three mutually exclusive components provide a natural decomposition of a farm-level productivity index and provide the basis for our empirical analysis as we examine if and to what extent the contribution of each of these components differs among the three groups of farms (i.e., conventional, transitional and organic). The empirical results are based on growth accounting and detailed farm-level data on inputs and outputs from the Swedish Farm Accounting Data Network (FADN) for the period 2001-2011.

293. Efficiency measurement of the projects using non-discretionary factors and imprecise DEA

Authors: Pooria Niknazar* and Mario Bourgault

Contact: pooria.niknazar@polymtl.ca, mario.bourgault@polymtl.ca

Category: Express

Abstract: In the field of project management, it is common to use Likert scale in surveys to measure the qualitative characteristics or outcomes of projects. Moreover, as each project has its unique conditions, the environmental factor's role in defining the characteristics or affecting the outcomes of project is more visible. These environmental factors, measured in Likert scale, are non-discretionary factors as the project managers have no control over them.

To measure the efficiency of projects, we propose an appropriate DEA model

to deal with this common situation in the field of project management. The proposed DEA model considers simultaneously both imprecise and non-discretionary data for some variables of DMUs. We have demonstrated the application of proposed model in an empirical study that involved a survey sent to project management professionals. The analysis has useful implication in the field of project management especially for the projects with distributed team in different locations.

295. Inputs and total factor productivity in manufacturing: a comparative analysis of countries performance from 1995 to 2009

Authors: Armenio de Souza Rangel and Fernando Garcia de Freitas*

Contact: armenio@usp.br, fernando.garcia.freitas@gmail.com

Category: Express

Abstract: This paper examines the differences in productivity found in a sample of 15 countries. We review 14 industries from the perspectives of consumption of intermediate goods used in production and total factor productivity (TFP). Based on the Leontief model, we compare consumption assuming that the industries of the different countries produce the same final demand vector. To analyze total factor productivity we employed the stochastic frontier approach. By analyzing the relationship between the two measures of productivity, we see distinct national cases among developing economies. Some countries, for instance, have decreased its productivity in the consumption of intermediate goods but have observed gains in total factor productivity. There are countries that perform well on both counts and other that performed bad on both measures.

296. Malmquist Index in the Dynamic & Network DEA model

Authors: Miki Tsutsui* and Kaoru Tone

Contact: miki@criepi.denken.or.jp

Category: Explain

Abstract: We propose a Malmquist index corresponding to the dynamic DEA and dynamic & network DEA models. Using our model, we can measure the efficiency score of DMUs in a more realistic manner that is not achieved by the traditional models so far.
The traditional dynamic DEA model generates relative period efficiency scores based on efficiency frontiers of each period. However the frontier-shift effect is ignored in this model in spite of treating inter-temporal data. The Malmquist index will be an effective measure to incorporate frontier-shift effect into evaluation, and thus result in capturing the actual efficiency change of each DMU in the dynamic DEA model.
In the study, we define the dynamic Malmquist index (DMI) which is the product of dynamic catch-up index (DCU) and dynamic frontier-shift effect (DFS). Furthermore, we propose a cumulative version of Malmquist index, which measures the productivity change from the base period. This will help to understand the trend of productivity change inter-temporally. We also extend the Malmquist index to the dynamic and network DEA model, i.e. the overall dynamic Malmquist index (O-DMI), which consists of divisional dynamic Malmquist indices (d-DMIs).

297. A scale and cluster adjusted DEA model that permits both convex and non-convex efficient frontiers

Authors: Kaoru Tone* and Miki Tsutsui

Contact: tone@grips.ac.jp

Category: Explain

Abstract: In DEA we are often puzzled by the big difference in CRS and VRS scores, and by the convex production set syndrome. In this paper we perform a

challenge to these subjects. At the first step, we evaluate CRS and VRS scores for all DMUs by means of some techniques, e.g. by the conventional methods. We obtain the scale-efficiency for each DMU, e.g. CRS/VRS. Using the scale-efficiency, we decompose the CRS slacks into scale-independent and scale-dependent parts for each DMU. At the second step, we eliminate scale-dependent slacks from the data set and thus obtain a scale-independent data set. At the third step, we classify DMUs into several clusters depending on the degree of scale-efficiency or on some predetermined characteristics. We evaluate slacks of scale-independent DMUs within the same cluster by the CRS model and obtain in-cluster slacks. Adding scale-dependent and in-cluster slacks, we define the total slacks for each DMU. And finally at the fourth step, we evaluate the efficiency score of DMU by means of the total slacks via SBM model and project the DMU to the efficient frontiers which are no more guaranteed to be convex and usually are non-convex. We also discuss scale elasticity issues.

298. Performance of Brazilian Business, Accounting and Tourism graduate programs: a study through data envelopment analysis and Malmquist Index.

Authors: Luciano Sampaio* and Francimário Oliveira and Edward Costa and Hironobu Sano

Contact: lucianombsampaio@gmail.com, edwardcost@gmail.com

Category: Discuss

Abstract: The Brazilian institution in charge of post-graduate programs (CAPES) evaluates all programs every three years, focusing on publications in scientific periodicals, which are classified by the Qualis– CAPES system. This study aims to measure the relative efficiency of post-graduate programs in Business, Accounting and Tourism through Data Envelopment Analysis (DEA) and to measure the change in productivity from the three-year period of 2004-2006 to the 2007-2009 period by the Malmquist Index. Efficiencies of some post-graduate programs in Brazil using DEA have been evaluated but the Malmquist Index was not used because the 2007-2009 data was only recently available. They also used different input and output variables and did not consider, in our view, the real importance CAPES attributes to publications. We used, as inputs, professors, dissertations and thesis and, as outputs, total points obtained from the Qualis classification of periodicals. Among the results: the efficiency increased from the first to the second period; the efficiency of public institutions was higher as was the efficiency of programs with PhD courses and of programs more than 12 years old; the Malmquist index increased from one triennium to another.

299. Agricultural Productivity in Sub-Saharan African: The Role of Institutional Quality

Authors: Nur Abdi and Anwar Naseem* and Artem Prokhorov

Contact: anwar.naseem@mcgill.ca

Category: Express

Abstract: This paper investigates the contribution of agricultural research to agricultural productivity in sub-Saharan Africa. The paper empirically examines the relationship between growth in agricultural productivity and performance of agricultural research institutions in SSA. We test a simple hypothesis, namely that the quality of public research institutions is a significant determinant of a country's agricultural productivity. We use modes of governance, educational qualification of research personnel, stakeholder participation in agricultural R&D processes, research financing mechanism and sources, as proxies for quality of agricultural research. We apply a stochastic frontier production function to a unique panel data, covering 18

countries in SSA for the period 1976-2005. This is the first cross-country study to examine the impact of agricultural R&D institutional setting on country agricultural productivity in Africa. The study adopts a one-step model based on the scaling property proposed by Wang and Schmidt (2002). The results show that higher research expenditures, good governance and multi-stakeholder participation in agricultural R&D processes do have positive effect on technical efficiency.

300. Econometric Estimation of Mix Efficiency: An Empirical Illustration of US Agriculture Sector

Authors: Shabbir Ahmad* and Christopher J. O'Donnell and C. A. Knox Lovell

Contact: shabbir.ahmad@uqconnect.edu.au

Category: Discuss

Abstract: O'Donnell (2012) proposes a comprehensive decomposition of total factor productivity (TFP) change in an aggregate input and output quantity framework. He introduces a relatively new concept of mix efficiency along with other conventional components of TFP (e.g., technical, scale and allocative efficiency). Mix efficiency is defined as a potential improvement in productivity when input or output mixes are changed. Any change in input mix (e.g., land to labour ratio) or output mix (e.g., crops to livestock) results in change in productivity. Input mix efficiency involves minimizing aggregate input while holding output vector fixed and output mix efficiency involves maximizing aggregate output while holding input vector fixed. The concept of mix efficiency differs from allocative efficiency. Mix efficiency is purely a productivity concept while allocative efficiency is a value based concept. Allocative efficiency results in increased profit or reduced cost of a firm, which increases the prosperity of the firm. Whilst an improvement in mix efficiency increases the productivity, thus, increases the overall economic welfare. Data Envelopment Analysis (DEA) linear programs are already available for measuring mix efficiency levels, but St

301. Affine homotheticity and affine transitivity

Authors: Antonio Peyrache

Contact: a.peyrache@uq.edu.au

Category: Express

Abstract: In a recent paper I showed that transitive productivity comparisons are possible if and only if the underlying production technology is jointly input and output homothetic and technical change Hicks neutral (Peyrache, 2012). In this paper I consider affine homothetic technologies as the simplest example of deviation from homotheticity. Affine homothetic technologies give rise to intransitive productivity comparisons. However, I argue that the classical definition of transitivity is inappropriate in such a context and I introduce a new definition which I deem affine transitivity. It is moreover possible to show that affine transitivity corresponds to the classical notion of transitivity in a transformed input-output space, where the mapping function is a one to one correspondence.

The key idea of the paper is that intransitivity in productivity comparisons arises because some type of non-homotheticity is introduced on the technology side. It is then possible to operate some type of mapping from the original input-output space into a transformed one which satisfies transitivity. I speculate about the possible extension of this idea to a more general production structure, namely the Gorman Polar Form.

302. Iteratively Weighted Least Squares, an alternative to Stochastic Frontier Analysis

Authors: Jos L. T. Blank* and Aljar J. Meesters

Contact: j.l.t.blank@tudelft.nl, A.J.Meesters@rug.nl

Category: Explain

Abstract: Serious drawbacks of SFA are the a priori assumptions on the error and efficiency component, the lack of transparency of the method and the impossibility of applying the method to a fully specified system of equations. This paper proposes an alternative class of stochastic frontier estimators that overcome these drawbacks. This class is based on the idea that some observations contain more information about the true frontier than others and should therefore get a larger weight in the regression analysis. In an iterative process several weighted least squares regressions are run with weights based on the obtained residuals from the former step. The weights are derived from a user specified weight function. It is shown that under certain conditions iteratively weighted least squares (IWLS) and SFA converge to the same frontier. The model is applied to a set of Dutch hospital data. The outcomes of this application are promising. The model converges rather quickly and presents reliable estimates for the parameters, the cost efficiencies and the error components.

303. Relationship between credit conditions and efficiency in real sector: firm-level evidence

Authors: Viktor Khanzhyn

Contact: vkhanzhy@nebrwesleyan.edu

Category: Young Researcher (YR)

Abstract: This paper explores the hypothesis that abundant credit conditions can provide disincentives for non-financial firms to increase efficiency during recoveries and economic booms. Evidence that supports this hypothesis contradicts the common belief in the literature that efficiency is pro-cyclical. Difference-in-differences method is applied to test the change in average productive efficiency of firms dependent on bank credit during periods of credit crunches and abundant credit conditions. Credit-dependent status was defined based on accessibility of firms to capital markets. Propensity matching is used to match firms for difference-in-differences comparison. Credit crunches were identified using outstanding credit/GDP ratio. The preliminary results for U.S. showed a significant increase in measured efficiency among credit-dependent manufacturing firms during the large credit crunch of 1987 – 1992, and a significant drop in efficiency was found during expansion thereafter. Productive efficiency scores were calculated based on the data for one output (sales) and two inputs (labor: number of employers; and capital stock: plant property and equipment expressed in present value and adjusted for capital utilization).

304. Eco-efficiency, -productivity and -effectiveness in a productive efficiency framework

Authors: Ludwig Lauwers* and Koen Mondelaers and Jef Van Meensel

Contact: ludwig.lauwers@ilvo.vlaanderen.be,koen.mondelaers@ilvo.vlaanderen.be, jef.vanmeensel@ilvo.vlaanderen.be

Category: Express

Abstract: Since its origin as an operational concept, the use of eco-efficiency for firm, government or multi-actor decision making faces many problems. These include the rebound effect, weighting multiple environmental indicators when indexing, respecting threshold levels and treating scale and social issues. We review drawbacks of the eco-efficiency concept and show how production frontier methods improve the operational eco-efficiency diagnosis, identification of improvement paths and search for induced innovations. The potential of environmentally adjusted production frontier models based on

the materials balance condition, capacity constraints and the Baumgartner conditions is explored.
While eco-efficiency is basically interpreted as a ratio-indicator, frontier methods help to analyze the numerator and denominator separately. They allow to identify drivers of trade-offs between environmental and social outcomes, necessary conditions for respecting capacity constraints and opportunity costs for alternative input –output combinations. Reflections are made on the usefulness of eco-efficiency in multi-actor configurations that appear necessary in maintaining resilience of the overall system, social capital or cradle-to cradle links.

305. Earnings quality and performance in the banking industry: A profit frontier approach

Authors: Manuel Illueca and Diego Prior* and Emili Tortosa-Ausina and MaPilar García-Alcober

Contact: Illueca@cofin.uji.es, diego.prior@uab.es, emili.tortosa@eco.uji.es

Category: Discuss

Abstract: The analysis of efficiency and productivity in banking has received a great deal of attention for almost three decades now. However, most of the existing literature to date has not explicitly accounted for risk when measuring efficiency. We propose an analysis of profit efficiency taking into account how the inclusion of a variety of bank risk measures might bias efficiency scores. Our measures of risk are partly inspired by the literature on earnings management and earnings quality taking into account that loan loss provisions, as a generally accepted proxy for risk, can be adjusted to manage earnings and regulatory capital. We also consider some variants of traditional models of profit efficiency where different regimes are stipulated so that financial institutions can be evaluated in different dimensions—i.e. prices, quantities, or prices and quantities simultaneously. We perform this analysis on the Spanish banking industry, whose institutions are deeply affected by the current international financial crisis, and where re-regulation is taking place.

306. Grain production potential in Russia: An application of the directional distance function

Authors: Maria Belyaeva* and Heinrich Hockmann

Contact: belyaeva@iamo.de,hockmann@iamo.de

Category: Express

Abstract: Recently Russia became one of the major suppliers of wheat on the world market, in the last ten years its agricultural production has exhibited significant growth, and, despite a sharp decline in 2010 due to extreme weather, this increasing trend is continuing. In this context, the objective of the research is to estimate production potentials and efficiency of production in Russia as well as to determine factors that are currently influencing the increase of wheat production at the moment. The study aims to estimate wheat production in different regions of Russia, excluding several northern regions where the soil quality and extreme weather conditions do not allow any crop production at all. The data set used for the analysis includes indicators of regional crop and animal production together with various socio-economic and climate indicators that might possibly have an influence on efficiency of wheat production. The study is being conducted using a directional distance function approach. We apply different directional vectors to analyse the impact on structural adjustment in the input and output space. For the estimation purposes the preference is given to the stochastic frontier analysis over the data envelopment analysis.

307. Large Courts, Small Justice! The inefficiency and the optimal

structure of the Italian Justice sector

Authors: Antonio Peyrache and Angelo Zago*

Contact: a.peyrache@uq.edu.au, angelo.zago@univr.it

Category: Explain

Abstract: In this paper we analyze the efficiency of the Italian courts of justice for the period 2003 to 2008. Despite its economic development, in Italy the average length of trials is one of the highest in the world, and it thus represents a relevant case to analyze.
We propose a methodology to estimate the sector optimal structure. We define the firm, the aggregate, and the industry production technology, defined as the union of all the possible aggregate technologies. We use the directional distance function to investigate the optimal sector structure by looking at the efficiency gains that may be realized by reducing size inefficiency, i.e., from courts operating on a too large scale, and merger inefficiencies, i.e., when courts are too small.
Results show that for the Italian case technical efficiency (lack of best practice adoption) is almost 40% and size inefficiency (courts operating on a too large scale) is about 35% of total inefficiency of the sector. It emerges that the single most effective (and feasible) policy intervention is the splitting of large courts of justice: it would boost the ability of the system to process cases and it would put it on a sustainable path with beneficial effects for economic growth.

308. The Expected Minimum and Maximum Inefficiency in Stochastic Frontier Models

Authors: Aljar Meesters

Contact: a.j.meesters@rug.nl

Category: Discuss

Abstract: This paper examines the properties of minimum and maximum inefficiency in stochastic frontier (SF) models. Although it is common practice in SF analysis to estimate firm level inefficiency scores, examining minimum and maximum inefficiency is in general neglected. Looking at minimum or maximum inefficiency can however be very informative. E.g. it reveals how inefficient a firm can be before the market will intervene. Properties of minimum and maximum inefficiency are derived for the standard SF models as well for the recently developed zero inefficiency model of Kumbhakar et al. (2013) and
a bounded efficiency model developed by Almanidis et al. (2011). Moreover, with the suggested method it is possible to estimate an expectation for the population minimum and maximum inefficiency based on sample estimates.

309. Axioms of a Polluting Technology: A Thermodynamic Approach

Authors: Kenneth Løvold Rødseth

Contact: klr@toi.no

Category: Discuss

Abstract: This paper mergers two strands of literature – the production economics literature on joint production of good and bad outputs and the environmental and ecological economics literature on the implications of the laws of thermodynamics for production possibilities – by introducing an axiomatic production model that is consistent with the laws of thermodynamics. First, a weaker form of G-disposability (i.e. directional disposability), additive G-disposability, is introduced, and it is shown that the first law of thermodynamics is satisfied when the standard axioms of free disposability of inputs and outputs are replaced by additive G-disposability of inputs and outputs. Second, a new type of essentiality, output essentiality, which rules

out the inactivity and null-jointness axioms, is introduced to satisfy the second law of thermodynamics. The paper concludes by showing how the proposed axiomatic production model can be estimated by Data Envelopment Analysis.

310. Heterogeneity in Production Structures and Efficiency: An Analysis of the Czech Food Processing Industry

Authors: Lukas Cechura* and Heinrich Hockmann

Contact: cechura@pef.czu.cz, hockmann@iamo.de

Category: Express

Abstract: This paper deals with the analysis of firm heterogeneity and sector specific technology. The theoretical model stands on the assumption of maximising the return on capital and overcomes problems involved in simple profit maximisation. The results show that a random parameter model with sector dummies and heteroscedasticity is the most appropriate model specification for distinguishing firm and sector level efficiency and heterogeneity. The heterogeneity among firms as well as among sectors was found to be an important characteristic in Czech food processing. This holds for production technology as well as for technical efficiency. Moreover, the decomposition of total variance shows that intrasectoral differences in technologies are much more pronounced than the intersectoral ones. The differences in intra-sector heterogeneity also suggest that the food processing industry will be subject to accelerated structural change in the coming years. Since leapfrogging does not appear to be present in selected industries (except for Milling), structural change will occur in such a way that the most successful companies will strengthen their position.

311. Self-selection into export market : Does productivity affect the entry barriers?

Authors: Xi Chen and Frédéric Olland*

Contact: folland@unistra.fr

Category: Express

Abstract: In this paper, we investigate the relationship between productivity and sunk costs of entry. We endogenise sunk costs of entry in an heterogeneous firm model à la Melitz: these sunk costs are affected internally by firm's own productivity and externally by industries – and countries – specifications. Under this assumption, we show that the "Melitz model" misestimates firm's self-selection into domestic and export markets. Based on French firm-level data, we estimate both sunk costs of entry and total factor productivity and explore the relationship between them. The estimation outcomes confirm the main results predicted by our theoretical model.

313. Environmental efficiency indices:\\ towards a new approach to green-growth accounting

Authors: Chiara Peroni*

Contact: chiara.peroni@statec.etat.lu

Category: Discuss

Abstract: This article analyses the link between environmental and productive efficiency in Western European Countries and the US, using data from the UN Framework Convention on Climate Change. The study models a multiple output technology in which emissions are an undesirable outcome of production. A DEA method delivers environmental efficiency indices, which grade countries according to their ability to increase production while reducing pollutants. The indices are interpreted as enhanced measures of carbon intensity (emissions per unit of GDP), a popular indicator of environmental degradation. Results shows that productive efficiency is

considerably lowered when environmental degradation is taken into account. Only two (Luxembourg and Sweden) out of 16 countries are environmentally efficient. Malmquist indices, however, show that environmental performances improved over the period considered in nearly all countries.
A decomposition of carbon intensity, which links emission performance to technical progress, is also presented. This highlights the positive contribution of labour productivity determinants on the reduction in carbon intensity.

315. Dynamic Efficiency and Incentive Regulation: An Application to Electricity Distribution Networks

Authors: Rahmatallah Poudineh* and Grigorios Emvalomatis and Tooraj Jamasb

Contact: rahmatpoudineh@gmail.com

Category: Express

Abstract: Following the power sector reform, many countries inclined towards incentive regulation to promote cost savings in the natural monopoly power networks. Meanwhile, efficiency and productivity techniques such as benchmarking total costs are prevailing tools to promote yardstick competition and to avoid possible overcapitalisation. However, the measure of efficiency obtained in benchmarking is only appropriate for the short run as it captures the firm's performance in a snapshot towards its long run equilibrium. On the other hand, the factors affecting short run behaviour of firms may not be adjusted instantaneously when the firms invest in new technologies and/or R&D. In this way inefficiency will be transmitted to the subsequent periods. This effect, which arises from the sluggish adjustment of output, is problematic under incentive regulation with ex-post regulatory treatment of investment because it adversely affects companies' revenue and might create disincentives for investment and innovation. This paper analyses this issue and estimates the rate of inefficiency transmission between periods for a panel of 128 Norwegian electricity distribution companies from 2004 to 2010.

316. To Geometrically Mean-Adjust Data or not to Geometrically Mean-Adjust Data in an Input Stochastic Distance Frontier Approach: That is Our Question - An Empirical Example of Greek Banking

Authors: Prof Richard Simper and Aristeidis Dadoukis*

Contact: a_dado12@yahoo.co.uk

Category: Young Researcher (YR)

Abstract: This project uses a stochastic frontier input distance function to provide a preliminary analysis of X-efficiencies in Greek Banking. The originality of our research is based across three strands. First, the sample period covers 20 banks operating in Greece allowing a pre and post Global Financial Crisis (GFC) analysis, the first to our knowledge in the published literature. Our results show that the GFC had differing effects on Greek banks but these were model dependent. That is, in our second strand of research, we re-evaluate the differences in X-efficiency and ranks using the Error Component (EC) and the Time Effects (TE) model proposed by Battese and Coelli (1992). The results indicate a difference between the EC and the TE model, which implies that exogenous economic conditions have an effect on Greek banking x-efficiencies and hence policy discussions. Finally, we re-assess the process of geometrically mean-adjusting the input and output variables as popularised in the literature. Adjusting the data using the geometric means affects the scores and the ranks obtained under both models, raising the question of whether the process of geometrically mean adjusting the data is suitable when studying banking industries.

317. Monitoring the performance of hydroelectric power plants

Authors: C.B. Vaz* and A.P. Ferreira

Contact: clvaz@ipb.pt, apf@ipb.pt

Category: Explain

Abstract: This study develops a methodology to provide insights regarding the performance of the hydroelectric power plants of an European player in the energy sector. The focus of the hydroelectric power performance assessment is on the operation stage, embody by the generated electrical energy. Hydroelectric power plants may use the natural drop of a river (run-of-river) or a plant is built across a river to raise the water level (reservoir) to provide the drop needed to create the driving force. As the operation schemes of these two types of hydropower plants, concerning the availability of the primary resource and also the load-following, require different control strategies, DEA analysis evaluates them separately. This analysis enables the identification of the best practices of plants which lead to improved performance in electrical energy generation process, from the resources available and exogenous variables. The bootstrapping is applied to obtain statistical inference on the efficiency estimates. The Malmquist index, complemented with bootstrapping, is used to measure the productivity changes of hydropower plants in the last years by taking into account two effects: the efficiency change and the technological change.

318. Application of Data Envelopment Analysis (DEA) at Macroeconomic level: Understanding Energy-Economy Nexus, Using OECD Dataset

Authors: Reza Fathollahzadeh Aghdam

Contact: reza_f_a@yahoo.com

Category: Discuss

Abstract: Gross Domestic Product (GDP) and Energy Intensity (EI) are two broadly used indicators for economic performance (EP) and energy efficiency (EE), respectively. With all limitations that these indicators hold their trend are persistently used for policy purposes. This paper provides an alternative approach for analyzing EP and EE, at macroeconomic level. This approach allows for a better understanding of Energy-Economy Nexus in the long-run. Using OECD dataset, this paper applies Data Envelopment Analysis (DEA). This, as far as is known, is the first application of DEA for a comparative analysis on such nexus. Alongside many aspects of such nexus, dynamics of relative Total Factor Productivity (TPF) for nineteen OECD countries are analyzed, at macro level. Preliminary results reveal that, in the long run, average TFP among all countries have significantly improved, during 1970-2011. These are largely due to technological advancement and not because of the policies that targeted improvement of EP and EE. Interestingly enough, some individual countries have experienced a downward TFP trend, while showing a significant positive real GDP growth. This should be considered as an alarming signal for policy makers of those nations.

319. Likelihood ranking of decision making units

Authors: Markku Kallio and Merja Halme

Contact: markku.kallio@aalto.fi, merja.halme@aalto.fi

Category: Discuss

Abstract: Assume that input-output vectors represent a random sample of a multivariate
distribution. Unlike in DEA we assume common prices and find maximum likelihood estimates for them. The profit based ranking criterion for each DMU
is the likelihood that the random profit is at most the profit of that DMU. Return based ranking is defined similarly. The approach can be used in parallel

to DEA. We compare both ranking methods with DEA in two cases: 25 branches of a commercial bank and 24 parishes of Helsinki.

320. The sources of unit labor cost changes in EU countries and the US: the contribution of efficiency, technical changes and capital deepening

Authors: Charles-Henri.DiMaria*; Chiara Peroni

Contact: charles-henri.dimaria@statec.etat.lu

Category: Express

Abstract: This article analyzes average labor costs changes in comparison with long term key determinants of labor productivity --- efficiency change, technical change and capital deepening --- using Data Envelopment Analysis. Data for Western European countries and the US show that the evolution of labour productivity components counteracts the deterioration in countries' cost competitiveness caused by increases in nominal wages. Furthermore, the analysis unearths the important contribution of capital deepening in lowering unit labor cost increases. The policy implication is that efforts aimed at reducing nominal labour costs should be accompanied by policies fostering capital deepening. Further improvements in countries' cost competitiveness can be achieved by enhancing efficiency gains and technical progress, which has been mostly negative during the period under study.

321. Cost Efficiency in Norwegian Salmon Farming

Authors: Helen Marita Sørensen Holst

Contact: helen.m.holst@uit.no

Category: Express

Abstract: Since the start in the 1970s, salmon farming has experienced an impressive productivity growth. Productivity development is driven by cost efficiency. In order to stay profitable in an increasingly competitive market, focus on cost has become more and more relevant. The average cost of production has decreased radically over the first decades, but seems to have stagnated in the last couple of years. With increasing competition from countries like Chile, Norwegian salmon farmers need to exploit their input in the best possible way to stay competitive. Earlier studies have measured the productivity development of Norwegian salmon farmers, like the study of Vassdal and Holst (2011) who focused on the physical inputs of the production process. This study will focus on the total cost of producing salmon, and will look at cost efficiency over time and may discover if there are price effects or some other factors that influence cost efficiency.

Vassdal T., and H.M.S. Holst (2011), Technical Progress and Regress in Norwegian Salmon Farming: A Malmquist Index Approach, Marine Resource Economics, Volume 26, pp. 329–341.

323. Competitive positioning and performance assessment in the construction industry

Authors: Isabel M. Horta* and Ana S. Camanho

Contact: imhorta@fe.up.pt

Category: Express

Abstract: The purpose of this paper is to characterize the competitive positioning of the construction industry companies and evaluate their financial performance. The methodology proposed involves three major stages. The first stage concerns the identification of the competitive positioning of companies within the construction sector. This is achieved using a hierarchical clustering algorithm suitable for large datasets and mixed type variables. The second stage is the analysis of performance of the different clusters. This is done

using the Data Envelopment Analysis technique. To characterize in detail the main performance features of each cluster, a decision tree is used to extract the main rules concerning the performance spread within each cluster and the gap between the cluster best practices and the national benchmarks. The third stage concerns the analysis of the strengths, weaknesses and areas of potential improvement for contractors in each competitive positioning. This required the analysis of benchmark companies of each cluster. The methodology proposed was applied for the analysis of performance of all contractors that operate in the Portuguese construction industry.

324. Costs and efficiency in the English higher education sector: an analysis using latent class stochastic frontier models

Authors: Jill Johnes* and Geraint Johnes

Contact: j.johnes@lancaster.ac.uk

Category: Express

Abstract: The purpose of this paper is to provide an in-depth study of the cost structure and efficiency of English higher education institutions (HEIs). We are particularly interested, given the change in the composition of the sector, in how costs structures and efficiency vary by mission group. Previous work has focussed on pre-determined mission groups; but that is not necessarily satisfactory as mission groups were often formed historically, and universities which may once have had similar missions may not necessarily have similar outlooks today. To this end we use a panel of data from the English higher education sector from 2002/03 to 2010/11 to estimate a cost function for English HEIs using the latent class variant of the stochastic frontier model. This allows us simultaneously to (i) identify clusters of institutions, based on what the data tell us, (ii) evaluate the parameters of the cost function for each cluster, thence evaluating also measures of economies of scope and of scale within each cluster, and (iii) measure the efficiency of each institution, both relative to other institutions in the same cluster and relative to all other institutions in the analysis. See long abstract attached for more details.

327. Yak production efficiency measurement using stochastic distance function: An application to Sanjiangyuan Area of China

Authors: Wei Huang*, Bernhard Br¨¹mmer

Contact: whuang@gwdg.de

Category: Express

Abstract: Sanjiangyuan Area is one of the biggest grassland areas in China, where the ecological environment is important and fragile. Grassland degradation is serious and overgrazing is suggested to be a directive cause. In this study, we are aiming to measure efficiency and productivity to reflect the relationship between the overgrazing and grassland degradation from an environmental efficiency perspective. The stochastic output distance function using household level data of yak husbandry production is built and the Maximum likelihood Estimation is used. Household data used in this paper are taken from field survey in household pasture in 2012. The data sample consists of 204 household observations from 3 counties in Sanjiangyuan Area. The inputs are grassland area, labor, capital and yak weight in the beginning year and the outputs are yak weight in the end of the year and the other revenue. Our results show that mean efficiency of the observed 204 sample household is 0.83. The mean efficiency of Maqin County, Tongde County and Zeku County are 0.84, 0.83 and 0.84 respectively. The spatial relationship of the distribution of efficiency and the compare of elasticity of input of grassland area would also be researched.

328. A NEW APPROACH FOR MEASURING MARKET POWER AND QUALITY IN THE EUROPEAN BANKING INDUSTRY

Authors: José Baños-Pino, Ana Lozano-Vivas and Ana Rodríguez-Álvarez

Contact: avivas@uma.es

Category: Explain

Abstract: The paper attempts to empirically evaluate whether banks are able to exercise market power when that power is oriented towards increasing the quality for banking services regarding the certification and the refinancing effects. That is, banks differentiate their products in terms of quality. Then, the banking market power if exists by this reason should be oriented to to contribute to stability with benefit for borrowers.
To empirically test this issue we propose a new empirical approach for defining and assessing competition in the banking industry that attempt to measure the competition intensity directly by measuring the responses of prices or outputs to changes in costs. Particularly, our new methodology determine a new form of market power measurement taking advantage of the kindness that from duality offers the output oriented distance function. Our new methodology used for the definition of market power will allow us to develop our empirical exercise oriented to measure the market power of the banking industry in terms of the certification and refinancing effect. Thus, by inserting the definition of market power obtained from the output oriented distance function in a model on bank behavior, will allow us to design a new

329. Inefficiency and unobservable heterogeneity: Empirical evidence from pathology in the UK National Health Service

Authors: John Buckell* and Dr Andrew Smith and Dr Roberta Longo and David Holland

Contact: ts10jasb@leeds.ac.uk

Category: Express

Abstract: Pathology services are increasingly recognised as key to effective healthcare delivery - underpinning diagnosis, long-term disease management and research (Carter Report, 2006). To the extent that pathology services affect a patient's treatment pathway, significant health care costs are influenced directly by the effectiveness of these services. Pathology is closely tied to a multiplicity of other services in the health care system, notably primary and secondary care, meaning that inefficient practice here can echo throughout the system. Given pressures on the UK Department of Health to make efficiency savings (National Audit Office, 2012) and that little is known about the performance of pathology laboratories, this area offers unlocked potential for timely gains. We use existing data (Holland et al., 2012) within an econometric framework to benchmark English NHS laboratories, using a sample of 58 over a five year period. We first find significant levels of inefficiency in pathology services. Second is the issue of heterogeneity. Via qualitative work, much is known about the operating environments of these laboratories; however, our data is only able to capture a limited amount of this. Therefore, a range of techniques for captur

330. Institutional Care of the Elderly in Germany

Authors: Helena Meier* and Heike Wetzel

Contact: helena.meier@uni-koeln.de

Category: Express

Abstract: In Germany care of the elderly is provided either by nursing homes or domiciliary care where an institutional organization provides care at the patient's home. Additionally, some patients are not looked after by an institutional organization but are taken care of by relatives who then receive financial support. In this study, we focus on the care provided by institutional organizations who are either active in the area of nursing homes or domiciliary care or both. The institutional organizations can be differed

according to ownership. Some are privately owned by non-profit organizations such as the German Red Cross Organization and organizations of the Catholic Church. This applies to 55% of the institutional organizations providing care services in Germany. Further, ownership can be private and profit maximizing, or public. In this analysis, we compare the efficiency of the different types of institutional organizations depending on ownership and location. We undertake this for nursing homes as well as for domiciliary care. We conduct an input-output-analysis applying stochastic frontier analysis. We explore total costs controlling for input factors such as number of people employed and employment type (full-time and part-time).

331. Estimation and interpretation of a production frontier with multiple time-varying individual effects

Authors: Antonio Alvarez and Carlos Arias*

Contact: carlos.arias@unileon.es

Category: Express

Abstract: The objective of this paper is to explore the evolution over time of technical efficiency. For that purpose we use a rather flexible specification of time-varying technical efficiency in which each individual inefficiency term is a linear combination of multiple temporal shocks common to all individuals and as many time-invariant individual effects. This approach looks like a promising path to deal with unobserved heterogeneity that could lead to inconsistent estimates of economic models. The starting point of the present paper is the estimation of the econometric model proposed in the received literature. The model has been thoroughly analyzed in previous papers but, to our best knowledge, has been estimated only for illustrative purposes. Therefore, the twist of the present paper is our interest in the policy interpretation of the time random shock and the managerial implications of the multiple individual effects. Some of these considerations could question previous assumptions on the correlation between the inputs and individual effects or temporal shocks.

332. Faculty Research Performance and Efficiency Evaluation in Greek University Departments of Economics Using DEA

Authors: Giannis Karagiannis

Contact: karagian@uom.gr

Category: Express

Abstract: In this paper we use the radial DEA model with single constant input to evaluate the research performance of faculty staff in several departments of economics in Greece and then we aggregate these faculty-level efficiency estimates to obtain efficiency at the department level. We show that in the case of the single constant input model aggregate efficiency is equal to average efficiency. In the analysis we consider a single output, i.e., the number of journal publications, and two attributes, i.e., a journal quality ladder and the total number citations while input quantity is set equal to one for all faculty members. The empirical results show remarkable intra- and inter-department variation in efficiency estimates.

333. ESTIMATING TECHNICAL AND ALLOCATIVE INEFFICIENCY FUNCTIONS

Authors: Giannis Karagiannis and Efthymios G. Tsionas*

Contact: karagian@uom.gr, tsionas@aueb.gr

Category: Discuss

Abstract: In paper we propose an alternative approach for estimating technical and allocative inefficiency within the error-component model which departures from the traditional cost function system of equations. Instead we rely on the

axiomatic approach to efficiency analysis and the theoretical properties of technical, allocative and cost efficiency indices first outlined in Fare, Grosskopf and Lovell (1985) to approximate them by means of flexible functional forms. In particular, for each efficiency measure we specify a translog function which has as left hand side variable the (unobserved) efficiency score of each decision making unit and as explanatory variables the input and output quantities in the case of the technical inefficiency function, and input and output quantities and input prices in the cases of the allocative and cost inefficiency functions. These result to a system of two equations, with composed error terms that are interrelated and can be estimated with FIML or 3SLS if there are panel data. From the estimated model, we can obtain firm-specific estimates of technical, allocative and cost efficiency even with cross section data.

334. The impact of changes in regulatory regime on the profits of Spanish electricity distribution firms

Authors: Leticia Blazquez* and Humberto Brea-Solis and Emili Grifell-Tatjé

Contact: leticia.blazquez@uclm.es, ha.brea@ulg.ac.be, emili.grifell@uab.cat

Category: Explain

Abstract: This paper presents an empirical analysis on the performance of the Spanish electricity distribution companies for the period from 1988 to 2010. During this period, two main different regulatory regimes were in force, and a significant increase in the concentration of the sector, prompted by numerous mergers and acquisitions, could be observed. Using the parametric approach framework proposed by Fuentes et al. (2001), we have estimated a translog specification for the input-oriented distance function underlying production technology. On the basis of this estimation, we have decomposed the companies' profits change between two consecutive periods into two components: a margin effect and a productivity effect. Furthermore, we decompose the productivity effect into its main drivers. A virtue of this approach is that allows studying profit generation without imposing a restrictive behavior of the firm. The results show an important increase in average productivity at an annual rate of 3.3 percent. The main driver of this improvement was technical change.

335. Social safety from a multi-actor point of view

Authors: Thijs Urlings* and Jos Blank

Contact: t.h.urlings@tudelft.nl

Category: Express

Abstract: Social safety, which can be defined as the combination of levels of crime, nuisance and perceived safety, is the responsibility of a multitude of organisations. Although there is a wide body of literature on the effect of police on safety, hardly any effort has been made so far to model the influence of the combination of actors in the safety field on the different aspects of social safety.

We introduce an output distance function with multiple inputs and multiple outputs, and apply it on a panel data set of 25 regions in the Netherlands for a period of 10 years. The inputs are the costs involved with police, State's attorney, municipalities and youth care; outputs are the 3 aspects of social safety. Constant returns to scale are assumed. We estimate the model with fixed effects in order to correct for differences among the regions and with dummies for the years in order to correct for the change in technology. By means of a thick frontier analysis we obtain a number of efficient observations and the efficiency scores for all observations.

The results suggest that police is the actor with the largest influence on social safety. Municipalities hardly have any influence. There is no proof for a

significant advance in technology.

336. Output price deflators and the sources of productivity growth

Authors: Giannis Karagiannis and Magnus Kellermann* and Klaus Salhofer

Contact: magnus.kellermann@tum.de

Category: Express

Abstract: This paper addresses the problem of estimating and decomposing firm-level productivity growth, based on panel data lacking firm-specific price information. One approach commonly used in productivity studies is to use revenues, deflated by a common industry output price index, as a proxy for output quantities. This procedure neglects any differences in output prices at the firm level; however in many cases this can be a restrictive assumption. The objective of this paper is to examine the impact that the use of alternative output measures may have on the relative importance of the various sources (i.e., changes in technical efficiency, technical change, scale or markup effect) of TFP change measured in a parametric framework.
A variety of different issues arises from this particular field in productivity measurement. We focus on: i. adjustments in the econometric estimation of the production technology to avoid the omitted variable bias as discussed by Klette and Griliches (1996) and among others De Loecker (2011) and ii. allowing for imperfect competition in the decomposition of TFP and taking a possible markup effect into account (Hall, 1988; Basu and Fernald, 1997).

337. How does the pollution abatement investment affect firms' performance?

Authors: J-P. Huiban, C. Mastromarco, A. Musolesi* and M. Simioni

Contact: musofm@hotmail.com

Category: Explain

Abstract: This paper studies the effect of the firm effort to abate pollution on its productivity. Two views have been proposed. According to the standard view, environmental regulation forces firms to allocate the usual production inputs labor and capital to pollution reduction, which push them away from the optimal production choices. At the opposite, the so-called “Porter hypothesis” suggests that a “broadly defined" regulation can trigger innovation and may partially or more than fully offset the traditional costs of regulation. The numerous tests of these approaches conduct to mixed results. We use a very rich panel firm-level dataset, issued from two French surveys. The Antipol survey provides a unique measure of the firm investment engaged yearly to abate its pollution emission. The EAE (Annual Business Survey) provides the usual information about firm structure and performance. We obtain an unbalanced panel of 8260 observations covering the period from 1993 to 2007. It is composed of 1013 firms of French food industry. From an econometric modelisation perspective, we try to decide between two ways to model the relationship between antipollution investments and firm productivity. We use a translog production function, estimated by u

339. Productivity and Technical Efficiency for Chilean Dairy Farms: An Analysis of Dairy Farms Using Stochastic Frontiers and a Latent Class Model

Authors: Víctor H. Moreira* and Boris E. Bravo-Ureta and Rodrigo A. Echevería

Contact: vmoreira@uach.cl, boris.bravoureta@uconn.edu, rodrigoecheverria@uach.cl

Category: Express

Abstract: The general objective of this study is to examine productivity and TE for a sample of Chilean dairy farms. In particular, we are interested in comparing intensive and extensive dairy operations. The data used is an unbalanced panel for the 2005-2010 period for 418 farms mainly located in the Southern

Region of Chile. The empirical specification is a translog production frontier estimated with a Latent Class Model (LCM) procedure. The model incorporates milk as the output, and dairy cows, labor, concentrate feed, forage feed expenses and other costs as inputs. The separating variables used in the LCM are: concentrate feed, agro-ecological zone and the ratio between milk produced in spring-summer with respect to winter-autumn. The largest partial elasticity is for Cows in the intensive group (0.388) and Other Costs (0.569) for the extensive group. The second input in importance is Concentrate Feed for both groups. The average function coefficient is 0.988 and 1.000 for the intensive and the extensive groups, respectively. The results show high average TE for the intensive (90.0 %) and extensive (85.9%) groups. As would be expected, we reject a pooled model in favor of the LCM.
(Research funded by FONDECYT 11110285)

340. Agricultural Productivity in the EU: a Comparison between the Old and New Member States

Authors: Lajos Baráth* and Imre Fertõ,

Contact: barath.lajos@krtk.mta.hu

Category: Express

Abstract: Over the last decades agricultural productivity and efficiency in the Eastern and Central European Countries have been widely analysed. However, there is limited information concerning the performance of these countries after the accession to the EU. The aims of this paper therefore are: (1) to decompose agricultural productivity indexes for the European agriculture; (2) to analyse how accession changed the patterns of EC and TFPC in the new member States and (3) to analyse whether there is a convergence or divergence between the old (OMS) and new member states (NMS)? The analysis is conducted using the framework first developed in ODonell (2008). For purposes of empirical analysis we use the Färe-Primont index. This index is economically ideal as it satisfies all economically-relevant axioms and tests from index number theory (ODonell, 2010). The paper analyse country level panel data for all EU-27 countries, using data from the Economic Account for Agriculture for the period 2005-2010. Preliminary results show that in the OMS was only a moderate TFP growth whereas in the NMS the TFP growth was more remarkably as a consequence it seems to be that there is a convergence between the OMS and NMS.

341. Metafrontier Cost Malmquist Productivity Index

Authors: Mei-Ying Huang* and Jia-Chin Juo and Tsu-tan Fu

Contact: mayin@mail.ntpu.edu.tw

Category: Discuss

Abstract: This study applies the data envelopment analysis (DEA) approach and extends the cost Malmquist (CM) productivity index of Maniadakis and Thanassoulis (2004) to decompose the productivity change of banks in Taiwan and China. As per the conventional technology gap existing in the relationship between a group-specific (current) technology and its meta (potential) technoylogy, there is a component, the allocative efficiency gap, in the relationship between the above two technologies while input prices are available. The productivity index used in our study is called the meta cost Malmquist (CM) index. It can extract additional components, the technology gap change and the allocative efficiency gap change, and the later is never considered in the conventional Malmquist or CM index. The technology gap change captures the property of technical catch-up with the meta technology over time. The allocative efficiency gap change is the relative change of the allocative efficiency under the meta technology to that under the group-

specific technology over time. Panel data of 27 Taiwanese banks and 18 Chinese banks covering the period 2006-2009 are used for empirical study.

342. Productivity and Efficiency of World Airlines:An Empirical Application with order-m and alpha-Frontiers

Authors: Christophe Bontemps* and Steve Lawford and Nathalie Lenoir

Contact: bontemps@toulouse.inra.fr, steve_lawford@yahoo.co.uk , nathalie.lenoir@enac.fr

Category: Express

Abstract: Using a new database on international airlines, we investigate industry productivity and airline efficiency. First, we question the available methods of input and output measurement. We examine and compare firm-level Total Factor Productivity (TFP) indexes across airlines and over time. We then disentangle various components of the TFP. In particular, productivity and technical change are analyzed at the firm and industry levels using the decomposition proposed by Simar and Wilson (1998) and Wheelock and Wilson (1999). Second, we employ robust frontier estimation techniques (the order-m and alpha-frontiers, developed recently by Daouia, Florens, Simar and others) to compute firm-level efficiencies. We use the order-m and alpha-scores as alternative benchmarks for ranking major airlines by performance. We analyze changes in the ranking of these airlines over time and across airlines types (majors or low cost, US or European, and domestic or international).

343. Quality and productivity in Nordic hospitals

Authors: Sverre A.C. Kittelsen* and Kjartan S. Anthun and Ingrid M.S. Huitfeldt and the NHCSG group

Contact: sverre.kittelsen@frisch.uio.no

Category: Express

Abstract: Previous studies have indicated that Finnish hospitals have significantly higher average productivity than hospitals in the other Nordic countries Sweden, Denmark and Norway, as well as a substantial variation within each country. Controlling for within country variations in activity based financing, length of stay, outpatient shares, university hospital status or capital region only contributes to a small portion of these differences. This paper examines whether quality differences can form part of the explanation for productivity differences and attempts to uncover any quality-cost tradeoff at the hospital level.

Data have been collected on operating costs and patient discharges in each DRG group for all public acute hospitals in 2008-2009 through the Nordic Hospital Comparison Study Group (NHCSG). Patient-register-based measures of quality for the Nordic countries have been developed. Such measures should capture the generic aspects of outcomes and accessibility across large segments of patients with different diseases, and be available in national patient and demographic registers. Among the possibilities are readmissions, waiting time and mortality (in hospital or outside) and patient safety indices (PSI).

344. The Impact of Ownership Unbundling on Cost Efficiency: Empirical Evidence from the New Zealand Electricity Distribution Sector

Authors: Massimo Filippini and Heike Wetzel*

Contact: heike.wetzel@uni-koeln.de

Category: Discuss

Abstract: Several countries around the world have introduced reforms to the electric power sector. One important element of these reforms is the introduction of an unbundling process, i.e., the separation of the competitive activities of

supply and production from the monopole activity of transmission and distribution of electricity. New Zealand, for instance, adopted an ownership unbundling in 1998. This paper analyzes the cost efficiency of 28 electricity distribution companies in New Zealand for the period between 1996 and 2011. Using a stochastic frontier panel data model, a total cost function and a variable cost function are estimated in order to evaluate the impact of ownership unbundling on the level of cost efficiency. The results indicate that ownership separation of electricity generation and retail operations from the distribution network has a positive effect on the cost efficiency of distribution companies in New Zealand. The estimated effect of ownership separation suggests a positive average one-off shift of 23 percent in the level of cost efficiency in the short-run and 15 percent in the long-run.

345. Financial Deregulation and Allocative Efficiency in Banking

Authors: Shabbir Ahmad and Abid A. Burki*

Contact: shabbir.ahmad@uqconnect.edu.au , burki@lums.edu.pk

Category: Explain

Abstract: Over-regulation promotes sub-optimal resource allocation due to which banks may fail to minimize costs or maximize profits. Assuming that banks minimize cost when actually they don't may produce biased parameter estimates and elasticity. We contribute to literature on comparative efficiency of banks when they fail to minimize costs. We extend the general framework due to Lau & Yotopoulos (1971) to model allocative inefficiency in a non-competitive environment and apply this model to data of commercial banks from Pakistan for the period 1991 to 2005. To study the temporal relationship, we divide the sample into pre-deregulation (1991-96) and post-deregulation (1997-05) phases. The joint estimation of equation system for generalized translog model is achieved by IZEF model. The results confirm that banks fail to minimize costs due to sub-optimal allocation of banking inputs. Estimates of time variant allocative inefficiency suggest that over-utilization of banking inputs gradually comes closer to unity or to a point where there is absence of allocative inefficiency. These results confirm that deregulation policies in Pakistan's banking sector have been partly successful in reducing mis-allocation of banking inputs.

346. Conditional Efficiency Analysis of Municipal Service Provision in Germany

Authors: Maria Nieswand

Contact: mnieswand@diw.de

Category: Discuss

Abstract: This paper examines the efficiency of the public service provision delivered by German municipalities. The municipal efficiency is estimated by the conditional order-m approach according to the methodology proposed by De Witte and Kortelainen (2013) extending the ideas of Cazals et al. (2002) and Daraio and Simar (2005). This allows accounting for environmental variables that cannot be controlled by the municipalities and that possibly influence the production possibilities, which dismisses the separability condition. Furthermore, the environmental variables can be both discrete (ordered and unordered) and continuous. We perform a nonparametric regression to evaluate the impact of these variables. The data set covers 1,060 German municipalities, located in nine of the 16 Federal States, for the year 2005. We use the total current expenditures to measure input and six output variables representing mandatory and voluntary municipal tasks. The heterogeneity in operating conditions is captured by a set of six environmental variables. We find that the average performance increases about 5 % when taking the heterogeneity in operating conditions into account. All considered

environmental variables are statistically significant.

348. Measuring Firm-Level Capital Stock and Productivity in Luxembourg's Manufacturing Sector

Authors: Umut Kilinc

Contact: Umut.Kilinc@statec.etat.lu

Category: Young Researcher (YR)

Abstract: This paper evaluates some widely-used methods of aggregate capital accounting and offers a modification to construct capital stock at the firm-level. The algorithm proposed in this paper can be used in the estimation and the analysis of firm productivity, as well as in the sole measurement of firms' capital stock. The proposed methodology is applied for the manufacturing sector of Luxembourg, and the results from alternative methods are discussed comparatively. This study also provides a descriptive analysis of firm dynamics, productivity, factor allocation and creative destruction in Luxembourg's manufacturing. Findings show that allocative efficiency is dramatically low in some particular manufacturing industries. Although gains from entry is rather small, firm-level exit is found to have significantly positive contribution to aggregate productivity growth for the period from 1996 to 2009.

349. Panel Data Nonparametric Estimation of Production Risk and Risk Preferences: Application to Polish Dairy Farms

Authors: Tomasz Gerard Czekaj* and Arne Henningsen

Contact: tcz@foi.ku.dk, arne@foi.ku.dk

Category: Young Researcher (YR)

Abstract: It is generally acknowledged that production risk and price uncertainty affect production decisions. Just and Pope (1978) proposed an analytical framework to examine production risk using a stochastic production function with an additive heteroscedastic error term. Although this approach has been widely used in the literature, most of the studies use parametric specifications of the mean production function as well as the risk (variance) and risk preference functions. However, it is well acknowledged that the parametric specification of functional form involves the risk of parametric misspecification, which may bias estimates. This problem may be solved by the use of nonparametric regression methods. Recently, Kumbhakar and Tsionas (2009, 2010) showed how to adopt these methods in the Just and Pope (1978) framework. We extend the approach of Kumbhakar and Tsionas (2009, 2010) to panel data and apply a local linear kernel estimator to estimate the mean production function, the risk (variance) and the risk preference functions based on an unbalanced panel data set of Polish dairy farms. Moreover we test the significance of the explanatory variables and discuss the use of logarithmic quantities and a multiplicative error term.

350. Measuring micro-level competitiveness: a model-based multidimensional approach

Authors: Rosa Bernardini Papalia and Annalisa Donno*

Contact: annalisa.donno2@unibo.it, rossella.bernardini@unibo.it

Category: Express

Abstract: The concept of competitiveness, for a long time considered as strictly connected to economic performances, evolved, above all in recent years, toward new, wider interpretations disclosing its multidimensional nature. The shift to a multidimensional view of the phenomenon has excited an intense debate involving theoretical reflections on the features characterizing it, as well as methodological considerations on its measurement. The present work has the objective of analyzing both tangible and intangible aspects

characterizing micro-level multidimensional competitiveness, and measuring it through a model-based approach. We propose a non-parametric approach to Structural Equation Models for the computation of multidimensional composite measures. Competitiveness is hypothesized to be determined by several latent dimensions (economic, labour, gender, innovation, environment), in their turn characterized by an inner complexity that Structural Equation Models allow to take into account. It will be possible to simultaneously consider the elements influencing micro-level competitiveness and to test not only their significance, but also to what extent they determine it. An empirical application to the Italian case will be presented.

351. Evaluating Performance of University¡¦s Business Colleges in Taiwan using the Wage-Metafrontier Function

Authors: Tsu-Tan Fu* and SN Hu and NY Lu and PH Kao

Contact: tfu@econ.sinica.edu.tw

Category: Express

Abstract: While most of the previous studies used performance indicators at school level for comparisons, they evaluated school performance from the perspective of educational suppliers. In this study, we attempt to consider school performance from the educational demand perspective. By using a unique survey to recent college graduates in 2005, we have collected data of starting and current wages for each college graduate, student¡¦s inputs in college and workplace and school characteristics. We develop wage metafrontier models for evaluating performance between university business colleges in Taiwan. Empirically, we develop two metafrontier models for the starting wage and current wage, respectively. Since the starting wages are offered under incomplete information of job market for both students and recruiters, therefore the former model can be regarded as the performance evaluation model with incomplete market information. On the contrary, the latter model is the model with complete job market information. Our preliminarily empirical results using DEA metafrontier models show that public schools perform averagely better than private schools in the starting wage model, whereas private schools perform averagely better than public scho

352. Eco-efficiency among dairy farmers: the importance of socioeconomic characteristics and farmer attitudes.

Authors: María Pérez Urdiales and Alfons Oude Lansink and Alan Wall*

Contact: awall@uniovi.es

Category: Express

Abstract: The concept of economic-ecological efficiency, or “eco-efficiency” has become an increasingly popular approach for analysing agricultural sustainability. In agricultural production, eco-efficiency measures the ability of farmers to transform environmental pressures (impacts) into economic value. We assess the eco-efficiency of the dairy sector in Spain using data from a survey carried out in 2011 for the specific purpose of analysing the ecological behaviour of 53 dairy farmers in the Spanish region of Asturias. The survey covers socioeconomic characteristics of farmers, attitudes towards the environment and specific environmental variables which have been used to calculate environmental indicators. To measure eco-efficiency we follow the approach of Kuosmanen and Kortelainen (J. Ind. Ecol., 2005), which uses DEA for aggregating environmental pressures and defines eco-efficiency as the ratio of economic value added to environmental pressures. We then analyse the influence on the eco-efficiency scores of the socio-economic characteristics and farmers’ attitudes using the truncated regression and bootstrapping procedures proposed by Simar and Wilson (J. Econometrics,

2007), finding that both sets of variables play an important role.

353. Using data envelopment analysis to assess environmental performance in nuclear power industry

Authors: Arnaud Abad* and Olga Goncalves and Nicolas Peypoch

Contact: arnaud.abad@univ-perp.fr

Category: Express

Abstract: Environmental problems and green issues have created an important interest on environmental performance (Meng et al., 2012). By 2010, the sector producing global electric power generated 12480.6 tonnes of CO2; 41% of global CO2 emissions. Nuclear energy can permit a transition towards a low-carbon energy system. However, this energy produces radioactive waste highly toxic.
This paper aims to measure the environmental performance of nuclear power industry. For this purpose a radial DEA (Data Envelopment Analysis) approach is used to measure environmental performance of a representative sample of countries. The proposed approach incorporates an output separation (desirable and undesirable outputs) for the environmental performance assessment.
This paper is not comparable with alternative research because it considers nuclear waste for evaluate the environmental performance of nuclear power industry in a sample of 24 OECD and non OECD countries. As a result, this paper contributes to the energy literature since very few studies concerns nuclear power plants.

356. Labor Compensation and Productivity at Plan Level in the European Automobile Industry

Authors: Jonathan Calleja-Blanco* and Emili Grifell-Tatjé

Contact: jonatan.calleja@uab.cat

Category: Explain

Abstract: The purpose of this paper is to study the link between labor compensation and productivity at plant level in the European automobile industry. The level of competitiveness of an economy depends on how well labor compensation is adjusted to productivity. This is especially true in the automobile industry, with an intensive use of labor.

In this study we analyze the adjustment of labor compensation to labor productivity and total factor productivity. The paper follows, expands and applies the methodology proposed by Grifell-Tatjé and Lovell (2013) based on a unit cost framework. A virtue of unit cost approach is its independence of unit size; it is a meaningful way to compare financial performance of units of varying size. We develop a model of unit cost change into the impacts of changing input prices and productivity change, both expressed in index number form. This framework allows us to assess the labor's net contribution to unit cost change. Furthermore, the paper decomposes productivity change by economic driver using a unit cost frontier. The methodology is applied to a longitudinal plant-level data on the European automobile industry in the period 2000-2011.

357. Multiplier constraints based on econometric distance functions for assurance region (AR) models in DEA

Authors: Markku Talonen

Contact: markku.talonen@pispala.net

Category: Discuss

Abstract: For measurement of efficiency in Data Envelopment Analysis (DEA), a linear problem (LP) is solved for each decision making unit (DMU). LP to be solved

is either an envelopment problem or a multiplier problem. In a multiplier problem for measurement efficiency in output orientation, optimal weights, called multipliers, are obtained for each DMU's inputs and outputs, such that each DMU obtains minimum ratio of weighted inputs to weighted outputs. Multipliers are constrained such that with optimal multipliers for any DMU, no DMU can obtain minimum ratio that is less than one. Thus, each DMU is shown in the best possible light in relation to other DMUs. In consequence of this, each DMU's best inputs or outputs obtain high multipliers, and worst inputs and outputs obtain small multipliers. Empirical results have shown prevalence of zero multipliers, which is a problem because efficiency measurement is based on a subset of inputs and outputs. To get rid of zero multipliers, we follow Dyson and Thanassoulis (1988), who constructed multiplier constraints as an assurance region (AR) for admissible multipliers. We suggest a new method for constructing ARs. Empirical results are presented for state employment agencies in Finland, 1992-2000;

359. SFA Pseudolikelihood – A New Way to Estimate Efficiency?

Authors: Mark Andor

Contact: andor@rwi-essen.de

Category: Express

Abstract: In their seminal papers, Aigner et al (1977) and Meeusen and van den Broeck (1977) simultaneously proposed the estimation of stochastic frontier production functions and thereby established stochastic frontier analysis (SFA). The estimation of stochastic frontier functions can be conducted in several ways, whereby there are particularly two estimation procedures. The most often used estimation technique is maximum likelihood (SFA ML). An alternative is the method of moments (SFA MoM). Olson et al (1980) as well as Coelli (1995) show that both estimators have their strengths and weaknesses.

This paper proposes a new approach to estimate the stochastic frontier function: the SFA pseudolikelihood (SFA PL). The production function is estimated via ordinary least squares method and is then modified by using the pseudolikelihood estimator of Fan et al (1996). An extensive Monte Carlo Simulation should show the virtues of the new approach. We expect that SFA PL outperforms the SFA MoM and that SFA PL has comparative advantages vis-à-vis the SFA ML, when the ratio of noise to inefficiency is high or the sample size is small. Hence, the value of this paper is the proposition of a new alternative to the conventional SFA ML.

360. Impact of energy policy instruments on the estimated level of underlying energy efficiency in the EU residential sector

Authors: Massimo Filippini and Lester C. Hunt and Jelena Zoric*

Contact: mfilippini@ethz.ch, L.Hunt@surrey.ac.uk, jelena.zoric@ef.uni-lj.si

Category: Explain

Abstract: The promotion of energy efficiency is seen as one of the top priorities of EU energy policy (EC, 2010). In order to design and implement effective energy policy instruments, it is necessary to have information on energy demand price and income elasticities in addition to sound indicators of energy efficiency. Following Filippini and Hunt (2011, 2012) this research combines the approaches taken in energy demand modelling and stochastic frontier analysis (SFA) in order to econometrically estimate the level of efficiency for the residential sector in the EU-27 member states for the period 1996 to 2009. As opposed to the more conventional indicator of energy intensity (i.e., energy demand to GDP ratio), this measure of energy efficiency controls for a range of economic and other factors and is therefore viewed as a more suitable approach to measure energy efficiency. Estimation results confirm

that the EU residential sector indeed holds a relatively high potential for energy savings from reduced inefficiency. Furthermore, results suggest that financial incentives and energy performance standards play an important role in promoting energy efficiency improvements, whereas informative measures do not have a significant impact.

361. A comparison of alternative Malmquist index decompositions

Authors: Dr. Roxani Karagiannis

Contact: roxani@uom.gr, rkarag@kepe.gr

Category: Explain

Abstract: It is well known in the efficiency and productivity literature, that when technology exhibits constant returns to scale the Malmquist productivity index can be decomposed into only two components regarding its sources of change: technical change and change in technical efficiency. When however technology exhibits variable returns to scale they are alternative ways to decompose the source of change in the Malmquist index (Fare et al. (1994), Grifell-Tatje and Lovell (1996, 1999), Ray and Desli (1997), Wheelock and Wilson (1999), Balk (2001), Orea (2002), Lovell (2003) and Zofio (2007)). These decompositions differ to each other in two aspects: first, the way technical change is measured and second, the way to measure the scale effect:

The aim of this paper is to compare the aforementioned alternative ways to decompose the source of changes in the Malmquist index. For the empirical analysis we use data on observed inputs, like as the number of beds, the number of physicians or the number of other hospital personnel and outputs, like as the number of inpatient days or the number of outpatient visits for a panel of Greek public hospitals during the period 2007-2011.

362. Cross-sector Differences in Farm-level Productivity: The Case of Greece

Authors: Maria Vrachioli* and Giannis Karagiannis

Contact: mariavrahioli@gmail.com, karagian@uom.gr

Category: Express

Abstract: In this work we examine both the within-sector labor productivity dispersion and the within-sector covariance between size and labor productivity, which is a robust measure to investigate the impact of reallocation hypothesis. To quantify the within-sector covariance between size and productivity, we use an empirical decomposition of the sector-level productivity as proposed by Olley and Pakes (1996). This decomposition splits the index of sector-level productivity into an unweighted firm-level average and a covariance term. This covariance term captures the within-sector covariance between size and productivity. To explore the covariance term, and therefore the reallocation hypothesis, we use FADN data for Greek cotton, tobacco, cereals and olive oil producers covering the period 1990-2008.

363. Productivity in the Spanish Public Universities, 2000-2009

Authors: Carmen Perez-Esparrells* and Angelica Vazquez-Rojas and Jose Gomez-Sancho and Javier Salinas-Jimenez

Contact: carmen.perez@uam.es, callinalli@yahoo.com.mx, jmgomez@unizar.es, javier.salinasj@uam.es

Category: Discuss

Abstract: This paper analyzes the change in total factor productivity and its components by means of the Malmquist index with a nonparametric approach for the 47 public universities in Spain in the period 2000 to 2009. This analysis has been approached by three models: a comprehensive perspective, a teaching perspective and research-only perspective. The

results show that positive changes in productivity for Spanish universities identified in the study period were positively driven by the effect "frontier shiftâ€□ and to a lesser extent by the effect of "catching up". In relative terms, the overall productivity growth of universities during this period was associated with increases in the productivity of the research activity, and most can be explained because all universities have favored the expansion of the boundaries in time.

364. Managerial indicators and performance analysis in dairy farming

Authors: Timo Sipiläinen* and Matti Ryhänen and Sami Ovaska

Contact: timo.sipilainen@helsinki.fi

Category: Express

Abstract: The aim of the article is to test how specific managerial indicators are linked to the performance of dairy farms. The indicators are likely to be connected with the input-output relations, and therefore, we cannot assume that these indicators are separable from inputs and outputs. An important aspect is that agricultural production typically suffers from stochastic variation especially due to weather. Therefore, at least robustness to outliers is also a desirable property if stochastic approach is not applied.
In the analysis we apply nonparametric, robust conditional efficiency approach, originally introduced by Cazals et al. (2002) and Daraio and Simar (2005, 2007). In contrast to two-stage approaches, the conditional efficiency technique avoids the assumption that contextual variables would only affect efficiency scores and not the efficient frontier. The use of partial frontiers makes the approach less sensitive to outliers. In the analysis, unconditional and conditional efficiencies are estimated. Non-parametric local linear regression is used to assess the effect of managerial indicators on conditional/unconditional efficiency ratio. The statistical inference is derived from bootstrapping (De Witte and Kortelainen 2012).

365. Tropical Production Technologies

Authors: Walter Briec and Qi Bin Liang and Rabaozafy Louisa Andriamasy* and Bernardin Solonandrasana

Contact: rabaozafy.andriamasy@etudiant.univ-perp.fr, briec@univ-perp.fr

Category: Express

Abstract: This paper proposes to model production technologies with an upper semilattice structure. The concept of Tropical-convexity is obtained by making the formal substitution + 7! and 7!. Tropical-convex technologies combine both an upper semilattice structure and a divisibility assumption. This technologies enjoy interesting properties. The most interesting concerns the slope of the production frontier. In convex models this slope is nonincreasing whereas, in a tropical-convex context, nonin-creasing and nondecreasing slopes may alternate with one another.
By the nature of tropical-convex sets,we can develop a theory of duality in tropical-convexity and this paper proposes a dual economic inter-pretation. This we do by introducing a max-plus cost function.We prove that the translation distance function is primal to this max-plus cost function that is dual to the translation distance function. Along this line a nonparametric production model is built.

366. Agricultural Productivity Gaps in Latin America and the Caribbean with Climatic Considerations: A Preliminary Stochastic Production Frontier Analysis

Authors: Michée A. Lachaud* and Boris E. Bravo-Ureta and Carlos Ludena

Contact: michee.lachaud@uconn.edu,boris.bravoureta@uconn.edu,CARLOSL@iadb.org

Category: Young Researcher (YR)

Abstract: A comprehensive analysis of the relationship between agricultural productivity and climate variability is important for Latin America and the Caribbean (LAC) where agriculture remains important in overall economic growth. Most previous studies focusing on agricultural productivity in LAC neglect the impact of climatic variability. Therefore, the objective here is to analyze the effect of climatic variables on agricultural productivity in LAC across countries and overtime. A Stochastic Production Frontier (SPF) framework is used along with FAO data for 22 LAC countries over a 47 year period (1961-2007). Climatic variability is introduced in the SPF in two alternative ways: 1) Dummy variables to account for the ENSO phenomenon; and 2) Various temperature and precipitation measures. The methodology, based on Hughes et al. (2011), allows for the isolation of climatic variability effects. We derive a climatic variable response curve that captures the change in production associated with climate variables. A climate effects index is constructed and Total Factor Productivity change is decomposed into technological, efficiency and scale changes. Subsequently, TFP is adjusted by the climate effects index to develop revised TFP measures.

367. Interregional Performance of the Public Health System of a High-Inequality Country

Authors: Maria Cristina N. GRamani

Contact: mariacng@insper.edu.br

Category: Express

Abstract: Brazil has the sixth-highest gross domestic product (GDP) in the world but is ranked 85th according to the health Human Development Index (HDI). This discrepancy can be partially justified because Brazil is a country with continental dimensions and a heterogeneous economy between states. Studies examining health performance generally compare countries with similar characteristics to obtain useful performance measures. In contrast, this study focuses on the health performance of Brazil, a country with high socioeconomic inequalities. Specifically, this study aims to disaggregate the overall health performance of all 27 states in four perspectives and evaluate the interregional performance of each perspective. The balanced scorecard methodology was applied to define the four perspectives: financial, customer, internal processes and learning & growth, and data envelopment analysis methodology was employed to calculate the performance of each perspective. The results showed large performance differences among the federal units and, in general, the northern and northeastern regions underperformed relative to the other regions. Finally, it is also confirmed the different drivers of health performance obtained from each region.

368. Efficiency Spillovers and Decomposition: With an Application to State Manufacturing in the U.S.

Authors: Anthony Glass* and Karligash Kenjegalieva and Robin Sickles

Contact: A.J.Glass@lboro.ac.uk , K.A.Kenjegalieva@lboro.ac.uk , rsickles@rice.edu

Category: Explain

Abstract: In this paper we make three contributions to the fledgling literature on spatial frontier modeling. Firstly, we develop a spatial autoregressive cost frontier model. Secondly, we set out an approach to calculate technical and allocative efficiency spillovers using the own (i.e. direct), spillover (i.e. indirect) and total (direct plus indirect) shadow prices. Thirdly, the standard monotonicity and curvature tests for a non-spatial cost function are extended to the case where there is spatial autoregressive dependence. We apply the three developments using data for state manufacturing in the U.S. for the period 1997-2008.

369. How efficient are German power plants? A nonparametric

performance analysis of heterogeneous electricity generation technologies in a meta frontier framework

Authors: Stefan Seifert* and Astrid Cullmann and Christian von Hirschhausen

Contact: sseifert@diw.de

Category: Express

Abstract: In the light of the ongoing integration of renewable energy sources in the German electricity generation system classical fossil fueled power plant operators are facing new challenges: on the one hand, they are now competing with technologies with basically zero variable costs, on the other hand public view demands more and more focus on emission reduction and sustainable energy supply. However, due to the Germany's nuclear phase-out in the next decade fossil-fuel power plants will play an important role for the security of electricity supply. In this paper we are comparing eco-efficiency and technical efficiency on the plant level using non-parametric DEA in the metafrontier framework.

The analysis is based on a unique cross section sample including 949 power stations and industrial power plants supplying electricity as well as heat (e.g. as district heating or for cogeneration) for the year 2009. The power plants technology is modeled using 3 inputs (capital (capacity), labour (FTE), energy (fuel in GJ)) to produce desirable (electricity and heat) and undesirable outputs (emissions). To account for technological differences efficiency is estimated relative to group frontiers depending on the underlying input (e.g. coal, gas o

370. Eco-Efficiency and Eco-Productivity change over time in a multisectoral economic system

Authors: Bernhard Mahlberg* and Mikulas Luptacik

Contact: Bernhard.Mahlberg@wu.ac.at

Category: Discuss

Abstract: Like Luptacik and Böhm [Luptacik, M., Böhm, B., 2010. Efficiency analysis of a multisectoral economic system. Central European Journal of Operations Research 18, 609-619] we measure eco-efficiency of an economy by means of an augmented Leontief input-output model extended by constraints for primary inputs. Using a multi-objective optimization model the eco-efficiency frontier of the economy is generated. The results of these multi-objective optimization problems define eco-efficient virtual decision making units (DMUs). The eco-efficiency is obtained as a solution of a date envelopment analysis (DEA) model with virtual DMUs defining the potential and a DMU describing the actual performance of the economy. In this paper the procedure is extended to an intertemporal approach in the spirit of the Luenberger productivity indicator. This indicator permits decomposing eco-productivity change into eco-efficiency change and eco-technical change. The indicator is then further decompounded in a way that enables us to examine the contributions of individual production factors, undesirable as well as desirable outputs to eco-productivity change over time. For illustration purposes the proposed model is applied to investigate eco-productivity

371. Competitive tendering and the cost efficiency of Dutch municipal waste management

Authors: Janneke Wilschut* and Flora Felso and Hans de Groot

Contact: j.a.wilschut@tudelft.nl

Category: Express

Abstract: A cost efficient system for collecting household waste reduces local charges and increases value for money for Dutch citizens. Some municipalities have

their own waste collection service, while others have concluded contracts with other municipalities or third parties for collecting and disposing household waste. In this study we identify differences in cost efficiency related to the organizational form of waste management, in particular the terms and conditions of tenders.
We compared the cost efficiency of the waste management of the individual municipalities by estimating a stochastic cost function that relates deflated costs to two production variables. The production variables are the number of households and the total amount of domestic waste.
The average cost efficiency of waste management in 2010 is 95.6%. The tendering municipalities are more cost-efficient than the other municipalities in 2010 (97.2% on average). We find that, although the differences in cost efficiency between municipalities are small, improvements can be made by organizing a tender in collaboration with other municipalities, a high weight for price in the awarding criteria and including some specific terms and conditions such as a penalty clause.

372. Dual-technology efficiency measurement in the U.S. power sector

Authors: Christian Growitsch and Simon Paulus* and Hannah Schwind and Heike Wetzel

Contact: simon.paulus@ewi.uni-koeln.de, hannah.schwind@ewi.uni-koeln.de

Category: Express

Abstract: In the US, coal- and gas-fired power plants represent 70% of the power mix, accounting for 2.1 mt of CO2 (EIA 2013). In the last decade, this sector has undergone far-reaching changes, from market liberalization in parts of the country to new environmental regulation and, lately, dramatic decreases of natural gas prices. Due that latter ‘shale gas revolution’, gas-fired plants have started competing with coal plants. This inter-technology competition raises the question on the evolution of plant efficiency and the ability to adapt to a market environment. Hence, we use productivity analysis techniques to analyse the dynamics between technological performance, plant-specific characteristics and public interventions. Unlike past productivity research where generation types were separately assessed, this work considers conventional electricity generation from coal and gas as a joint technology and disentangles the drivers behind efficiency evolutions. Using plant specific panel data from 2001 to 2011, our proposed “dual-technology” analysis employs ‘good’ and ‘bad’ outputs and integrates material-balance concerns. We expect that the changing market environment triggers potential offsetting mechanisms among plant parameters.

373. Inference in fixed-effects stochastic frontier models

Authors: Federico Belotti* and Giuseppe Ilardi and Andrea Piano Mortari

Contact: federico.belotti@uniroma2.it

Category: Explain

Abstract: The fixed-effects estimation of the true Stochastic Frontier model proposed in Greene (2005) may produce severely biased estimates of the variance parameters due to the incidental parameters problem.
Chen et al. (2011) and Belotti & Ilardi (2012) recently proposed two different approaches to overcome this problem.
In this work, we combine the advantages of the aforementioned approaches and propose consistent inferential procedures for a heteroscedastic true fixed-effects specification for the Normal-Half Normal and the Normal-Truncated Normal models. Furthermore, we extend these specifications to the dynamic case by considering autocorrelated inefficiency together with fixed-effects.
By relying on the first-difference transformation, both proposals eliminate the

nuisance parameters and achieve consistency also for N → ∞ with fixed T. Evidence from Monte Carlo simulations shows accurate finite sample performances in terms of bias and MSE even in presence of a limited number of units. An empirical application using a panel of US electric utilities is provided to test these estimators with real data.

374. Environmental Efficiency in Waste Management: an Empirical Analysis of Italian Municipalities

Authors: Ferraris Matteo** And Alessandro Manello

Contact: m.ferraris@ceris.cnr.it

Category: Discuss

Abstract: In the light of the recent European environmental regulation, in Italy, waste collection management has been involved in some important changes both from environmental and management point of view. From the one hand, firms want to maximize the quantity of collected Municipal Solid Waste (MSW) showing an increasing capacity of waste collection per unit of labor and capital, from the other hand they want to minimize the level of Undifferentiated Solid Wastes (USW) in order to meet environmental goals. This paper extend the concept of Directional Distance Function (DDF) to the waste sector, in which previous applications of efficiency models have been mainly focused on the cost-function side.
The idea of DDF (by Chambers et al.,1996; 1998) is here applied to treat asymmetrically two categories of outputs: one desirable (amount of MSW) and one undesirable (level of undifferentiated wastes) both observed (with inputs) from a sample of around 450 Italian municipalities during 2006. Computed efficiency scores are analyzed in light of different tariff systems (e.g. flat fee and pay as you through) , different waste-collection schemes (e.g. drop off and door to door) and prevalent political side in local government. Therefore, the econ

375. Regional framework conditions and the efficiency of Innovation Investments

Authors: Andrea Conte

Contact: andrea.conte@ec.europa.eu

Category: Explain

Abstract: Innovation is not randomly distributed among firms, but is rather the outcome of successful strategies, investment and relationships which firms actively seek and develop in the market.
This paper provides a measure of the efficiency of different innovative investments in terms of both innovative outputs and economic performance. Stochastic Frontier Analysis (SFA) techniques are employed to measure the efficiency across firms with respect to different economic and innovative outputs. Data for the empirical analysis are drawn from the Community Innovation Survey, which provides the most comprehensive picture of the innovative process in the European manufacturing and service sectors. These efficiency levels are then explained by a set of environmental and firm-specific determinants.
Specific attention is devoted to regional differences by looking specifically at differences in regional "framework conditions" (i.e. innovation-enhancing components such as the quality of government, type of public spending etc.).
In turn, empirical results are used as an input into the computable general equilibrium (CGE) RHOMOLO model currently under development by Commission services to support the evaluation of Cohesion policy investments.

376. Ex-ante and Ex-post Merger Analysis in Infrastructure Regulation:

Evidence from Electricity Distribution in Norway

Authors: Per J. AGRELL and Peter BOGETOFT and Thor Erik GRAMMELTVEDT

Contact: per.agrell@ucluovain.be,pb.eco@cbs.dk

Category: Explain

Abstract: The incentives for restructuring among network-based monopolies such as electricity distribution systems are explicitly set by the regulation regime used. In the case of DEA-based yardstick regulation, such as in Norway and Germany, correct incentives for mergers and task restructuring are important for the long-term welfare maximiza- tion. The Norwegian regulator NVE has adopted a policy based on the Bogetoft and Wang (2005) merger effect decomposition model. Their procedures involve comparing the sum of the cost norms for each of the involved firms with the cost norms that result if they are treated as a single, merged entity. This difference, which is equivalent to the harmony effect and is referred to as such in the Norwegian regulation, is then used to correct the cost norm calculated for the merged firm. The net present value of the harmony effect over 10 years is calculated and paid as a regulatory windfall gain to the merged firm. In effect, this means that the extra saving potential associated with the har- mony effect can be retained by the firms for the first 10 years. Thereafter, the savings must be transferred to the end-users. We evaluate this policy analytically and empiri- cally using data for mergers between Norwe

377. Primary education efficiency in Burkina Faso: a multi-output stochastic frontier analysis

Authors: Elise Wendlassida Miningou* and Valerie Vierstraete

Contact: m.elisee@gmail.com

Category: Young Researcher (YR)

Abstract: Primary education plays an important role in human capital development particularly in developing countries. In many of these countries, several policies have been implemented in order to improve the quality and the access to primary education. Thus, during the last decade, many actions have been undertaken in order to develop the education sector in Burkina Faso. However, when comparing the different provinces of Burkina Faso, one can notice that there is a greater disparity in indicators of the access to and the quality of education than in resources allocated. This remark can raise the issue of the efficient use of resources in the primary education sector through provinces of Burkina Faso. Using the SFA method, an assessment of the efficiency of the 45 provinces of Burkina Faso in their use of primary education resources is proposed. Since we want to take into account the access to and the quality of the education sector as primary education outcomes, we use a multi-output specification of the SFA method. We also examine the explanatory factors of primary education efficiency in Burkina Faso. The results show that the system of primary education in Burkina Faso has an overall efficiency of about 58%.

378. Primary education efficiency in Burkina Faso: a multi-output stochastic frontier analysis

Authors: Elise Wendlassida Miningou* and Valerie Vierstraete

Contact: m.elisee@gmail.com

Category: Young Researcher (YR)

Abstract: Primary education plays an important role in human capital development particularly in developing countries. In many of these countries, several policies have been implemented in order to improve the quality and the access to primary education. Thus, during the last decade, many actions have been undertaken in order to develop the education sector in Burkina

Faso. However, when comparing the different provinces of Burkina Faso, one can notice that there is a greater disparity in indicators of the access to and the quality of education than in resources allocated. This remark can raise the issue of the efficient use of resources in the primary education sector through provinces of Burkina Faso. Using the SFA method, an assessment of the efficiency of the 45 provinces of Burkina Faso in their use of primary education resources is proposed. Since we want to take into account the access to and the quality of the education sector as primary education outcomes, we use a multi-output specification of the SFA method. We also examine the explanatory factors of primary education efficiency in Burkina Faso. The results show that the system of primary education in Burkina Faso has an overall efficiency of about 58%.

379. Evaluating the influence of meteorological conditions on dairy production

Authors: Jose A. Perez and David Roibas* and Alan Wall

Contact: droibas@uniovi.es

Category: Express

Abstract: Livestock farming is highly sensitive to weather conditions (St-Pierre et al., 2003). However, there is only one study that we are aware of that relates weather conditions to milk production and efficiency (Mukherjee et al. 2012). These authors analyze the effect of heat stress suffered by dairy cows on productivity using a sample of farms from Florida and Georgia (USA), where heat stress often occurs. However, weather conditions also influence crop yields and therefore feed production inside the farm will be influenced by meteorology. This study accounts for both these influences of weather on milk production: cow comfort, on the one hand, and forage production on the other. The sample used is an unbalanced panel with information from 375 dairy farms in the region of Asturias, Spain observed during the period 2006-2011. Weather variables (temperature, humidity, rainfall, wind speed and insolation) were provided by the State Meteorological Agency and come from 11 meteorological stations spread over the region. In order to assess the impact of weather variables on milk production a stochastic frontier analysis is carried out using the meteorological variables as determinants of the distribution of the asymmetric error term.

380. The efficiency of renewable energy support policies: A stochastic frontier analysis approach

Authors: Andreas Knaut* and Simeon Hagspiel

Contact: andreas.knaut@ewi.uni-koeln.de, simeon.hagspiel@ewi.uni-koeln.de

Category: Express

Abstract: An increasing amount of renewable energies for the supply of electricity is a major aim of most European countries. Since renewable energies are mostly not yet competitive to conventional generation technologies, renewable support policies had been implemented to promote investments. During operation, the various policy designs performed differently with respect to their efficiency. An optimal design has yet to be found. Now, the numerous implementations and changes in policy designs in the last decade can be considered as natural experiments of different policy instruments. In this paper, we measure the performance of these instruments by applying panel-data stochastic frontier analysis. Taking realized renewable electricity generation volumes as output, we use technology-specific support expenses, installed capacities and environmental variables as inputs. By comparing various renewable policy frameworks with respect to their technology-specific expenses we are able to benchmark the performance of different policy designs. We identify operational best policy practices and quantify the

deviation of alternative implementations.

381. Estimation of Market Power and Efficiency: A Unified Approach

Authors: Mike Tsionas and Subal Kumbhakar

Contact: tsionas@aueb.gr, kkar@binghamton.edu

Category: Explain

Abstract: We propose new econometric specifications that take account of the endogeneity (correlation) issues between cost efficiency and market power. We argue that the formal examination of the relationship between market power and efficiency calls for the development of new econometric models where the latent nature of both these variables creates new problems that have to be properly addressed. We believe that competition and efficiency measures must derived from a common model in order to be able to use, interpret and analyze them on common grounds. Alternatively, what is needed is a unifying framework where cost efficiency and market power can be estimated jointly by taking account of their dependence. By doing so efficiency estimates are automatically adjusted for market power. In fact, we show how the Lerner index can be properly used in this context through an additional equation. Since cost efficiency appears in both equations we have a simultaneous equation structure, a fact that is ignored in the literature and can lead to undermine the statistical validity of estimates, but in addition efficiency is an unobservable, latent variable.

382. TECHNICAL EFFICIENCY AND METATECHNOLOGY RATIOS FOR CATTLE FARMS IN ARGENTINA: A META-FRONTIER ANALYSIS

Authors: Daniel Lema* and Nicolas Gatti and Victor Brescia

Contact: danilema@correo.inta.gob.ar, ngatti@correo.inta.gob.ar, vbrescia@correo.inta.gob.ar

Category: Express

Abstract: The paper presents an estimation of technical efficiency (TE) and metatechnology ratios (MTR) for cattle farms in Argentina using the meta frontier approach (MF) developed by Battese, Rao and O'Donnell (2004) and O'Donnell, Rao and Battese (2008). The data base is a cross section sample of 1300 cattle farms that were surveyed during the year 2010 in several regions of Argentina. The estimation results show that firms from Pampa´s region (the most important productive zone) have an average technical efficiency (TE) of 53%-56%, meanwhile for others less developed regions like the North-East and Nort-West, the TE is around 94-99%. To obtain a better measurement of the technology gap, the Meta-Technology Ratio (MTR) was estimated. This ratio represents the distance between the regional production frontier and the aggregate technology frontier or Meta-frontier (MF). The average MTR for Pampa´s region is 78-80%, in contrast, the others regions have an average MTR between 19% and 28%. These results are important to identify potential sources of productivity improvements in cattle production. At the Pampa´s region, the production frontiers are relatively close to the MF but the average TE could be improved, which suggests that firms could enhance the use of the existing technology. In other regions, the average efficiency is higher but the technology gap is important. To these cases, productivity gains could come from new technologies adoption and this would make the production function get closer to the MF.

383. Multiplicative aggregation of variables in DEA

Authors: Mette Asmild* and Jens Leth Hougaard and Francisco Imperatore

Contact: meas@foi.ku.dk

Category: Express

Abstract: The choice and definition of variables in DEA is an important issue and

amongst the important decisions to be made in empirical studies is the level of aggregation/disaggregation of variables. Usually (dis)aggregations are additive, but in the case of project duration and team size their aggregation into total work effort is multiplicative. We therefore in this paper investigate how DEA models can be formulated in order to appropriately incorporate such multiplicative factors.

384. THE IMPACT OF CORRUPTION AND FINANCIAL PERFORMANCE ON ECONOMIC DEVELOPMENT: A COMPARATIVE STUDY

Authors: Abdel Latef Anouze

Contact: aa153@aub.edu.lb

Category: Explain

Abstract: While previous economic development studies account only for the impact of financial performance on economic growth, the role of country transparency and corruption as socio -economic factors remain yet to be assessed. Furthermore, most of these studies are descriptive in nature; they have been developed based on statistical tests to establish relationships and predict economic development. In practice, statistical based studies suffer from numerous limitations including: a lack of proportionate and representative sample, and robustness of model building. An awareness of these limitations improves our understanding of the complexities involved in the selection of appropriate research methodologies and provides a solid background for proposing a holistic model.

This study concentrates on the socio-economic and financial factors so that economic growth is understood as function of both enter factors. Moreover, it integrates different data mining techniques; data envelopment analysis (DEA), random Forest (RF) and structural equations modeling (SEM). DEA is used to compute the performance of financial sector; whereas RF and SEM are used to predict and test the proposed holistic economic development model.

385. Quality of life in a country: Luenberger and Malmquist index generalizations of the HDI

Authors: Atakelty Hailu* and Robert G. Chambers

Contact: ahailu@are.uwa.edu.au

Category: Discuss

Abstract: This paper relies on recent advances in production theoretic approaches (e.g. Chambers (ET, 2002) and Hailu & Chambers (JPA, 2012)) to construct Luenberger indicators of quality of living for countries. Compared to the Human Development Index (HDI) which uses simple weights to average over multiple outcomes, the Luenberger indicator avoids the need for ad hoc weighting and instead lets the quality indicator for country depend on the best combination of outcomes delivered by a country's peers. Further, the quality indicators constructed in this study consider a wider set of outcomes, including incomes, life expectancy, education, corruption levels, democracy and peace. Country rankings obtained from our Luenberger indicator are compared to HDI based rankings. The paper also presents alternative Malmquist index generalizations of the HDI.

386. Modeling economic and environmental performance: incorporation of technological relationship between desirable and undesirable outputs within the distance function approach

Authors: Raushan Bokusheva* and Subal Kumbhakar

Contact: bokushev@ethz.ch

Category: Discuss

Abstract: The paper contributes to the existing methodology for modeling a polluting

production technology by presenting an extension of the distance function approach which allows consideration of technological relationship between traditional and environmentally detrimental outputs and thus a more adequate modeling of polluting technology. In our approach we suggest to describe a pollution-generating technology by means of two functions: one which catches the technological relationship between bad and good outputs and the other one which represents the relationship between outputs and inputs.

387. Risk-Loving and Risk-Averse Preferences in Mean-Variance-Skewness-Kurtosis Portfolio Modeling: A Common Characterization using the Shortage Function

Authors: Walter Briec and Kristiaan Kerstens* and Ignace Van de Woestyne

Contact: briec@univ-perp.fr, k.kerstens@ieseg.fr, ignace.vandewoestyne@hubrussel.be

Category: Explain

Abstract: This paper develops a nonparametric efficiency measurement approach for the static portfolio selection problem in mean-variance-skewness-kurtosis space. A shortage function is defined that can characterize both mixed risk-loving and mixed risk-aversion preferences: it can either look for possible increases in all four moments, or look for increases in uneven moments and decreases in even moments. We also establish appropriate duality relations with four moment investor utility functions. This framework is illustrated with two-dimensional and three-dimensional geometric reconstructions of the optimal portfolio frontiers. Furthermore, we try to characterize the optimal portfolios corresponding to the risk-loving and risk-averse preferences.

388. Upstream Product Market Regulations, ICT, R&D and Productivity

Authors: Gilbert Cette* and Jimmy Lopez and Jacques Mairesse

Contact: jimmy.lopez@u-bourgogne.fr

Category: Discuss

Abstract: We analyze the impact of anticompetitive Non-Manufacturing Regulations (NMR) on R&D, ICT and productivity of downstream industries, i.e. industries using intermediate inputs produced by the regulated industries. Our empirical model mobilizes three equations: ICT and R&D demand specifications as well as a multifactor productivity equation allowing estimating R&D and ICT elasticity. In each equation, we examine whether the impact of NMR is increasing with the intensity of use of regulated inputs. These specifications are estimated on a panel of 14 OECD countries and 13 industries over the 1987-2007 period. We find evidence that NMR have significantly: (i) reduced R&D and ICT capital accumulations and (ii) curbed productivity through these two channels and a 'direct' effect of NMR.

389. Multi-Media Advertising Efficiency

Authors: Preecha Asavadachanukorn and Saowaros Yaisawarng and Suthathip Yaisawarng*

Contact: Preecha@acc.chula.ac.th, Saowaros@acc.chula.ac.th, yaisawas@union.edu

Category: Express

Abstract: In 'red' ocean markets where competition is fierce, firms use advertising to compete for market shares. In 'blue' ocean markets where competition is irrelevant, firms use advertising to create demand for their products. Advertising Age (2012, p.17) reports that ad spending in the United States increased 4.3% in 2012 and is expected to increase by 3.5% in 2013. In emerging markets, the growth rates were much higher reaching the record of 13.7% in Russia and the trend continues. The worldwide ad spending is forecasted to reach $497.3 billion or 4.1% growth in 2013. How efficient is

the advertising in conveying desirable messages to potential customers? How best will the firms allocate their budget across channels of advertising media? Assuming that each firm pays the same price for each type of advertising media at a given year, this paper calculates DEA input-oriented cost technical advertising efficiency and the optimal media share for 20 top ad spenders, 2001-2009. These firms use multiple advertising media such as print, broadcast and Internet to generate sales and brand values. Our results would provide insights for firms to allocate their advertising budget to improve the effectiveness of marketing strategies.

390. Is land fragmentation an obstacle to adopting environmentally safer technologies in milk production? A latent class model approach.

Authors: Luis Orea* and Jose A. Perez and David Roibas

Contact: lorea@uniovi.es

Category: Express

Abstract: One of the aims of the Common Agricultural Policy is rural development where farmers receive direct payments to protect environment and preserve rural heritage. Most environmental requirements have to do with extensive farming that uses a large land area per cow. As this production system relies greatly on the land area being farmed, the negative effect of land fragmentation on milk production found by Perez et al. (2011) is likely especially tough in extensive production (as opposed to intensive farming). Thus, land fragmentation can make the above-mentioned policy much less effective. In this sense, this study examines whether land fragmentation has a larger impact on dairy production in extensive farms than in intensive ones. To achieve this aim, stochastic frontier production functions are estimated using a sample of Spanish dairy farms located in a region where land is highly fragmented. As unobserved technological differences among farms are expected (i.e. extensive vs. intensive), we propose using a latent class model approach to split our sample of dairy farms in different groups. Our approach also allows us to examine whether farms tend to select more (less) extensive methods as the degree of land fragmentation increases.

391. Sustainable productivity growth in the airport industry: evidence from Italy

Authors: Davide Scotti* and Alessandro Manello and Gianmaria Martini

Contact: davide.scotti@unibg.it, a.manello@ceris.cnr.it, gianmaria.martini@unibg.it

Category: Express

Abstract: The aim of the paper is to evaluate productivity dynamics showed by Italian airports' in light of both desirable (e.g., passengers, cargo and aircraft movements) and undesirable outputs. More in details, we focus on CO2 and Local Air Pollution (LAP) produced by aircraft during the Landing - Take off cycle (i.e., during airport operations). To the best of our knowledge, no previous papers consider the CO2 produced by airports' activities. The Directional Distance Function (DDF) approach is applied to obtain productivity growth indexes able to consider asymmetrically pollutants in computations. A sequential version of Malmquist-Luendberg indicators is adopted to obtain more reliable and robust results according to Oh and Hesmati (2010). We make a comparison between results coming from standard production models without undesirable outputs and those ones obtained with our methodology. Furthermore, we investigate the existing relationship among some airports' characteristics (e.g., ownership structure, airline dominance and low cost carriers' market share) and TFP growth over time. Finally, we intend to find possible socio-economic variables able to stimulate a certain path in eco-sustainable productivity growth.

392. Eco-efficiency and Environmental Rating Tools for Buildings

Authors: Tarmo Räty and Hiroki Ito

Contact: tarmo.raty@metla.fi

Category: Express

Abstract: This paper bridges the discussion between two independent fields of study; the environmental rating of buildings and nonparametric efficiency measurement. We will review the rating methods used in six different Environmental Rating Tools (ERTs) and will introduce an alternative approach known as Data Envelopment Analysis (DEA). In this context, we will call DEA type efficiency measures as eco-efficiency. We will first discuss some relevant methodological preliminaries of multiple criteria decision making and the production theory, and will show how they are implemented in different ERTs. The methods used in eco-efficiency and ERTs are similar, but in eco-efficiency the weights of environmental attributes are optimized for each building in turn - given the performance of reference buildings, eco-efficiency measure presents a maximum rating a building may get. Eco-efficiency can also take into account the fact that some of the attributes work as inputs for environmental quality, so that it is possible to model the impact of the level of operations on efficiency; usually implemented as constant or variable returns to scale. It is not seen as reasonable to use eco-efficiency on the sub-criteria level, but it could be justified to pro

394. Data Envelopment Analysis for Measuring of Economic Growth in Terms of Welfare Beyond GDP

Authors: Mikulas Luptacik and Martin Labaj and Eduard Nezinsky*

Contact: Mikulas.Luptacik@wu.ac.at, labaj@euba.sk, eduard.nezinsky@euba.sk

Category: Express

Abstract: Recent discussions on the definition of growth in terms of welfare beyond GDP suggest that it is of urgent need to develop new approaches for measuring the economic performance of the firms and national economies. The new concepts should take into account simultaneously economic as well as social and environmental goals. We first discuss several approaches to productivity measures. Then we extend the Data Envelopment Analysis models for environment to measure the so called eco-efficiency and for social indicators to take into account the social performance. For an illustration, we perform the analysis of 30 European countries in the year 2010. In the last section we discuss the possibilities of inter-temporal analysis of proposed models and of their use in ex-ante evaluation of different policy scenarios.

395. A Cost Frontier Approach to Analysing Productivity Change in Ethiopian Manufacturing

Authors: Christopher J. O'Donnell and Addisu A. Lashitew*

Contact: a.a.lashitew@rug.nl

Category: Explain

Abstract: We show how a cost function can be used to construct an input price index that satisfies important axioms from index number theory, including the identity and transitivity axioms. We use this index to form a total factor productivity index that can be exhaustively decomposed into measures of environmental change (capturing movements in the production frontier) and efficiency change (capturing movements towards, away from, or around the frontier). We illustrate the methodology using micro-level data of Ethiopian manufacturing firms. We use econometric methods to estimate the parameters of a variable returns to scale cost frontier. We then report estimates of productivity change, environmental change, scale efficiency change and cost efficiency change.

396. Using the latent class approach as a supervised method to cluster

firms in DEA: An application to the US electricity transmission sector

Authors: Manuel Llorca* and Luis Orea and Michael G. Pollitt

Contact: llorcamanuel@uniovi.es, lorea@uniovi.es, m.pollitt@jbs.cam.ac.uk

Category: Young Researcher (YR)

Abstract: In this paper we advocate using the so-called latent class model (LCM) approach to control for technological differences in traditional efficiency analysis of regulated electricity networks. Our proposal relies on the fact that latent class models are designed to cluster firms searching for differences in technology parameters. Moreover, our approach can be viewed as a supervised method for clustering data as it takes into account the same (production or cost) relationship that is analyzed later on, often using non-parametric frontier techniques. The simulation exercises confirm our expectations and show that the proposed approach outperforms other alternative sample selection procedures. The proposed methodology is illustrated with an application to a sample of US electricity transmission firms for the period 2001-2009.

397. Banking Competition, Efficiency, and Risk in Global Banking Industry

Authors: Sheng-Hung Chen

Contact: shenghong@mail.nhu.edu.tw

Category: Express

Abstract: Using comprehensive data on bank¡¦s financial information for listed and unlisted banks including commercial bank, cooperative bank, and saving bank in global banking sector form 1996 to 2010, this paper applies the theoretical framework by Boone (2008) to measure the degree of banking competition to decompose this effect on the inter-temporal dynamic relationship between bank risk and efficiency from SFA (Stochastic Frontier Analysis) utilizing Panel VAR (Vector Autoregression for Panel Data Model). Empirical evidence indicates saving banks on average show lower risk distribution than commercial banks and have steadily increasing over the period of 2003 to 2007. Over last decades, global banking industry presents decreasing performance in terms of cost and profit efficiency. In addition, cooperative banks show lowest cost efficiency while saving banks exhibit lowest profit efficiency. Based on cost efficiency measure, bank risk proxied by Z-score has higher correlation with cost efficiency and their lagged risk. This implies that banks with higher cost efficiency in previous year would significantly reduce current bank risk but this reverse influence shows in previous two year. Moreover, banks with higher banking competition in p

398. Sources of productivity growth in the new EU Member States and Russia

Authors: Ilya B. Voskoboynikov

Contact: i.voskoboynikov@rug.nl

Category: Express

Abstract: Transition from plan to market is accompanied by technological catching up and reallocation of inputs across industries. The influence of this transformation on productivity growth is ambiguous. On the one hand, technological spillovers and elimination of multiple price distortions should improve efficiency. On the other hand, the structural change could lead to the extension of low productive industries.

Using detailed newly developed industrial data of capital, labor and output for Russia as well as the EU KLEMS data for new EU member states in 1995-2007, this paper exposes industrial sources of productivity growth and the influence of structural change on productivity growth. The paper reports that

(i) there is convergence of multifactor productivity (MFP) to the technological frontier in many sectors; (ii) substantial contribution of labour reallocation to productivity growth is observed in Russia and Slovenia only; (iii) the influence of structural change on aggregate MFP growth is controversial. Value added reallocation to sectors with high MFP growth accelerates performance (High Skills Manufacturing in Hungary and Czechia), while the extension of stagnant sectors (Oil and Gas in Russia) slowdowns it.

400. CONGESTION OF INTENSIVE CARE UNITS USING AN APPROPRIATE PRODUCTION TECHNOLOGY

Authors: Diogo Cunha Ferreira* and Rui Cunha Marques

Contact: diogo.cunha.ferreira@ist.utl.pt, rui.marques@ist.utl.pt

Category: Explain

Abstract: Intensive Care Unit (ICU) is a specialized internment's department where most of patients are from the emergency department. Those present usually a higher illness severity than other internment medical units, which means they spend much more resources than the average. However, a problem of congestion could be also present, which happens when increases in one or more inputs can be associated with decreasing of one or more outputs. Indeed, more resources in health care may result in worst outputs or outcomes. This work aims to measure that effect as well as its main sources using the bias-corrected (with bootstrap) approach of Fare and Svenson (1980) and Fare, Grossokpf and Lovell (1985). A robust set of tests based also on bootstrap is performed as well, to assess the correct production technology. Data was collected from the official database of the Portuguese Ministry of Health, Central Administration of the Health System, for the 2008-2009 period and includes the different specialties belonging to the ICU. Input and output-oriented models are considered and compared. The results show important bias-corrected levels of congestion.

401. Technological progress and fixed capital investment in Russia's manufacturing industries in 2003--2011: firm level analysis

Authors: Eugenia Nazrullaeva* and Gregory Kantorovich

Contact: e.nazrullaeva@gmail.com, gkantorovich@hse.ru

Category: Express

Abstract: Do fixed capital investments influence technological progress? Scholars of applied growth modeling conventionally assume that investment growth leads to capital accumulation with no influence on technical efficiency and technology improvement. In contrast to that, the results of our study suggest that this theoretical assumption does not hold in reality (at least for Russian economy): investments do affect consumption of factor inputs in the production process.

The hypotheses we test are the following:

H1 Fixed capital investments influence factor elasticities (input/output coefficients) in the stochastic frontier framework.

H2 Investment may decrease the gap between an actual output and potential output (inefficiency component).

We have collected firm level data in Russia's manufacturing sector for the period 2003-2011. Our preliminary results suggest that fixed capital investments have a statistically significant influence on the variance of the inefficiency component. In addition to measuring the effect of investments on technical efficiency of Russian manufacturing firms, our framework may also provide valuable policy implications for efficient allocation of investment funds.

402. Another brick in the wall. A new Ranking of Academic Journals in Economics using a pure output oriented FDH

Authors: Antonio García-Romero and Daniel Santín* and Gabriela Sicilia.

Contact: agr333@gmail.com, dsantin@ccee.ucm.es, gsicilia@gmail.com

Category: Express

Abstract: The Journals rankings are widely used for various purposes, from hiring and promotion decisions, or to conduct research evaluation. There is a plethora of journals rankings in Economics. The most common procedures used to construct a journals ranking are based on citation. There is also a fair amount of rankings elaborated from the combination of several indicators mainly citations and experts opinion. The aim of this paper is to propose a pure output oriented FDH model to create a journals ranking in Economics. A second contribution of this paper is the introduction of a new usage-based indicator that we call the Seductive Power Index (SPI). We have collected data of five indicators for 282 journals in Economics. The indicators are the Impact Factor (IF), the h-index, the Article Influence (AI), a discounted version of the IF, and the SPI computed from two usage indicators. The results confirm that the ranking obtained using FDH from citation indicators is highly correlated with previously published rankings. Regarding the ranking obtained including the SPI, the correlation is significantly lower. This result reveals that the usage of journals and their scientific impact seem to be distinct variables.

403. Price and Politically Induced Productivity Changes Affecting CO2 Emissions of Danish Electricity and Heat Producing Plants

Authors: Geraldine Henningsen and Arne Henningsen* and Simon Bolwig

Contact: arne@foi.ku.dk, arne.henningsen@gmail.com

Category: Discuss

Abstract: Most researchers agree that anthropogenic CO2 emissions cause climate change and that these changes will have severe effects not only on humans. Therefore, many countries have implemented policies that aim at reducing CO2 emissions, where Denmark is one of the countries with the largest portfolio and the longest history of climate policies. We assess the effectiveness of these policies by analysing how they affect the CO2 efficiency of fuel-fired electricity and heat producers. We measure CO2 efficiencies by a distance function with CO2 as undesirable output. As the output quantities (particularly heat) are given for many plants, they can only improve their CO2 efficiency by reducing their fuel input or switching to fuels that cause lower CO2 emissions such as biofuels. Therefore, we measure efficiency as potential reductions of fuel input and the CO2 emissions. The distance measures are obtained by DEA based on a large plant-level panel data set of virtually all fuel-fired electricity and heat producers in Denmark for the years 1998 to 2011. Preliminary results indicate that climate policies have at most a very limited effect on the CO2 efficiencies.

404. Productivity, Efficiency, and Competitiveness of the Danish Farm Sector and their Determinants

Authors: Ole Fabricius* and Kurt Nielsen

Contact: olf@foi.ku.dk, kun@foi.ku.dk

Category: Young Researcher (YR)

Abstract: Abstract

The Danish agricultural sector is highly export-oriented: a very large proportion of Danish agricultural production is exported and the proportion of agricultural commodities in Danish exports is much larger than in other industrialized countries. Hence, the international competitiveness of the Danish farm sector is of high importance not only for Danish farmers but also

for the entire economy. However, in recent years, serious doubts about the international competitiveness of the Danish farm arose. Therefore, we will scrutinize the productivity and competitiveness of the Danish agricultural sector and compare it to six neighboring countries. For this, we use Data Envelopment Analysis (DEA) and a comprehensive farm-level dataset from EU's Farm Accountancy Data Network (FADN). As no data on physical quantities of the inputs and outputs are available, we use monetary units deflated by national price indexes so that price differences between countries are reflected in the input quantities. In a second-stage, we analyze the determinants of the efficiency-scores. The efficiencies of Danish farms are considerably lower than in Germany due to high wages and financing costs in Denmark.

406. FINANCIAL INNOVATION, COMPETITION AND TECHNICAL EFFICIENCY AMONG FINANCIAL INTERMEDIARIES

Authors: Meryem Fethi and Vania Sena* and Mohamed Shaban

Contact: vsena@essex.ac.uk

Category: Express

Abstract: There is agreement among economists that financial innovation is an important type of innovation (Miller, 1986; Merton, 1992). Innovation is a key driver of firms' survival and in this respect the financial sector is not different as financial innovation can help firms in the financial sector to be more productive and therefore to enhance their survival's likelihood. Its relevance lies not only in the centrality it plays in ensuring that the financial sector can grow steadily but also in the important role it plays in allowing other industries to grow and develop. For instance the creation of new financial products allows firms in all industries to raise capital at a lower cost than they would otherwise (Lerner, 2006) and therefore helps further investment and growth of the innovators. However, the process that leads to the production of innovation in the financial sector is still poorly understood as most studies focus on the diffusion of the innovation and its impact on the adopters' profitability (Frame and White, 2004).

Traditionally researchers have devoted a lot of effort to identify the characteristics of the financial innovation that make it different from innovation in other sectors, namely manufacturing (Lerner, 2006

407. Technological superiority

Authors: Mette Asmild and Jens Leth Hougaard*

Contact: meas@foi.ku.dk, jlh@foi.ku.dk

Category: Explain

Abstract: A relevant question for many productivity studies is whether one subsample provides better production possibilities than another subsample: One might for example question whether the regulatory framework of US banks provides better production possibilities than that of their European counterparts or whether one organizational form is better than another, for instance, cooperatives as opposed to investor owned firms.

In the present paper we suggest an approach to determining whether the production technology of one subgroup is superior to that of another subgroup. We first outline which characteristics an index of technological superiority should satisfy which leads to the conclusion that only two classes of indexes are relevant: Those building on (relative) volumes of the dominance set and those building on the number of observations dominated by the members of the subgroups. Next we overcome practical problems related to operationalizing the volume based index.

An illustration on demolition projects from two companies shows how the new index leads to different conclusions about technological superiority than when considering the average efficiency scores relative to the pooled frontier for the two subgroups.

408. PRODUCTIVITY ANALYSIS OF MICROFINANCE INSTITUTIONS (MFIs) IN BANGLADESH

Authors: Subir K Bairagi

Contact: subirkanti105@gmail.com

Category: Young Researcher (YR)

Abstract: This study estimates the inefficiency and productivity of 10 major MFIs in Bangladesh using the parametric (Stochastic distance function) and non-parametric (Malmquist) methods. Two outputs (gross loan portfolio, interest and fee income), and four inputs (assets, operating expenses, financial expenses, and number of staff) have been used, collected from the MIX Market. The data period covers from 2003 to 2011. Capturing the technological change a time trend is added in the distance function. Five efficiency variables, operational self sufficiency, loan loss rate, debt to equity ratio, cost per borrower, and percentage of female borrower, are also included to capture the firms' inefficiencies. The results show that on an average the rate of TFP growth in MFIs is 0.6% during 2003-2011, which is due to the technological progress (0.7%). These results are consistent with the non-parametric analysis (1% TFP growth; 1.1% technological growth). Both methods show that the efficiency growth is negative (-0.1%). The determinants of firms' inefficiencies are operational self sufficiency which is significant at the 1% level. Firm specific technical efficiencies show that only one microfinance organization, ASA, has been efficient over time.

409. Business Environment, Innovation and Productivity: Evidence from Russia's Regions

Authors: Helena Schweiger* and Paolo Zacchia

Contact: schweigh@ebrd.com, zacchia@econ.berkeley.edu

Category: Express

Abstract: Russia remains highly dependent on its natural resources. Innovation is high on the policy agenda and is viewed as an essential precondition for technological and structural changes.

Data from the recent regionally representative Business Environment and Enterprise Performance Survey show that there are significant differences in innovation activity of establishments across the Russian regions. We first look at determinants of innovation: besides the standard covariates we explore the role of business environment constraints. We deal with omitted variables and endogeneity. Using a CDM model that links together all the determinants and outcomes of the innovative process, we then try to account for the potentially multiple causal links between the firms' characteristics and business environment, the decisions to engage in innovation activity, and the innovation and productivity outcomes.

Preliminary results suggest that several business environment constraints affect innovation, in particular R&D activity. We find that there are productivity differentials between innovative and non-innovative firms. However, these do not appear to be due to the innovative process itself, or the effect of the latter is very small.

410. Technical Efficiency of Smallholder Agriculture in Developing Countries: The Case of Ethiopia

Authors: Anbes Tenaye Kidane* and Eirik Romstad

Contact: anbes2003@yahoo.com, eirik.romstad@umb.no

Category: Young Researcher (YR)

Abstract: In this paper we estimate the technical efficiency and its determinants of Ethiopian farmers using Ethiopian Rural Household Survey; panel data of 1994-2009. The true random effect (TRE) and true fixed effect (TFE) models proposed by Greene (2005a) are used. These specifications allow differentiating time-varying technical inefficiency from unit specific time invariant unobserved heterogeneity.
Farm size, labour, traction power, fertilizer and precipitation attain significant farm output elasticity. Land quality, extension program participation, credit and hoe use also significantly affect farm output. The five major agro-ecological zones included all experienced Hicks-neutral technological improvements in the study period. The average level of farm production efficiency for the surveyed farmers is 0.58, indicating that the average farmer in the sample produces significantly less value of output produced compared to the most efficient farmer using the same technology and inputs. The scale coefficient is 1.12.
Participation in off-farm activity, participation in extension program, credit use, household size-labour interaction, number of plot-farm size interaction, and farm size-labour interaction significantly affect farm househ

412. Construction Industry Performance: An International Comparison of Productivity and Environmental Efficiency in Brazil and Other Nations

Authors: Fernando Garcia* and Ana Lélia Magnabosco and Jorge Pires

Contact: fernando.garcia.freitas@gmail.com, jorge.pires@fgv.br

Category: Express

Abstract: We examine the performance of the Brazilian construction industry in the past years as compared to its peers in other countries, with respect to productivity growth, natural resources usage, energy usage and emission of pollutants. First we estimate a translog stochastic production frontier for the construction industry using a sample of 39 countries during the period 1995-2009, drawn from the World Input Output Database (Groningen). Productivity change is then decomposed and the contributions of technical change, scale effects, and changes in technical and allocative efficiency are evaluated. We also assess efficiency in the Brazilian construction sector under the lenses of energy and natural resources usage (water) as well as the emission of pollutants (carbon dioxide, methane, and nitrous oxide) comparing such emissions to those of a sample of countries. To that effect we use a fixed-coefficient (Leontief) input-output model of production and partial productivity ratios (or their reciprocal).

413. Dynamics of Factor Productivity Dispersions

Authors: Christian Bayer, Ariel Mecikovsky* and Matthias Meier

Contact: amecikovsky@uni-bonn.de

Category: Young Researcher (YR)

Abstract: This paper documents a new set of stylized facts on the joint distribution of labor and capital productivity in the cross section of fi
rms di
fferentiating between low and high frequencies. We exploit panel data from Germany, Chile, Colombia and Indonesia and show that the basic patterns are similar across the economies. First, we show that across factors there are signi
cant correlation patterns that di
ffer between low and high frequency. At high frequency, differences between a

firm's and the average productivity are positively correlated across factors, while they are negatively correlated across factors at low-frequency. Second, we show that the bulk of the cross-sectional dispersion in factor productivities of
firms is due to longlasting di
erences even after controlling for industry. We then develop a simple model of technology choice and show that the model is capable to replicate the basic patterns. Moreover, we show that such model economies that grow faster, i.e. developing economies, will endogenously exhibit larger dispersions in factor productivities. Finally, we discuss the welfare implications of our model.

414. The Brazilian Distribution Electric Power Companies Regulation Model

Authors: Lopes, Ana and Banker, Rajiv and Matos, Giordano

Contact: analopes.ufmg@gmail.com

Category: Express

Abstract: Recently, ANEEL, the Brazilian Electric Power Companies Regulator, introduced Data Envelopment Analysis (DEA) to provide incentives for efficient distribution costs for 84 power companies. A DEA model based on operational cost as input and network extension, market billed and number of consumers as outputs was implemented in 2011. The DEA model used by the regulator was a non decreasing returns to scale model. This paper discuss the regulator returns to scale choice. The differences in the costs of attending rural, industrial and urban consumers are not considered in ANEEL's model. Also the number of trees, distance between poles, presence of underground networks, density of customers, and terrain topography are important drivers of distribution costs and needs to be considered in the DEA model. While it does not happen a variable returns to scale model is the best choice to evaluate the efficiency of the Brazilian distribution energy companies.

415. Efficiency Measurement with Shadow Prices for Convex Technologies

Authors: R. Robert Russell and William Schworm*

Contact: rcubed@ucr.edu, b.schworm@unsw.edu.au

Category: Explain

Abstract: In this paper, we propose an efficiency index that has several desirable properties. When restricted to the class of convex polyhedral technologies such as generated by DEA analysis, the proposed index satisfies a list of desirable properties that includes the Fare-Lovell [1978] axioms as well as unit independence and continuity. A natural dual (shadow price) interpretation of the index is provided that is useful in calculating the index.

We describe a general procedure for calculating the index in a DEA context. An essential step in calculating the index is the construction of a pseudo-technology as proposed in Dmitruk and Koshevoy [1991].

417. Efficiency of Hospitals in the Czech Republic using DEA Alternative Models and DRG-Adjusted Data

Authors: Jana Votapkova* and Lenka Stastna

Contact: jana.votapkova@gmail.com

Category: Young Researcher (YR)

Abstract: The paper estimates cost efficiency of 84 general hospitals in the Czech Republic during 2006 – 2010 using the input-oriented Data Envelopment Analysis (DEA). We evaluate inpatient care and the way total inpatient costs are transformed to outputs, such as total number of patients treated at acute wards weighted by DRG (the system of diagnostic related groups) and patients treated at nursing wards. We also test for specification when

publication output is included among outputs, because costs related to teaching and research activities are high for hospitals with teaching status. Prior to the analysis, we search for potential influential observations using multiple methods. The results suggest no clustering of certain types of hospitals, however, average efficiency from the first step is quite low, reaching 0.6 for VRS and 0.5 for CRS.

In the second stage analysis, we will regress efficiency score upon the set of environmental variables (e.g. the share of the elderly in municipality, profit status of a hospital, size of the hospital, size of the municipality, presence of a highly specialized center in the hospital or percentage of doctors striking). We assume that the second stage analysis will explain a portion of inefficiency

418. Investigating drivers of income and scale efficiency on Irish beef farms using Data Envelopment Analysis

Authors: Eoghan Finneran* and Paul Crosson

Contact: eoghan.finneran@teagasc.ie

Category: Express

Abstract: Irish agri-food industry targets aim to increase Irish beef production value by 20% by the year 2020. The objectives of this study were to measure income and scale efficiency of Irish beef farms and to identify system and management variables associated with greater scale and income efficiency. Data envelopment analysis (DEA) was used to derive income (IES) and scale (SES) efficiency scores for beef rearing farms in Ireland for the years 2009 and 2010. A sampling bias term was calculated using bootstrapping. An output oriented model was developed using "FEAR" in the "R" language. Scale efficiency is a measure of proximity to optimal scale (i.e. the scale at which productivity (output/input) is greatest. Income efficiency model input variables were land, labour, livestock units (LU), fertiliser, concentrates, other variable costs, total direct payment subsidies and total overhead costs. High scale efficiency farms were smaller, with lower stocking rates and greater market gross output value per livestock unit (LU) than low scale efficiency farms. Number of LU, hectares farmed, and concentrate and fertiliser expenditure were negatively associated with IES. Low IES farms had greater rented land and these farms were more fragmented.

419. Gender Differences in Faculty Research Productivity --The Case of Taiwan

Authors: Flora F. Tien

Contact: floratien@ntu.edu.tw

Category: Discuss

Abstract: There are now more female scientists contributing to scientific knowledge than ever before. Still, gender gap in publication exists. In general, women published less than men. Studies indicate that gender becomes a less powerful predictor of research productivity when research interest, academic rank, institutional prestige, collegial communication and work load are considered. However, how do female differ from their male colleagues in the patterns of faculty research productivity still needs to be examined. This paper explore the research question: How do females differ from males in terms of faculty research productivity? The paper will utilize a national survey data in Taiwan to explore gender difference on faculty research productivity. Multiple regression and structural equation models will be used for data analysis. The results of the study will enhance our understanding on gender difference in academy. In addition, suggestions on how the institutions provide supports and resources to female faculty members will be provided.

420. THE NEXUS BETWEEN EFFICIENCY AND COMPETITION IN ASIAN BANKING

Authors: ROSSAZANA AB-RAHIM* and FARHANA ISMAIL

Contact: rossazana@gmail.com

Category: Explain

Abstract: There is some concern that attempts to investigate the relationship between competition and efficiency in the banking industry had tended to rely on structural measure by taking concentration per se as a proxy for competition; whilst efficiency is measured by financial ratios. By addressing the above discussion as the gap in the literature, this study contributes to the existing literature by utilizing Data Envelopment Analysis to compute efficiency and Lerner indexes to estimate competition in Asian banking. The first objective of this study is to estimate banking efficiency and competition index while the second objective is to analyse the running causality between efficiency and competition. Causality tests between competition and various measures of efficiency are undertaken to achieve the second objective. The Granger causality tests indicate a positive effect of competition on technical efficiency, pure technical efficiency and scale efficiency. In addition, a negative causality running from efficiency to competition is also found in technical efficiency and its sources.

421. Within Moment Estimators for Fixed-Effect Stochastic Frontier Models

Authors: Yi-Ting Chen and Hung-Jen Wang*

Contact: wangh@ntu.edu.tw

Category: Discuss

Abstract: In this paper, we propose a feasible approach to estimate fixed-effect panel stochastic frontier (SF) models. The approach is based on the moments of a within-transformed model. Given that the inefficiency term is distributed independently of explanatory variables, the estimation proceeds by centering the model residuals and applying common fixed-effect estimators to obtain slope coefficients. We then derive moment equations of the transformed residuals and use these equations to estimate parameters of the inefficiency. Compared with the existing methods, the moment-based approach has the following advantages: (1) It is less computer intensive and is easier to apply. (2) It does not impose assumptions other than those commonly adopted in the literature. (3) The method is applicable to models with various distribution assumptions, including but not limit to the normal-half normal assumption. (4) This approach can also be extended to develop and perform various moment tests for distributional assumptions of the model, such as those suggested by Chen and Wang (2011, ER). A Monte Carlo experiment is conducted which shows good performance of the estimator.

422. Identifying facets of a piecewise linear technology by adapted Fourier-Motzkin elimination method

Authors: Abolfazl Keshvari* and Timo Kuosmanen

Contact: abkeshvari@gmail.com

Category: Explain

Abstract: The traditional results of productive efficiency analysis are the efficiency scores of decision making units and the information of their reference points on the frontier. Therefore, a point-wise estimation of the frontier is known, but the information about all the surfaces of the frontier is usually inaccessible. In this paper we adapt and optimize Fourier-Motzkin elimination method to solve DEA problems and find facets of the estimated frontier. The proposed adapted version of Fourier-Motzkin elimination method for DEA problems finds both (strong) efficient and weak efficient facets as well as the

efficiency score of all DMUs. The proposed algorithm processes DMUs one by one and finds the frontier of the current DEA problem with the processed DMUs and the normal vector of all the facets. The algorithm is easy to follow and is simple enough to be implemented by various programming languages. Building redundant facets is one of the known issues of the Fourier-Motzkin method for DEA. In the proposed algorithm in the paper, we identify and remove all the redundant facets. To have a better understanding of the issue, we show how the redundant facets are produced and how to recognize them.

424. Generalized convexity with idempotent operations and its application in production theory

Authors: Vladimir Matveenko

Contact: matveenko@emi.nw.ru

Category: Explain

Abstract: The aim of the paper is to introduce some of the concepts of generalized convexity using idempotent operations, to elaborate applications in the theory of production functions, and to apply the approach to studying a model of a triad 'resources - institutions - production'.