EWEPA X

FINAL PROGRAM

TENTH EUROPEAN WORKSHOP ON EFFICIENCY AND PRODUCTIVITY ANALYSIS

Lille, June 27-30, 2007

Efficiency and Productivity Analysis: Retrospect and Prospect

Organised by
GAPEM
P. Agrell, K. Kerstens, P. Vanden Eeckaut

Hosted by
IÉSEG School of Management
Lille Economics & Management (CNRS)

Quick Program Overview

	Tuesday June 26	Wednesday June 27	Thursday June 28	Friday June 29	Saturday June 30	Sunday July 1
09:00		**Registration**	**Session 5** Parallel Session 5A Parallel Session 5B Parallel Session 5C Parallel Session 15D Parallel Session 5E	**Round Tables (10F)** **Session 10** Parallel Session 10A Parallel Session 10B Parallel Session 10C Parallel Session 10D Parallel Session10E	**Round Tables (15F)** **Session 15** Parallel Session 15A Parallel Session 15B Parallel Session 15C Parallel Session 15D Parallel Session 15E	**Guided visit Museum of Arts**
10:30		**Opening Remarks**	Coffee Break D2 **Poster Sessions I (S2)**	Coffee Break D3 **Poster Sessions II (S7)**	Coffee Break D4 **Poster Sessions III (S12)**	
11:00		**Keynote Session 1 (S1)**	**Sessions YR 1** YR 1 Session 6A YR 1 Session 6B YR 1 Session 6C YR 1 Session 6D	**Sessions YR 2 (S11)** YR 2 Session 11A YR 2 Session 11B YR 2 Session 11C ---	**Sessions YR 3 (S16)** YR 3 Session 16A YR 3 Session 16B YR 3 Session 16C YR 3 Session 16D	
12:30						
13:00		Lunch D1 **Poster Sessions I (S2)**	Lunch D2 **Poster Sessions II (S7)**	Lunch D3 **Poster Sessions III (S12)**	**Closing Reception**	
14:00		**Session 3** Parallel Session 3A Parallel Session 3B Parallel Session 3C Parallel Session3D Parallel Session 3E	**Keynote Session 2 (S8)**	**Keynote Session 3 (S13)**		
15:30		Coffee Break D1 **Poster Sessions I (S2)**	Coffee Break D2 **Poster Sessions II (S7)**	Coffee Break D3 **Poster Sessions III (S12)**		
16:00		**Session 4** Parallel Session 4A Parallel Session 4B Parallel Session 4C Parallel Session 4D Parallel Session 4E Parallel Session 4F	**Session 9** Parallel Session 9A Parallel Session 9B Parallel Session 9C Parallel Session 9D Parallel Session 9E Parallel Session 9F	**Session 14** Parallel Session 14A Parallel Session 14B Parallel Session 14C Parallel Session 14D Parallel Session 14E ---		
17:30			**Beer Degustation**			
19:00	**Registration & Welcome Reception**			**Conference Dinner**		
20:00						
21:00						
22:00						

Session 1 Wednesday, June 27, 2007 11:00 - 12:30

Keynote I

Building B - Ground Floor - Room B050

Efficiency and Productivity: Malmquist and More
Fare, Rolf
Comment on: Efficiency and Productivity: Malmquist and More
Oulton, Nicholas
Comment on: Efficiency and Productivity: Malmquist and More
ten Raa, Thijs

Session 2 Wednesday, June 27, 2007 12:00 - 12:00 (next day)

Poster I

Building B - Ground Floor - Room EMF

An Assessment of Efficiency and Productivity Change of Central Administrative Services of UK Universities using Data Envelopment Analysis.
Bakoulas, Konstantinos - Thanassoulis, Emmanuel
Productivity Performance of Regional Electric Cooperatives in the Philippines
Posadas, Ramon - Cabanda, Emilyn
Corruption, Efficiency and Productivity Growth. A Non-Parametric Approach
Salinas-Jimenez, M. Mar - Salinas-Jiménez, Javier
Random vs Fixed Restricted SUR Model: Case Study on a System of Cost and Factor Share Equations
Ouertani, Mohamed Nejib - Ben Jedidia, Lotfi
Bridging Radial and Non-radial Measures of Efficiency in DEA
Tone, Kaoru - Tsutsui, Miki - Avkiran, Necmi
Estimating Efficiency within the Manufacturing Sector in Kenya during the Structural Reform Period: An Empirical Analysis
Ngui, Dianah Mukwate - Thomi,Walter
The Generalized Distance Function as a Solution to Infeasibility of Super Efficiency Models
Andrew, Johnson - McGinnis, Leon
Trading Flows and Trading Restrictions: Emission Permit Trading in the Swedish Pulp and Paper Industry
Pachkova, Elena
Improving Supply Chain Efficiency – A Strategic Decision-Making Analysis
Pasa, Iulia
Is There a Link between Productivity Growth and Investment Bursts?
Geylani, Pinar - Stefanou, Spiro

Session 3 Wednesday, June 27, 2007 14:00 - 15:30

Session 3 A Network Industry (De)Regulation
Building A - First Floor - Room A101 J.M KEYNES

Efficiency Measurement and Regulation in U.S. Telecommunications: a Robustness Analysis
Resende, Marcelo
European Railway Deregulation: The Influence of Regulatory and Environmental Conditions on Efficiency
Wetzel, Heike
A Quantitative Study of Train Operating Companies Cost and Efficiency Trends 1996 to 2006: Lessons for Future Franchising Policy
Wheat, Phillip - Smith, Andrew
A Comparison of Railway Performance in Europe: an Application of Multi-Directional Efficiency Analysis
Holvad, Torben - Hougaard, Jens Leth - Kronborg, Dorte

Session 3 B University Performance
Building A - Second Floor - Room A201 J. MONNET

Educational Offer Evaluation in Romanian Universities by Efficiency Techniques
Spircu, Tiberiu - Spircu, Liliana - Albu, Crisan
Budget Constrained Productivity of University Production
Räty, Tarmo - Kangasharju, Aki
Assessing the Performance of Spanish University Technology Transfer Offices
Caldera, Aida - Debande, Olivier
Scale, Age, Substitution Effects and their Interactions in Academic Production. A Disaggregated Analysis at Discipline Level
Bonaccorsi, Andrea - Daraio, Cinzia - Simar, Leopold

Session 3 C Electricity Regulation I
Building A - First Floor - Room A103 M. CROZIER

Evaluating The Regulator: Winners and Lossers in the Spanish Electricity Distribution
Blazquez Gomez, MÂª Leticia - Grifell-Tatjé, Emili
Hybrid Frontier Yardstick Regulation for the German Energy Networks
Agrell, Per
Regulatory Benchmarking with Panel Data
Weyman-Jones, Thomas - Bagdadioglu, Necmiddin

Session 3 Wednesday, June 27, 2007 14:00 - 15:30

Session 3 D Health I
Building A - First Floor - Room A121 M.E. PORTER

Membership in Hospital Organizations, Productivity Growth, and Technical Change for Non-profit Hospitals
Granderson, Gerald - Tauchen, Helen
Resource Utilization in U.S. Hospital Markets
Valdmanis, Vivian - Ferrier, Gary - Leleu, Herve
Complications! Complications! Complications! : Measuring Efficiency in Healthcare
Lordan, Grace
Understanding (In)efficiency in Thai Publicly Owned Hospitals
Asavadachanukorn, Preecha - Yaisawarng, Saowaros - Yaisawarng, Suthathip

Session 3 E Deregulation in Banking
Building A - First Floor - Room A120 E. MALINVAUD

Cost Structure, Ownership Effect and Competition: The Role of Deregulation and Prudential Re-Regulation
Zhao, Tianshu - Casu, Barbara - Ferrari, Alessandra
Social Banking, Deregulation, and Profitability of Banks: The Indian Case
Mukherjee, Kankana - Das, Abhiman - Ray, Subhash

Session 4 Wednesday, June 27, 2007 16:00 - 17:30

Session 4 A Health II

Building A - First Floor - Room A101 J.M KEYNES

Competition and Market Power in Physician Private Practices
Gunning, Timothy - Sickles, Robin
Economies of Scale and Efficiency Measurement in the Swiss Nursing Homes Industry
Farsi, Mehdi - Filippini, Massimo - Lunati, Diego
The Relationship between Physician Quality and Hospital Efficiency
Bernet, Patrick - Valdmanis, Vivian - Michael, Rosko
Motivating Physicians to Improve Their Efficiency: An Evaluation of a Pilot Scheme
Staat, Matthias

Session 4 B School Performance

Building A - Second Floor - Room A201 J. MONNET

The 65 Percent Problem
Grosskopf, Shawna - Hayes, Kathy - Taylor, Lori
Measuring Efficiency of Tunisian School in the Presence of Quasi-Fixed Inputs: A Bootstrap DEA Approach
Essid, Hedi - Ouelette, Pierre - Vigeant, Stéphane
Performance Evaluation of Portuguese Secondary Schools
Portela, Maria - Camanho, Ana

Session 4 C Electricity Regulation II

Building A - First Floor - Room A103 M. CROZIER

Total Factor Productivity and Technical Efficiency Measurement under Factor Nonsubstitution: An Application to US Electric Utilities
Genius, Margarita - Tzouvelekas, Vangelis - Stefanou, Spiro
A Synergy Effect between Electricity and Gas in US Energy Utility Industry: A Combined Use of DEA and DEA-Discriminant Analysis
Goto, Mika - Sueyoshi, Toshiyuki
Do Mergers Really Increase Efficiency? A Cost Efficiency Analysis of Electricity Distributors in the US
Hess, Borge
Productivity Development in the Swedish Electricity Distribution 2001-2005
Ek, Arvid Goran

Session 4 Wednesday, June 27, 2007 16:00 - 17:30

Session 4 D Agriculture I
Building A - First Floor - Room A121 M.E. PORTER

Technical Efficiency and Technological Gaps for Dairy Farms in Three Southern Cone Countries
Moreira, Victor - Bravo-Ureta, Boris

Productivity Differentials on Dairy Farms in Nordic Countries – The Metafrontier Approach
Sipiläinen, Timo - Kumbhakar, Subal - Kuosmanen, Timo

Efficiency in Turkish Agriculture: A Household Level Analysis
Dudu, Hasan - Çakmak, Erol Hasan - Öcal, Nadir

Farm Heterogeneity and Efficiency in Polish Agriculture: A Stochastic Frontier Analysis
Hockmann, Heinrich - Pieniadz, Agata

Session 4 E Insurance Applications
Building A - First Floor - Room A120 E. MALINVAUD

The Transition to the Single Market in the German Insurance Industry
Url, Thomas - Mahlberg, Bernhard

Efficiency and Productivity in Thai Non-life Insurance Industry
Yaisawarng, Saowaros - Asavadachanukorn, Preecha - Yaisawarng, Suthathip

Deregulation and Cost Efficiency: The Case of European Insurance
Vencappa, Dev - Fenn, Paul

Session 4 F Strategic and Industrial Issues in Banking
Building B - Second Floor - Room B253

Benchmarking and Industry Performance
ten Raa, Thijs

Evaluation of Mix-Product Strategies among Different Market Environments: The Case of Retail Banking Industry
Hubrecht, Aude - Leleu, Herve

The Shadow Price of Non Performing Loans in Tunisian Commercial Banks: A Directional Distance Approach
Chaffai, Mohamed - Lassoued, Samia

Session 5 Thursday, June 28, 2007 09:00 - 10:30

Session 5 A Nonparametric Statistical Estimation
Building A - First Floor - Room A101 J.M KEYNES

A Smooth Nonparametric Conditional Quantile Frontier Estimator
Martins-Filho, Carlos - Yao, Feng
Statistical Inference in Conditional Robust Nonparametric Frontier Models
Daraio, Cinzia - Simar, Leopold
Nonparametric Stochastic Frontier: The Multivariate Case with Stochastic Versions of FDH/DEA Estimators
Simar, Leopold - Zelenyuk, Valentin
Bandwidth Selection Problems for Nonparametric Estimation of Conditional Efficiency Scores
Badin, Luiza - Simar, Leopold

Session 5 B Advances in Production Theory I
Building A - Second Floor - Room A201 J. MONNET

Estimating Translated Demand Functions
Fare, Rolf - Grosskopf, Shawna - Hayes, Kathy - Margaritis, Dimitri
A "Calculus" for Data Envelopment Analysis
Chambers, Robert - Fare, Rolf
Properties of the Directional Distance Function as a Measure of Efficiency
Russell, R. Robert - Schworm, William
The Partial Technical Efficiency Measure of Production
Li, Sung-ko

Session 5 C Methodological Advances in Banking Performance
Building A - First Floor - Room A103 M. CROZIER

Profit and Productivity: Differences Across Organizational Form
Grifell-Tatjé, Emili - Lovell, C.A.Knox
Stochastic Frontiers with Bounded Inefficiency
Qian, Junhui - Sickles, Robin
Quality Adjusted Inputs, Outputs and Productivity Change in Indian Banking: A Hedonic Approach
Das, Abhiman - Kumbhakar, Subal
Foreign Ownership and Efficiency: The Case of Ukrainian Banking
Dushkevych, Natalya

Session 5 Thursday, June 28, 2007 09:00 - 10:30

Session 5 D Agriculture II
Building A - First Floor - Room A121 M.E. PORTER

Agglomeration Externalities and Technical Efficiency in Pig Production
Larue, Solène - Latruffe, Laure

Technology Adoption in French Agriculture and the Role of Financial Constraints
Blancard, Stephane - Briec, Walter - Boussemart, Jean-Philippe - Kerstens, Kristiaan

Session 5 E Electricity Regulation III
Building A - First Floor - Room A120 E. MALINVAUD

Incorporating Quality of Service in a Benchmarking Model: An Application to French Electricity Distribution Operators
Plagnet, Marie-Anne - Crespo, Héléne - Perelman, Sergio - Romano, Elliot - Coelli, Tim

Efficiency Effects of Integrating Quality of Service in Incentive Regulation: Experience from Norwegian Electricity Distribution
Growitsch, Christian - Jamasb, Tooraj

Regulation of Distribution Companies – DEA with Separable Costs
Bjørndal, Endre - Bjørndal, Mette

Incorporating Environmental Factors in the Regulatory Benchmarking Model for Electricity Distribution Companies in Norway.
Grammeltvedt, Thor Erik - Hansen, Wiljar - Langset, Tore - Wiull, Stig Olav

Session 6 Thursday, June 28, 2007 11:00 - 12:30

Session 6 A Semi-Parametric Approaches (YR)

Building A - First Floor - Room A101 J.M KEYNES

How to Expand Capacity of Tunisian's Local Hospital in the Network Schema of Public Hospitals and Global Budgeting System: A Semi-Parametric Approach
Chokri, Arfa - Leleu, Herve - Mohamed, Goaïed

Dealing with Environmental Variables in Efficiency Analysis of Transition Banking: A Comparison of Semi-Parametric and Non-Parametric Approaches
Karligash, Kenjegalieva - Weyman-Jones, Thomas - Simper, Richard

Semiparametric Estimation of Stochastic Frontiers under Regularity Conditions: A Single-Index Approach
Kortelainen, Mika

Session 6 B Efficiency & Productivity in Manufacturing (YR)

Building A - Second Floor - Room A201 J. MONNET

Convergence at the Industrial Level: Evidence from the OECD
Wu, Xiaoyu - Russell, R. Robert

Technical Efficiency Point and Confidence Interval Estimates of the Manufacturing Sector in African Economies: A Case of Kenya
Ngui, Dianah Mukwate - Becker, Claudia

Technical Change, Competitiveness and Poverty Reduction in the Ghanaian Apparel Industry
Ayitey, Donatus Kosi

Session 6 C Health (YR)

Building A - First Floor - Room A103 M. CROZIER

Measuring Efficiency in Healthcare:An Application to Out of Hours Primary Care Services on the Island of Ireland
Lordan, Grace

Evaluating the Performance of Public Health Units Using DEA
Lavado, Rouselle

Session 6 D Agriculture (YR)

Building A - First Floor - Room A121 M.E. PORTER

Productivity Growth in Agriculture: Regional Evidence from Romania
Aldea, Anamaria - Vidican, Georgeta

A Comparison of Stochastic Frontier Approaches to Estimating Inefficiency and Total Factor Productivity: An Application to Irish Dairy Farming
Carroll, James - Newman, Carol - Thorne, Fiona

Distinguishing Technologies and Measuring Performance in Farm Production: The Case of Pennsylvania Dairy
Emvalomatis, Grigorios - Stefanou, Spiro

Session 7 Thursday, June 28, 2007 12:00 - 12:00 (next day)

Poster II

Building B - Ground Floor - Room EMF

The Cell as an Economic Unit: Comparing the Efficiency of Metabolic Networks
Castelli, Lorenzo - Pesenti, Raffaele - Segrè, Daniel - Silli, Maddalena

On the Use of Ratios in DEA
Emrouznejad, Ali

Training Effects on Productivity and Wages Considering the Average Human Capital of Workers in the Production Function
Dumas, Audrey

Economic Growth and Foreign Direct Investment Inflows: A Stochastic Frontier Analysis
Villano, Renato - Dollery, Brian - Wijeweera, Albert

The Efficiency of US Gas Transmission Operators: Lessons for Regulators
Jamasb, Tooraj - Pollitt, Michael - Triebs, Thomas

Accounting for Environmental Differences in Estimating Productivity Change in the Australian Wool Industry
Villano, Renato - Fleming, Euan - Fleming, Pauline

Exploring Production-Theoretical Insights for Economic-Environmental Trade-Off Analysis
Van Meensel, Jef - Lauwers, Ludwig

Comparing Statistical Properties of Frontier Estimates When Some Outputs Are Undesirable
Salnykov, Mykhaylo

Total Factor Productivity of Ukraine: First Decade
Demchuk, Pavlo

Accounting for Undesirable Outputs and Non-Discretionary Inputs in the Olive Oil Industry Efficiency Analysis
Dios-Palomares, Rafaela - Prieto Gijarro, Ángel M. - Martínez-Paz, José Miguel

How Did Mandated Quality Investments Influence the Productivity and Profitability of English and Welsh Water Companies?
Maziotis, Alexandros - Saal, David - Thanassoulis, Emmanuel

Do Performance and Environmental Conditions influence Cross-Country Banking Activity in Europe?
Lozano-Vivas, Ana – Pastor, Jesús T.

Session 8 Thursday, June 28, 2007 14:00 - 15:30

Keynote II

Building B - Ground Floor - Room B050

DEA - The Mathematical Programming Approach to Efficiency Analysis
Thanassoulis, Emmanuel

Comment on: DEA - The Mathematical Programming Approach to Efficiency Analysis
Tind, Jørgen

Comment on: DEA - The Mathematical Programming Approach to Efficiency Analysis
Wilson, Paul

Session 9 Thursday, June 28, 2007 16:00 - 17:30

Session 9 A Advances in Production Theory II

Building A - First Floor - Room A101 J.M KEYNES

Quantile Estimation of Production Profile
Huang, Cliff - Fu, Tsu-tan - Yang, Yung-Lieh
Cost Allocation and Convex Envelopment
Hougaard, Jens Leth - Tind, Jørgen
The Estimation of Dual Cost Functions for Stochastic Technologies
Chambers, Robert
Stochastic Nonparametric Envelopment of Panel Data with Fixed and Random Effects
Kuosmanen, Timo

Session 9 B Nonparametric Specification Issues

Building A - Second Floor - Room A201 J. MONNET

Nonparametric Efficiency Analysis under Economies of Scope
De Rock, Bram - Cherchye, Laurens - Vermeulen, Frederic
Dynamic Measures of Economies of Scope
Oude Lansink, Alfons - Silva, Elvira - Stefanou, Spiro
Nonparametric Test of Congestion
Cavaignac, Laurent - Peypoch, Nicolas - Barros, Carlos
The Validity of Input Aggregation in DEA Models: A Statistical Test
Ray, Subhash - Mukherjee, Kankana

Session 9 C Banking Applications

Building A - First Floor - Room A103 M. CROZIER

South East Asian Banking after the Crisis: A Non-Parametric Analysis of the Impact of Environmental Factors
Mohd Khan, Shazida - Casu, Barbara
Consolidation and Innovation in U.S. Banking: A Dynamic Reallocation Approach
Bos, Jaap - Kolari, James W.

Session 9 Thursday, June 28, 2007 16:00 - 17:30

Session 9 D Transport

Building A - First Floor - Room A121 M.E. PORTER

Introducing Regulation in the Measurement of Efficiency, with an Application to the Canadian Air Carriers Industry
Ouelette, Pierre - Petit, Patrick - Vigeant, Stéphane
Efficiency Measurement of Road Maintenance
Ozbek, Mehmet Egemen - De la Garza, Jesus M. - Triantis, Konstantinos
Cost Efficiency and Economics of German Public Bus Operators - A Parametric Approach
von Hirschhausen, Christian - Wilhelm, Axel - Nieswand, Maria - Geissler, Marika

Session 9 E Water Utilities

Building A - First Floor - Room A120 E. MALINVAUD

Designing Incentives in Local Public Utilities, an International Comparison in the Drinking Water Sector
De Witte, Kristof - Marques, Rui Cunha
Cost Efficiency of Slovenian Water Distribution Utilities: an Application of Stochastic Frontier Panel Data Methods
Zoric, Jelena - Filippini, Massimo - Hrovatin, Nevenka
The Impact of OFWAT Incentives on Company Performance
Portela, Maria - Thanassoulis, Emmanuel - Horncastle, Alan - Maugg, Tobias
Taking Into Account Environmental Variables in Frontier Models, a Metafrontier Approach to the Drinking Water Sector
De Witte, Kristof - Marques, Rui Cunha

Session 9 F Asian and Middle East Banking

Building B - Second Floor - Room B253

The Impact of Operational Risk toward the Efficiency of Banking: A Comparison of Taiwan's and China's Banking Industries
Cheng, Cheng-ping - Chen, Bih-Shiow
The Efficiency Productivity of Jordanian Banking Sector in the Presence of Negative Output
Emrouznejad, Ali - Anouze, Abdel Latef
On Measuring the Efficiency of Banks in Taiwan: A Stochastic Metafrontier Analysis
Sun, Chia-Hung
A Comparison Between DEA and SFA Method in Japanese Banking Industry
Le, T.P.

Session 10 Friday, June 29, 2007 09:00 - 10:30

Session 10 A Banking: Industry Analysis
Building A - First Floor - Room A101 J.M KEYNES

Robust Non-parametric Quantile Estimation of Efficiency and Productivity Change in U.S. Commercial Banking, 1985--2004
Wilson, Paul - Wheelock, David

Measuring Market Power and Efficiency in Latin American Banking
Garza-Garcia, Jesus G. - Girardone, Claudia - Chortareas, Georgios

Consolidation in the European Banking Industry: How Effective is it?
Lozano-Vivas, Ana - Kumbhakar, Subal - Fethi, Meryem Duygun - Shaban, Mohamed

Efficiency in Islamic and Conventional Banking: An International Comparison
Abdul Majid, Mariani - Saal, David

Session 10 B Agriculture III
Building A - Second Floor - Room A201 J. MONNET

Farming Type and Performance: A Comparison of Conventional and Organic Dairy Production in the United States
Mosheim, Roberto

Using Production Theoretic Concepts to Construct Soil Quality Indicators
Hailu, Atakelty - Chambers, Robert

Estimating the Organizational Cost of Managing the Farm
Tauer, Loren

The Decomposition of Cost Efficiency for the Italian Wine Industry: Co-Operatives vs Investor-Owned Firms
Maietta, Ornella Wanda - Perali, Federico

Session 10 C Exploring Sources of Manufacturing Efficiency and Productivity
Building A - First Floor - Room A103 M. CROZIER

Cost Efficiency of Electronic Firms in China
Xuejie, Bai - Hu, Jin-Li

Analysis of Technical Efficiency of Manufacturing Firms in Spain
Arias, Carlos - Álvarez, Antonio

Drivers of Productivity Differentials between Southern and Northern Manufacturing in Italy: Technical Inefficiencies or Allocative Distortions?
Petraglia, Carmelo - Erbetta, Fabrizio

Do Infrastructure and Banking Efficiency Boost Productivity? Evidence from Italian Manufacturing Firms
Mastromarco, Camilla - Zago, Angelo - Aiello, Francesco

Session 10 Friday, June 29, 2007 09:00 - 10:30

Session 10 D Engineering Applications of Efficiency Analysis
Building A - First Floor - Room A121 M.E. PORTER

Developing Berth Planning System of Hyundai-Steel Dang-jin Port : Focused on Port Productivity
Young Yeon, Hwang

Benchmarking Performance in Warehouse Operations
Andrew, Johnson - McGinnis, Leon

Software Production Efficiency Measurement without Software Size Parameters Using DEA
Paradi, Joseph - McEachern, Christopher

Real-Time Efficiency/Performance Evaluation: Iterative Aerospace Scheduler Algorithm Optimization for Multi-Payload Next Generation Commercial Satellite Imagers
Eichensehr, Phil - Triantis, Konstantinos

Session 10 E Parametric Panel Production Analysis
Building A - First Floor - Room A120 E. MALINVAUD

Estimating Panel Stochastic Frontier Models with Fixed Effects by Model Transformation
Wang, Hung-Jen - Ho, Chia-Wen

On the Sensitivity of US Electric Utilities' Efficiency Estimates – A Distance Function Approach
Hess, Borge - Growitsch, Christian

Session 10 F Round Table
Building B - Second Floor - Room B253

Reforming Railways: Theoretical Insights and Practical Lessons
McMahon, Paul (UK Office of Rail Regulation) -
Bouf, Dominique (Laboratoire d'Economie des Transports) -
Rivera Trujillo, César (Instituto Mexicano del Transporte) -
Holvad, Torben (European Railway Agency)

Session 11 Friday, June 29, 2007 11:00 - 12:30

Session 11 A Methodological Advances in Efficiency & Productivity I (YR)

Building A - First Floor - Room A101 J.M KEYNES

Separating Catch-up and Technical Change in Stochastic Frontier Models. A Monte Carlo Approach.
del Corral, Julio - Álvarez, Antonio - Alejandro, Fernández

Improving Statistical Inference on Malmquist Productivity Indices.
Curi, Claudia - Daraio, Cinzia - Mancuso, Paolo - Simar, Leopold

Dynamical Analysis of Malmquist Productivity Index.
Daskovska, Alexandra - Simar, Leopold - Van Bellegem, Sebastien

Session 11 B Transport (YR)

Building A - Second Floor - Room A201 J. MONNET

Measuring the Technical Efficiency of Railways in North America Before and After Privatization.
Rivera-Trujillo, Cesar - Mendoza-Diaz, Alberto

Next Stop: Increased Efficiency? - A Non-parametric Efficiency Analysis of German Public Transport Companies
Cullmann, Astrid

Session 11 C Applications of Efficiency Analysis (YR)

Building A - First Floor - Room A103 M. CROZIER

German Higher Education Institutions and Efficiency - Empirical Evidence from a Data Envelopment Analysis Accounting for Heterogeneity
Olivares, Maria

Technical Efficiency under Risk Aversion and Interconnection between Uncertainty Components: Assessment from Olive-Growing Farms in Tunisia
Ben Jemaa, Mohamed Mekki

Session 12 Friday, June 29, 2007 12:00 - 12:00 (next day)

Poster III
Building B - Ground Floor - Room EMF

A Critique of the Minimax Approach to Efficiency Measurement.
Tofallis, Chris
Stochastic Nonparametric Envelopment of Data: Cross-Sectional Frontier Estimation under Regularity Conditions
Kortelainen, Mika - Kuosmanen, Timo
Innovations in the US Textile Industry: The Nonwoven Sector
Christoffersen, Susan - Datta, Anusua
Technical Efficiency and Market Competitiveness in Electric Utility Industry
Nemoto, Jiro - Goto, Mika
The Productive Performance of Public Health Care Centres in Cienfuegos, Cuba.
García Fariñas, Anai
Social and Financial Performances in Microfinance Industry. Empirical Evidence from the Application of DEA and a Mutivariate Analysis to 28 Peruvian Microfinance Institutions.
Cornée, Simon - Thenet, Gervais
On the Reliability of Approximating Shadow Prices by the VRS Piecewise Linear Frontier
Li, Sung-ko - Sun, Jingchun
A Study of the Efficiency of Malaysian Anchor Banks: A DEA Analysis Approach
Yoong Hon, Lee - Cheah, Eng Tuck - Lin Yu, Koay
Effects of FDI Flows on Aggregate Productive Efficiency: An Application on a Panel of the OECD Countries
Kodjo-Komina, Kodjo - Kinda, Tidiane
Transportation Procurement Support Using Data Envelopment Analysis
Brusset, Xavier - Agrell, Per - Bogetoft, Peter
Sustainable Value Analysis with Best Practice Benchmarks: A Nonparametric Frontier Approach
Kuosmanen, Natalia - Kuosmanen, Timo

Session 13 Friday, June 29, 2007 14:00 - 15:30

Keynote III
Building B - Ground Floor - Room B050

The Econometric Approach to Efficiency Analysis
Greene, William
Comment on: The Econometric Approach to Efficiency Analysis
Sevestre, Patrick
Comment on: The Econometric Approach to Efficiency Analysis
Simar, Leopold

Session 14 Friday, June 29, 2007 16:00 - 17:30

Session 14 A Methodological Aspects in Nonparametric Analysis
Building A - First Floor - Room A101 J.M KEYNES

Target and Technical Efficiency in DEA - Controlling for Environmental Characteristics
Olesen, Ole B. - Petersen, Niels Christian
Computation Algorithms for DEA Models with Weight Restrictions
Podinovski, Victor
Alternative Approaches to Include Exogenous Variables in Efficiency Analysis: A Comparison Using Monte Carlo Experimentation
Cordero-Ferrera, J. M. - Pedraja Chaparro, F. - Santín González, D.
Separation of Uncontrollable Factors and Time Shift Effects from DEA Scores: Multi-Stage Data Adjustment Model Using DEA and Tobit with DMU Dummies
Tsutsui, Miki - Tone, Kaoru

Session 14 B Eco-Efficiency
Building A - Second Floor - Room A201 J. MONNET

Incorporating both the Undesirable Output and the Uncontrollable Variables in DEA: The Performance of Chinese Coal-fired Power Plants
Yang, Hongliang - Pollitt, Michael
Electric Utilities, Environmental Externalities and Cost Measured Productivity Growth
Prior, Diego - Granderson, Gerald
Production-Theoretical Underpinnings of Eco-Efficiency: Marrying Diverse Methodological Approaches
Lauwers, Ludwig - Meul, Marijke - Van Meensel, Jef - Van Passel, Steven
Eco-Efficiency as a New Principle for the Allowance Allocation Mechanism in Emission Trading
Luptacik, Mikulas

Session 14 C Socio-Economic and Environmental Performances
Building A - First Floor - Room A103 M. CROZIER

A DEA Model as a Generalized Human Development Index
Estellita Lins, Marcos - Moreira da Silva, Angela Cristina - Carvalho Pereira, Bárbara
Ranking Corporations Based On Their Social and Environmental Performance
Constantin, Belu
Doing Bad to Do Better? Slack Patterns, Financial Performance and the Link to Corporate Social Responsibility
Asmild, Mette - Chapple, Wendy - Hougaard, Jens Leth

Session 14 Friday, June 29, 2007 16:00 - 17:30

Session 14 D Human Resources, Regulation, Incentives and Productivity

Building A - First Floor - Room A121 M.E. PORTER

Productivity And Downsizing: Who Gets Fired? Evidence from One Consumer-Goods Industry in Russia
Rinaldi, Gustavo

Secure Relative Performance Pay
Nielsen, Kurt

Application of Efficiency Measurement in the Analysis of Entrepreneurial Processes
Tajnikar, Maks - Pusnik, Ksenja

Price Cap Regulation with Imperfect Information
Lay, Helen - Weeks, Melvyn

Session 14 E Marketing Performance

Building A - First Floor - Room A120 E. MALINVAUD

Comparison of Two Alternative Store Formats using a Malmquist-Type Index
Vaz, Clara - Camanho, Ana

Total Factor Productivity and the Role of Location & Ownership: Evidence from the UK Retail Sector
Anon Higon, Dolores

Session 15 Saturday, June 29, 2007 09:00 - 10:30

Session 15 A Parametric Frontier Applications
Building A - First Floor - Room A101 J.M KEYNES

Profit Efficiency in Social Labor Services
Blank, Jos - Koot, Patrick
What Does the Distribution of Efficiency Look Like? A Nonparametric Deconvolution Approach
Parmeter, Christopher - Horrace, William
Foreign Capital, Human Capital and Efficiency: A Stochastic Frontier Analysis for Developing Countries
Mastromarco, Camilla - Ghosh, Sucharita
Productivity Differentials or Different Production Technologies?
Bos, Jaap - Economidou, Claire - Koetter, Michael - Kolari, James W.

Session 15 B Public Sector Contributions to Productivity
Building A - Second Floor - Room A201 J. MONNET

Research Efficiency in Public Centers: The Case of the Spanish Food Technology Program
Zofio Prieto, Jose Luis - Zabala Iturriagagoitia, Jon Mikel - Jiménez Sáez, Fernando
Testing for Substitutability between Factors of Production with an Application to University Administration
Ferrari, Alessandra - Casu, Barbara - Thanassoulis, Emmanuel - Despic, Ozren
Productivity, Spillovers and Human Capital
Sena, Vania

Session 15 C Innovative DEA Applications
Building A - First Floor - Room A103 M. CROZIER

Co-plot: A Useful Tool to Detect Outliers in DEA
Mahlberg, Bernhard - Raveh, Adi
Analyzing the Structure of Inefficiency
Asmild, Mette - Bogetoft, Peter - Hougaard, Jens Leth
The Effect of Age on the Performance of Professional Golfers
Fried, Harold - Tauer, Loren
What Can we Learn from the Application of Frontier Analysis to Sporting Performance
Simpson, Gary

Session 15 Saturday, June 29, 2007 09:00 - 10:30

Session 15 D IT and Productivity
Building A - First Floor - Room A121 M.E. PORTER

IT Productivity and Productivity Paradox: A Semiparametric Smooth Coefficient Estimation
Chen, Jong-Rong - Huang, Cliff - Liu, Ting-Kun

Does IT-Outsourcing Increase Firm Success? A Firm-level Investigation for Germany
Ohnemus, Joerg

InnovaTion, InvesTment and ImiTation: How Information and Communication Technology Affected European Productivity Performance
Los, Bart - Timmer, Marcel

Session 15 E Portfolio Performance
Building A - First Floor - Room A120 E. MALINVAUD

Portfolio Selection with Higher-Order L-Moments: A Robust Non-Parametric Mean-Variance-Skewness-Kurtosis Efficient Frontier
Jurczenko, Emmanuel - Maillet, Bertrand - Merlin, Paul - Yanou, Ghislain

Geometric Representation of the Mean-Variance-Skewness Portfolio Frontier: A Shortage Function Approach
Kerstens, Kristiaan - Van de Woestyne, Ignace - Mounir, Amine

Session 15 F Round Table
Building B - Second Floor - Room B253

Efficiency Consultation in Engineering: Is it Worth the Investment?
Lay, Helen (Indepen Consulting) -
Walden, John B. (NOAA/NEFSC) -
Johnson, Andrew (Texas A&M University) -
Triantis, Kostas (Virginia Tech)

Session 16 Saturday, June 29, 2007 11:00 - 12:30

Session 16 A Public Utilities & Regulation (YR)
Building A - First Floor - Room A101 J.M KEYNES

Incorporating the Price of Quality into Benchmarking UK Electricity Distribution
Yu, William - Jamasb, Tooraj - Pollitt, Michael
Predicting Efficiency Differentials for Operators under Multiple Regulators
Lorenz, Mathias - Agrell, Per
Spatial-Temporal Dimensions of Efficiency Among Electric Cooperatives in the Philippines
Lavado, Rouselle - Barrios, Erniel
Efficiency and Effectiveness in Water Distribution: A Challenge for African Companies
Tarsim, Achraf - Estache, Antonio – Perelman, Sergio – Saal, David

Session 16 B Macro Economic and Environmental Issues (YR)
Building A - Second Floor - Room A201 J. MONNET

Regional Dimension of the Impact of Foreign Direct Investment on the Host Economy: A Case of Ukraine
Kravtsova, Victoria
Efficiency and Export Activities of Vietnamese Small and Medium Enterprises: Does Export Matter?
Nguyen Dinh, C. - Simpson, G. - Thanassoulis, E. - Nguyen Ngoc, A.
The Impact of ICT-use on Efficiency and Productivity
Bin, Wang - Hailin, Liao
Estimation of Environmental Efficiencies and Shadow Prices of Pollutants: Stochastic Frontier Analysis Approach
Salnykov, Mykhaylo

Session 16 C Financial Sector (YR)
Building A - First Floor - Room A103 M. CROZIER

Cost and Revenue Efficiency in the German Life Insurance Industry: Direct versus Agent-based Insurers
Trigo Gamarra, Lucinda - Growitsch, Christian
Parametric Estimation of Merger Related Efficiency Gains
Gourlay, Adrian - Ravishankar, Geetha - Weyman-Jones, Thomas

Session 16 D Methodological Advances in Efficiency & Productivity (YR)
Building A - First Floor - Room A121 M.E. PORTER

State-Space Models, Technological Change and Initial Conditions
Severgnini, Battista
Stochastic Frontier Model with Discrete Valued Dependent Variables
Fe-Rodriguez, Eduardo

EWEPA X

BOOK OF ABSTRACTS

TENTH EUROPEAN WORKSHOP ON EFFICIENCY AND PRODUCTIVITY ANALYSIS

Lille, June 27-30, 2007

Efficiency and Productivity Analysis: Retrospect and Prospect

Organised by
GAPEM
P. Agrell, K. Kerstens, P. Vanden Eeckaut

Hosted by
IÉSEG School of Management
Lille Economics & Management (CNRS)

Dear Conference participant,

The Book of Abstracts for the Tenth European Workshop on Efficiency and Productivity Analysis (EWEPA X) includes 204 abstracts for accepted papers and posters in 56 sessions from 235 participants coming from 37 countries. As this represents not only the success of the current conference, but a stable frequentation of the European conference, it is already in itself a positive sign of the state of our field. However, let us look at four dimensions to why the field of efficiency and productivity analysis is in fact an excellent example of scientific endeavor when it works as intended.

First, the theoretical advances are naturally the most important criterion. Here, the field has structured, operationalized, solved and integrated a wide range of problems related to the estimation and analysis of the magnitude and sources to static and dynamic productive efficiency. Both deterministic and stochastic approaches have evolved substantially in completeness and applicability the last 20 years since the seminal work. It is hardly controversial to attribute part of this progress to the concentrated efforts made possible through the organization of the biannual workshops in Europe and North America. The workshops provided a constructive and effective opportunity to present, discuss and develop important results during a period when this was critical for the maturity of the field.

Second, the range of affiliations for the authors at EWEPA X bears witness about the interdisciplinary nature of our field. Both applied and theoretical works are being pursued at faculties of agricultural sciences, business administration, economics, engineering, management science and medicine. This is a natural consequence of the common interest to measure and understand technical and economic performance in a greater sense. By constantly applying, testing, interpreting and refining our measures to problems using real data sets from actual applications, the theoretical advances can be made in relevant and promising directions.

Third, the international character of the efficiency and productivity community is a well-established fact. With the recent introduction of a regular biannual Asian-Pacific workshop, in addition to the many ad hoc local and thematic conferences and workshops every year all over the world, it is clear that the intention to keep the field truly international is manifest. Far from the case in all branches of economics and operations research in spite of their apparent linguistical homogeneity, efficiency analysis has striven to avoid the trap of creating isolated schools of thought.

Fourth, the range and scope of policy applications in economics and management using efficiency analysis tools is a remarkable sign of acceptance and maturity. Each and every day, quantitative tools for efficiency and productivity measurement are put to the test in guiding and controlling the evaluation, selection, reimbursement and budgeting of activities, units and firms. The international workshops have become an important platform for exchange for this audience, exchanging experience and also results in their respective fields.

So read the Book of Abstract with a sense of satisfaction. Our community has achieved a lot in terms of advancing science, of building bridges between theories, and to support practical use of scientific method in life. There is more to be done, but EWEPA X has just begun…

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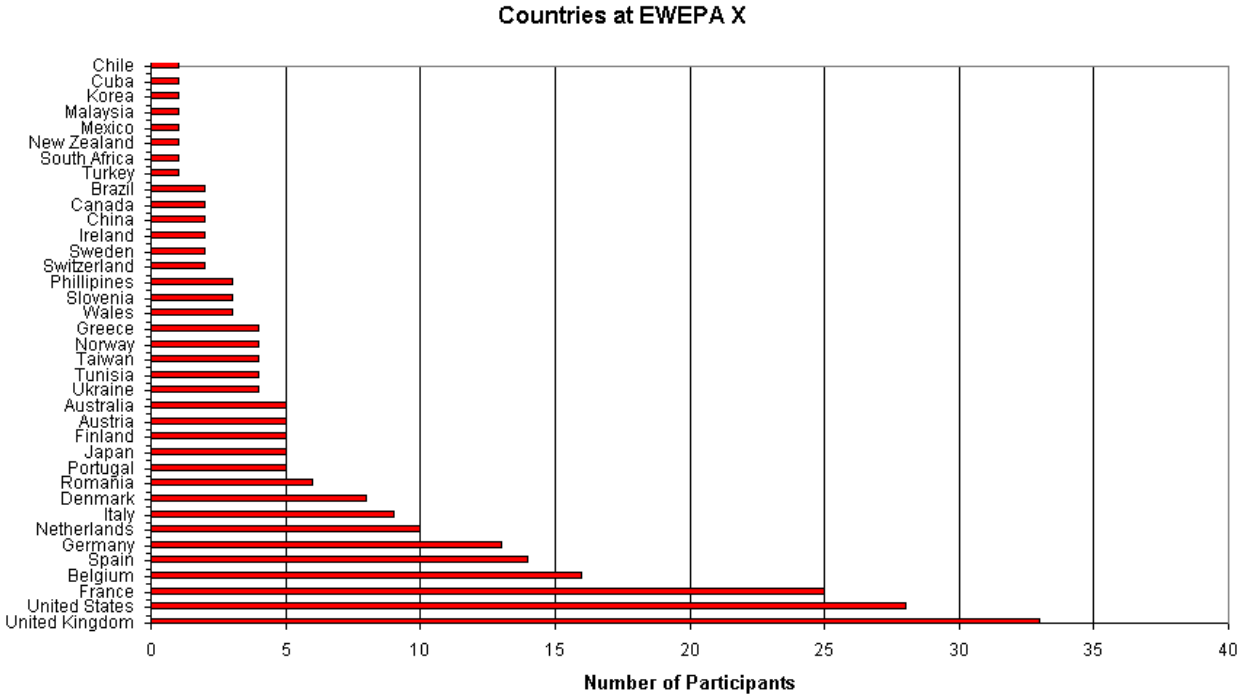
Statistics on EWEPA X

Some basic statistics concerning EWEPA X:

293 initial submissions
204 abstracts in the final program

56 sessions, including:
- 3 keynote sessions
- 3 poster sessions
- 11 Young Researcher sessions
- 39 parallel sessions (including 2 Round Tables)

523 people registered in the database
236 participants originating from 37 countries (see figure)



Efficiency and Productivity: Malmquist and More

Fare, Rolf
(Oregon State University, Dept. of Economics)

Talk based on the forthcoming book:
H. Fried, C.A.K. Lovell, S. Schmidt (eds.)
The Measurement of Productive Efficiency and Productivity Change, NY: Oxford Univ. Press

Session 1 Keynote I: Efficiency & Productivity
Wednesday, June 27, 2007 11:00 - 12:30
Building B - Ground Floor - Room B050

Comment on: Efficiency and Productivity: Malmquist and More

Oulton, Nicholas
(London School Economics, Centre Economic Performance)

Session 1 Keynote I: Efficiency & Productivity
Wednesday, June 27, 2007 11:00 - 12:30
Building B - Ground Floor - Room B050

Comment on: Efficiency and Productivity: Malmquist and More

ten Raa, Thijs
(Tilburg University, CENTER)

Session 1 Keynote I: Efficiency & Productivity
Wednesday, June 27, 2007 11:00 - 12:30
Building B - Ground Floor - Room B050

An Assessment of Efficiency and Productivity Change of Central Administrative Services of UK Universities using Data Envelopment Analysis.

Bakoulas, Konstantinos - Thanassoulis, Emmanuel

Session 2 Poster I
Wednesday, June 27, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

Administrative costs represent a large proportion of university expenditure. To date there has been little investigation as to the efficiency of these services in terms of costs. This paper presents results from an assessment of Central Administrative Services of UK Universities on cost efficiencies. Data Envelopment Analysis (DEA) is used to compute the cost efficiencies and also Malmquist indices of productivity change over a six year period (1999/00-2004/05). Productivity change is decomposed into efficiency change and boundary shift to identify the factors underlying the change in the productivity of each institution's administration.

Productivity Performance of Regional Electric Cooperatives in the Philippines

Posadas, Ramon - Cabanda, Emilyn

Session 2 Poster I
Wednesday, June 27, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

This paper examines the productivity performance of private electric cooperatives (ECs) in the Philippines. Our sample draws on 15 regions in the Philippines, with a total of 117 cooperatives over the period 1999-2003. Data envelopment analysis (DEA) models are used to calculate productive performance of our panel sample. Our findings suggest that regional electric cooperatives (RECs) are technologically-oriented, yet, show a declining efficiency change of 0.1 percent annually. In this case, the electricity industry across regions may adopt a weighted combination of electricity-based technologies and supported with policies of autonomy without losing the service-oriented culture. Thus, productivity is driven more by technological innovations in the industry than managerial efficiency. This is a new empirical contribution to the electricity productivity literature.

Corruption, Efficiency and Productivity Growth. A Non-Parametric Approach

Salinas-Jimenez, M. Mar - Salinas-Jiménez, Javier

Session 2 Poster I
Wednesday, June 27, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

Over the last decade there has been growing interest in understanding the relationship between corruption and economic performance. Focusing on the economic consequences of corruption, the literature suggests that corruption does not only condition an economy's productivity level, but also its rate of growth. Nevertheless, most empirical works have stressed the influence of corruption on growth through its indirect effects on investment, while its effects on productivity growth have been less studied. In this context, the principal motivation of this work is to analyze whether corruption affects the economic results of a broad sample of countries from a productivity-based perspective. To this end, we shall adopt a frontier approach which will allow us to study whether corruption conditions the efficiency levels at which the economies operate. Furthermore, TFP change is decomposed into efficiency change and technological progress by means of Malmquist productivity indices. On the basis of this decomposition we analyze whether corruption affect TFP growth via efficiency gains or technological change, thus gaining insight into the channels through which corruption influence economic growth. Other variables that might condition efficiency and productivity growth (i.e., human capital, trade, regional variables) are also considered. Moreover, instrumental variables are used in order to solve possible problems of endogeneity, measurement error and reverse casuality. The results regarding the impact of corruption on economic performance show that this variable negatively affects the efficiency levels at which the economies perform. Moreover, the results suggest that corruption has a negative impact on TFP growth, with economies that have lower levels of corruption recording, on average, faster growth rates. This negative effect of corruption on productivity growth is manifest through its impact on shifts of the technological frontier, while its influence is not found to be significant in explaining changes in relative efficiency.

Random vs Fixed Restricted SUR Model: Case Study on a System of Cost and Factor Share Equations

Ouertani, Mohamed Nejib - Ben Jedidia, Lotfi

Session 2 Poster I
Wednesday, June 27, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

Many estimated system are based on usual Zellner type Aitken estimator or SUR-GLS estimator proposed by Baltagi(1980). In a cost system composed of a cost function and its share equations, the problem is to identify the nature of the system, i.e., random effects versus fixed effects system. Consequently, we propose what we call a “system’s Hausman test” to determine which of the model is appropriate to fit the data.

Bridging Radial and Non-radial Measures of Efficiency in DEA

Tone, Kaoru - Tsutsui, Miki - Avkiran, Necmi

Session 2 Poster I
Wednesday, June 27, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

In DEA we have two measures of efficiency with different characteristics; radial and non-radial. We propose a method for linking these two models in a unified framework. This unified model includes two scalar parameters and by changing the parameter values we can jump from the radial CCR to the non-radial SBM. An appropriate choice of these parameters will generate compromised models and thus contribute to overcome shortcomings inherent in both approaches.

Estimating Efficiency within the Manufacturing Sector in Kenya during the Structural Reform Period: An Empirical Analysis

Ngui, Dianah Mukwate - Thomi, Walter

Session 2 Poster I
Wednesday, June 27, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

From mid 1980s, the government of Kenya pursued Structural Adjustment Programmes leading to the liberalization of the domestic economy - both output and input markets and, opened the economy to international competition. Trade liberalization and outward oriented strategies are expected to increase efficiency at firm level. Using survey data collected as part of a World Bank Regional Program on Enterprise Development (RPED) over the period 1993 –1995 and 2002/2003, this paper analyses technical efficiency in three manufacturing sectors of the Kenyan economy: food, metal and textile at two periods in time during the structural reform period;- 1991/1992-1994/1995 and 2000/2001-2002/2003. After estimating a stochastic production frontier, the efficiency results are reviewed in light of both point and confidence interval estimates constructed using Horrace and Schmidt (1996) technique. The food and textile sub-sectors indicate an improvement in average technical efficiency from 1991/1992-1994/1995 to 2000/2001-2002/2003 while the metal sub-sector shows a decline in average technical efficiency. Further, the analysis reveals that with an exception of the food sub-sector, there has been a significant difference in distribution of efficiency scores in the textile and metal sub-sectors across the two periods. The difference is significantly different in the 2000/2001-2002/2003 period across the sub-sectors compared to the 1991/1992-1994/1995 period where the distribution is not statistically significant. The conclusion is the manufacturing sub-sectors have performed differently during the structural reform period have despite the fact that they have been operating under similar macro-economic conditions. However, the confidence intervals indicate that low precision is attached to the efficiency estimates hence, caution has to be taken upon the interpretation based upon the point estimates.

The Generalized Distance Function as a Solution to Infeasibility of Super Efficiency Models

Andrew, Johnson - McGinnis, Leon

Session 2 Poster I
Wednesday, June 27, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

The generalized distance function provides an alternative to the more traditional input or output oriented distance functions and includes the hyperbolic distance function as a special case. Within super efficiency models the generalized distance function provides the distinct advantage of eliminating the infeasibility problem when the parameter alpha is (0,1). Further the use of the generalized distance function in a super efficiency models allows the restriction, all data must be positive, to be relaxed. Rather a the less stringent restriction of a single observation in the reference set has zero values for the same input set as the observation under evaluation, is all that is required. These properties of the generalized distance function are shown along with an application of these results to the Malmquist Index.

Trading Flows and Trading Restrictions: Emission Permit Trading in the Swedish Pulp and Paper Industry

Pachkova, Elena

Session 2 Poster I
Wednesday, June 27, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

This paper introduces restrictions to emission trading within non-parametric emission trading models introduced by Brännlund et. al (1998). Emission trading is based on the idea that some plants can buy emission permits from other plants if the number of their initial permits is not enough to produce their desired level of outputs. The total bound on emissions from an industry is fixed, but the permits can be redistributed within the industry. However, such redistributions of permits might be undesirable. Emissions may have the worst effect in the direct vicinity of the plant, and it is therefore possible that for some plants the number of emission permits should not be increased. An example of such a plant is one close to fishing communities, certain environmental areas etc. Thus, emission trading where such a unit plays the role of the buyer and hence increases the number of its permits might be undesirable, even though this leads to higher industry profits and the total emission is not changed. In this paper a model is provided, that enables introduction of restrictions of such undesirable redistributions of emission permits. The model is illustrated with the Swedish pulp and paper industry data from 1989 and 1990 the same data used in Brännlund et. al. (1998).

Improving Supply Chain Efficiency – A Strategic Decision-Making Analysis

Pasa, Iulia

Session 2 Poster I

Wednesday, June 27, 2007 12:00 - 12:00 (next day)

Building B - Ground Floor - Room EMF

The process of putting operations objective into active plans is never easy. There is an important need for an effective framework to guide managers and entrepreneurs in implementing strategies through a complex supply chain. This paper tries to provide a rapid modeling approach to strategic decision-making analysis in a complex supply chain in order to improve efficiency. For this purpose the decision making situations are analyzed, and the practices improving effectiveness are identified. This study further examines how environmental aspects (competitiveness and dynamism) influence the efficiency of the supply chain. The empirical analysis of this paper is trying to better clarify the way the efficiency of supply chain decision making responds to multiple environmental conditions. The findings reveal that making supply chain decisions is more effective in dynamic environments. In order to be competitive when the environment is changing, firms need to renew themselves by both exploiting competencies and exploring new ones (Floyd and Lane, 2000). There is little systematic evidence whether companies adopt different coordination mechanisms to develop a complex supply chain. Many prior researches have tended to focus on formal hierarchical structure, thereby ignoring the increasing importance of informal relations in coordinating the development of a complex supply chain. Yet, the impact of hierarchical structure and informal relations has not been studied in an integrated model. Second, the key characteristic of the strategic management discipline is its emphasis on a firm's competitive environment. (Lambert, 1998) defined supply chain management as "the integration of key business process from end user through original suppliers that provides products, services, and information that add value to customers and other stakeholders". In order to gain the full advantage from a strategy, it needs to be deployed and executed through action plans. That means after setting up objectives the very next step is to develop the ways in which these objectives will be reached (Miller and Hayslip, 1989). Organizational units use different formal and informal coordination mechanisms to develop the efficiency of the supply chain. The paper is structured in four main chapters: the first one will be related to literature review, the second one will focus on some empirical findings, the third one will present data collection, and results interpretation. In the last one I will put some relevant conclusions from the proposed research open for discussions.

Is There a Link between Productivity Growth and Investment Bursts?

Geylani, Pinar - Stefanou, Spiro

Session 2 Poster I

Wednesday, June 27, 2007 12:00 - 12:00 (next day)

Building B - Ground Floor - Room EMF

This paper investigates whether there is a link between productivity growth and large investments (defined as investment spikes) using Census Bureau's Longitudinal Research Database (LRD) at plant-level from 1972-1995 by focusing on U.S. Meat, Dairy and Food Manufacturing Industries. There are two objectives for the study. One is to examine whether the probability of having investment spike increases as the time passed since the last investment spike increases, i.e. increasing investment hazard; and the second objective is to examine whether an increase in total factor productivity raises the probability of investment spikes. To achieve these goals, we estimate set of logit regressions where the probability of having an investment spike is characterized as a function of relevant plant-level characteristics such as plants' investment age, plants' size, plants' age, plants' 4-digit SIC industry dummies and, productivity growth variable. There are two key findings. First set of results show that the probability of having investment spike decreases as the time passed since the last investment spike increases, i.e. decreasing investment hazard. Even though there are slight differences across group of plants among industries, the general pattern across industries shows a downward sloping investment hazard. This finding is different from the idea of an upward sloping hazard function where probability of having an investment spikes increases as the time passed since the last investment spike increase due to depreciation and technical change. One possible explanation for downward sloping hazard function is due to differences in obsolescence rates of plants, such as plants with rapid obsolescence rates may invest more frequently than plants with slow obsolescence rates. Our results indicate that plants in these industries are early investors and we see high frequency investment in early investment ages. The second set of results from the logit regression across industries indicates that the probability of investing across plants decreases as productivity growth increases. This implies the fact that fixed cost of investment causes plants with high productivity to postpone investing. These results are robust across industries. Estimates for all food manufacturing plants (two-digit industry level) provide further evidence in support of these two findings, a decreasing hazard function and a decrease in the likelihood of having investment spikes as productivity increases.

Efficiency Measurement and Regulation in U.S. Telecommunications: A Robustness Analysis

Resende, Marcelo

Session 3 A Network Industry (De)Regulation
Wednesday, June 27, 2007 14:00 - 15:30
Building A - First Floor - Room A101 J.M KEYNES

The paper investigates the robustness of different efficiency measures that can support the implementation of diverse forms of incentive regulation in the context of U.S. telecommunications. Comparisons, in terms of an output orientation, are considered for efficiency scores obtained from Data Envelopment Analysis (DEA), distance function (with corrected ordinary least squares and a random effects model) and distance function embedded in a stochastic frontier framework (with time invariant, time varying efficiencies or with inefficiency effects). Similarly to the previous empirical literature, one finds, in most cases, only a moderate consistency across the different approaches. In fact, the different spectrum of techniques imposed varied degrees of structure in the error term and indicated non-negligible discrepancies across the different measurement approaches in terms of the ranking structure, degree of persistence and best and worst practices patterns.

European Railway Deregulation: The Influence of Regulatory and Environmental Conditions on Efficiency

Wetzel, Heike

Session 3 A Network Industry (De)Regulation
Wednesday, June 27, 2007 14:00 - 15:30
Building A - First Floor - Room A101 J.M KEYNES

In the late eighties and early nineties of the last century, European national governments as well as the EU Commission decided to introduce competitive elements into the European railway industries. The railway sector had been seen as performing poorly due to high subsidy requirements and an increasingly falling market share compared to other modes of transportation. Since then, the main focus of the sector reform had been market liberalization by granting non-discriminatory access to the infrastructure to third parties and separating the infrastructure from the transportation business. Until today, the majority of European countries implemented some kind of reform in the railway sector. However, these reforms differ broadly in terms of their date of implementation and their degree: The UK restructured their railways already in the early 1990s, whereas Spain has not opened the sector until 2003. Unbundling in Europe still varies from accounting separation only over organizational separation within a holding structure to complete ownership separation, with one firm owning the infrastructure and providing network access and services to numerous competitive transportation firms. While in some countries the whole sector is publicly owned yet numerous privately-owned firms are in business in other countries. In this paper, we analyze how the different regulatory interventions affected the sector's productivity development over time. Apart from these regulatory differences European countries are also characterized by different environmental conditions such as population density, economic situation and network density. In order to measure the influence of regulatory and environmental conditions on the efficiency of European railways we apply stochastic frontier analysis (SFA) and calculate the technological change with a Malmquist Index model. The data includes railway companies from 28 European countries, observed over a period of 13 years from 1992 to 2004. Specifying a translog distance function including regulatory and other country-specific environmental variables as well as a time-trend, we compare efficiency across countries and efficiency change over time.

A Quantitative Study of Train Operating Companies Cost and Efficiency Trends 1996 to 2006: Lessons for Future Franchising Policy

Wheat, Phillip - Smith, Andrew

Session 3 A Network Industry (De)Regulation
Wednesday, June 27, 2007 14:00 - 15:30
Building A - First Floor - Room A101 J.M KEYNES

Franchising and competitive tendering has become an important method for introducing competition “for the market” where competition “in the market” is considered to be undesirable. The empirical evidence suggests that competitive tendering / franchising has produced substantial cost reductions in a range of contexts, for example, refuse collection and NHS ancillary services, as well as, in the transport sector, London buses. By contrast, despite some reported Train Operating Company (TOC) cost savings during the early years after privatisation, TOC costs have increased very sharply since the Hatfield accident. Nash and Smith (2006) find that TOC unit costs increased by almost 40% between 1999/00 and 2003/04 As a result, subsidies to passenger train operators increased sharply over this period. Our paper aims to explore why franchising failed to bring costs down in the passenger rail sector in Britain over the period 1996-2006, and in particular, how the institutional arrangements impacted on TOC cost trends over this period. We employ state-of-the-art efficiency methods to estimate a TOC cost function, thus enabling the impact of a range of policy and variables to be tested, as well as permitting examination of the cost structure of the industry in terms of scale, inefficiency (and changes over time), quality and technological progress. We build on previous work in this area through both data and methodological improvements. No previous analysis has extended beyond 1999/00, and there is great policy interest in extending the analysis forward, given the cost explosion in train operating costs since then. We also have access to new data which permits a clear segmentation of TOC costs from third party payments for access to the infrastructure Identifying TOC own costs is essential to understanding the true drivers of TOC cost rises as opposed to cost increases imposed on the TOCs by other parts of the industry. Our data set also contains data on various quality measures for TOCs such as age of rolling stock and safety measures which will allow us to control for these effects in the estimation. While a range of methods have been employed across a limited number of previous studies, it is unclear whether differences in results are true differences or simply due to the statistical method employed. For example it is well acknowledged (see, for example, Farsi, Filippini, Greene (2005)) that utilising the fixed effects approach may over state the true efficiency effects since the dummy variables capture all time invariant characteristics. In our paper we present several models estimated using different parametric efficiency techniques utilising the same data set. This allows us to investigate the extent to which the econometric method impacts on the results of the analysis. We plan to estimate panel models including fixed and random effects, as well as other stochastic frontier models (SFA) which utilise maximum likelihood estimation methods. We also investigate, where appropriate, the difference in results from including quality characteristics as determinants of the mean of the inefficiency error versus directly in the cost function, both in terms of the net efficiency scores and the estimated coefficients of the explanatory variables in the cost function.

A Comparison of Railway Performance in Europe: An Application of Multi-Directional Efficiency Analysis

Holvad, Torben - Hougaard, Jens Leth - Kronborg, Dorte

Session 3 A Network Industry (De)Regulation
Wednesday, June 27, 2007 14:00 - 15:30
Building A - First Floor - Room A101 J.M KEYNES

The organisation of passenger railways is undergoing significant changes in a number of countries in Europe as well as in the rest of the World. Traditionally, railways have been organised nationally as state monopolies responsible for both infrastructure and services, but recent years have seen a move away from this model. Therefore, it is of interest to examine how the railway systems compare to each other in this changing environment. In this paper an assessment of how railway performance varies among the EU 25 countries will be undertaken with reference to cost efficiency. This assessment will be based on the so-called Multi-directional Efficiency Analysis (MEA). MEA, like DEA, is a non-parametric method, differing from DEA in the way in which efficiency is measured. In other words, MEA makes use of an entirely different efficiency index. We shall argue that MEA is better suited for dealing with technologies exhibiting limited substitution possibilities (in inputs) as in the present model of railway. Moreover, in general MEA has the advantage that from a managerial viewpoint, it provides more relevant performance information and it allows for a more substantive analysis of the effect of external variables on the inefficiency scores. In particular, it becomes possible to disaggregate inefficiency into different components corresponding to different types of cost generating variables and thereby provide both management of railways and policy makers with more detailed information on possible improvements of performance. The data to be used in this efficiency analysis have been collected as part of an EU sponsored project ("Study of the Financing of and Public Budget Contributions to Railways") where railway statistics for all current EU Member States and Norway and Switzerland are available for the period 1995 – 2001. These data cover activity and resource indicators (e.g. passenger kilometres, tonne-kilometres, traffic units, staff and length of lines) as well as data from the income statement (e.g. revenue, costs and public budget contributions) and balance sheet information (e.g. capital, reserves and debt). Revenue and costs indicators are available for different subgroups. The paper will be structured as follows. Section 1 will provide background information about the railway sector in Europe. Section 2 will then outline the methodology used for the performance assessment (MEA). In Section 3 the data used will be presented. Efficiency results and explanatory factors are examined in Section 4. Section 5 concludes with policy implications and final remarks.

Educational Offer Evaluation in Romanian Universities by Efficiency Techniques

Spircu, Tiberiu - Spircu, Liliana - Albu, Crisan

Session 3 B University Performance
Wednesday, June 27, 2007 14:00 - 15:30
Building A - Second Floor - Room A201 J. MONNET

The performance of a university is measured using quality standards adapted to the requirements of the educational process which, in our opinion, is similar to a production process. Thus, to education unit notions such as used inputs, realized outputs, efficiency/inefficiency degree, score and rank, productivity will be associated. During the last years an intense preoccupation, regarding the alignment of the university education process to the norms and rules established in The Bologna Declaration has appeared in Romania. Now the Romanian educational process is in full transformation, trying to ensure the convergence of the education system product (output) towards accurate European requirements, to attain efficiency standards, to realize a global competitivity and a large mobility of the graduates in the European area. The proposal of a team from the A.E.S. to evaluate the educational offer in Romanian universities by efficiency techniques was accepted and presently a professional staff from 9 different Romanian universities is involved in a research project. In this project the economic, technical and also humanistic domains are evaluated. To be able to realize a comparative study between the old and the new curricula, an evaluation of the old curriculum was conducted over the generation 2000-2006. “Classical” inputs and outputs of the process (such as the distribution of professional staff by age and qualification, the exam results obtained by students) have been registered; also “subjective” information about the process has been gathered from questionnaires. An input-output matrix prepared for DEA techniques has been obtained. However, a) due to differences in educational domains compared at the basic stage (first two years of study) which possibly leads to a large variability, a preliminary principal component analysis of the I-O matrix is necessary, and b) due to the limited number of “production units” (i.e. of analyzed faculties), by contrast of a larger number of inputs/outputs, the bootstrap method is used to better estimate the production frontier. In the paper some of the results and conclusions of this research will be presented.

Budget Constrained Productivity of University Production

Räty, Tarmo - Kangasharju, Aki

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This paper develops a new way to measure productivity of educational services, applying it in the analysis of the Finnish universities. New approach is called for, as commonly used stochastic and deterministic productivity measures, such as SFA, DEA and FDH, set strong requirements for the homogeneity of the observations. Furthermore, ability of deterministic models to classify units as efficient and inefficient is known to be strongly dependent on the dimensions of the input-output space and the number of observations. To gain results on asymptotic properties of these models, homogeneity and sample size requirements are even stricter. In practice, researches have to suffice with small homogeneous data sets with poor model performance or larger data sets that clearly violate homogeneity requirement. This is also generally true in measuring the productivity of universities. This paper presents a comprehensive analysis of the productivity of Finnish universities using a new set of measures called Budget Constrained Productivity (BCP). They are particularly suitable for the analysis of a small set of differentiated units. We compare productivity between the study field units, where total number of units is between 2 and 9 depending on the field. The university specific productivity estimates are then easily aggregated from the unit wise BCP scores. BCP measures are based on the ratio of share of outputs on share of resources. In the multi-output case we show that, it is possible to express this ratio as the value of unit's outputs using the average unit, or imputed prices of the field relative to unit's actual cost. For the BCP, we suppose further that no valuation of outputs should violate the field level budget constraint set by the Ministry of Education. Variants of BCP optimize the unit's performance also with given assurance region around the imputed prices and alternative strategies that either let the prices vary over units or uses the same price vector for all the units within a field. Using the data of 15 study fields from 17 Finnish universities from 1998-2005, we find that relatively small multidiciplinary and specialized universities reach the highest productivity levels. Field wise, dental, education, engineering and business sciences, have experienced remarkable performance improvements, while medical sciences and humanities have suffered from remarkable productivity decrease. University wise, the schools of technology and economics have improved their productivity over 1998-2005, as well as multi-disciplinary Universities of of Kuopio, Wasa, Lappland, Jyväskylä and Åbo Academi. Universities of Helsinki and Tampere, the two largest multi-disciplinary units, shows 6 % productivity decrease. On average the whole university sector has kept up its performance and experienced a small 1,9 % productivity increase.

Assessing the Performance of Spanish University Technology Transfer Offices

Caldera, Aida - Debande, Olivier

Session 3 B University Performance
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We use unique micro data on Spanish university technology transfer offices (TTOs) to measure their efficiency and identify sources of their performance. The stochastic frontier estimation (SFE) and the data envelopment analysis (DEA) methods are used to estimate the production function of TTOs and to construct individual measures of their technical efficiency. Our evidence suggests substantial heterogeneity across Spanish TTOs determined largely by characteristics of the host universities, firms and TTOs themselves. The most efficient TTOs employ more skilled staff than less efficient units, are older and hosted by universities with an active technology transfer policy. Further, innovative firms and large firms have a positive effect on the efficiency of TTOs whereas small firms have the opposite effect.

Scale, Age, Substitution Effects and their Interactions in Academic Production. A Disaggregated Analysis at Discipline Level

Bonaccorsi, Andrea - Daraio, Cinzia - Simar, Leopold

Session 3 B University Performance
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In this paper we use newly developed nonparametric techniques (Daraio and Simar, 2007) for the analysis of technical efficiency of Italian universities. A new and original database is used, in which data of Italian universities are disaggregated at the discipline level in order to allow for comparison of effects across fields characterized by different degrees of capital intensity, orientation towards basic research or industrial applications, and relation with the job market. The database includes also information on the recent evaluation exercise carried out by the Italian Committee for the Evaluation of Research (CIVR), and on projects funded by discipline. In this paper we focus on Engineering and technical sciences, medical and natural sciences. We provide also comparisons to aggregate measures at the university level obtained in previous works (Bonaccorsi, Daraio and Simar, 2006, 2007). Robust partial frontiers (of order-alpha and of order-m) and conditional efficiency measures allow to identify local effects that more clearly shed light on detailed institutional features of public research. We investigate on the existence of returns to scale across research areas. We analyse the trade-offs between teaching and research and age effects by discipline. Finally we explore the impact of the intensity of PhD students on the research efficiency. These strategic issues shed lights on the microstructure of research and education in the public system, taking into account the relevant impact of subject-mix at the level of university.

Evaluating The Regulator: Winners and Lossers in the Spanish Electricity Distribution

Blazquez Gomez, MÂª Leticia - Grifell-Tatjé, Emili

Session 3 C Electricity Regulation I
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The Spanish electricity sector has experienced deep changes in its regulation along the last decades. The regulative reforms have implied that competence to be introduced in generation and retail activities. On the other hand, transmission and distribution activities are still considered as natural monopolies under regulation. The aim of this paper is to analyse the consequences derived from the regulative changes happened during the period 1988-2002 in the Spanish electricity distribution. The different reforms applied to this activity along this period have intended to give the firms the necessary incentives to improve their efficiency and to allow both firms and consumers to benefit from these efficiency gains. To achieve these objectives, “cost-of-service” and “rate-of-return" models have been abandoned and incentives models have been adopted instead; specifically, price cap models with some characteristics of the yardstick competition models. To carry out the analysis, we compare the reimbursements that regulator has paid to the electricity firms in return for their distribution activity each year to the incomes they would have obtained if the incentives model by Bogetof (1997, 2000) and Agrell et al. (2000, 2005) had been applied by the regulator. This model proposes a principal-agent scheme under asymmetric information about technology. The regulator reimburses the firms their actual cost plus (minus) a fraction of the efficiency gains (or losses) which are reached by the firms. In this way the regulator gives incentives to the firms to minimize their costs and their informational advantages. Additionally, the model design permits the regulator to define the share of the efficiency gains or losses which is assumed by the firm and by the consumers. The model solution is calculated using the Data Envelopment Analysis (DEA) techniques, which fit properly into regulatory practice. The results of the analysis indicate that Spanish regulator has not linked the firms’ performance to their reimbursements. This has provoked that the inefficient firms at the beginning of the analysis period continued being equally (or even more) inefficient until the end of this period. Moreover, the results show that the Spanish regulator has benefited the firms to the detriment of the electricity consumers. The electricity firms have got a higher reimbursement than an optimal incentive model would recommend.

Hybrid Frontier Yardstick Regulation for the German Energy Networks

Agrell, Per

Session 3 C Electricity Regulation I
Wednesday, June 27, 2007 14:00 - 15:30
Building A - First Floor - Room A103 M. CROZIER

Bundesnetzagentur (The German Federal Network Agency)is responsible for the regulation of all electricity and gas distribution and transmission system operators with more than 100,000 customers connected or that are active in more than one federal state. Following the new Energy Industry Act in 2005, the regulator embarked on a new regulatory approach, breaking away from the previous cost-recovery model. At the heart of the regulation of distribution operators is an incentive mechanism based on an estimated production frontier, using identical models for both deterministic (CRS) and stochastic frontiers (loglinear for gas, translog for electricity). The implementation follows a three-stage path, where the first stage aims at absorbing incumbent inefficiency and catching-up best-practice and the final stage is a rolling-horizon yardstick regime of the Agrell, Bogetoft and Tind (2004) type. In the lapse of a single year, data was collected, processed and validated for about 350 electricity distributors and 500 gas distributors. In this paper, we describe the approach, the model specification process, the data validation and the estimation results. The models show high rank correlation (Spearman) between DEA and SFA models, both for electricity (0.72) and for gas (0.94). Results are also provided for subadditivity tests, test for age effects in network capital and for the consistency of capital valuation. The project is not only interesting from a pure productivity analysis viewpoint, but also serves as a benchmark for regulatory reform processes in general.

Regulatory Benchmarking with Panel Data

Weyman-Jones, Thomas - Bagdadioglu, Necmiddin

Session 3 C Electricity Regulation I
Wednesday, June 27, 2007 14:00 - 15:30
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Comparative efficiency and productivity analysis, more commonly ‘benchmarking’, has become widely used by network regulators as part of price-capping or revenue-capping regulatory regimes. However, productivity comparisons require careful consideration of the relative importance of inter-firm heterogeneity and inefficiency in contributing to firm performance and this is essential to the credibility of liberalisation and regulatory proposals. This paper considers a range of panel data procedures for regulatory benchmarking that allow for both latent heterogeneity and inefficiency in short panels of a large number of firms. In these panels, time-invariant effects can be important, but the literature is divided over whether Classical SFA-panel or True SFA-panel models are to be preferred in treating time-invariant effects, since the Classical approach treats them entirely as inefficiency, and the True approach treats them entirely as latent heterogeneity. We argue that by using time-invariant observed heterogeneity information, a panel data procedure can be developed which accommodates both time-invariant heterogeneity and time-invariant inefficiency in a random effects SFA-framework. Both types of time-invariant effects are important when state-owned network industries subject to low incentive power regulation (e.g. in EU-accession countries) are undergoing structural change prior to liberalization. The paper applies an input distance function model with appropriate second order concavity properties for econometric estimation to a panel of electricity distribution utilities in Turkey, since electricity industry reform is a major policy issue there. The results show that a random effects model with non-separable time-invariant observed heterogeneity as well as time-invariant inefficiency is able to perform better in terms of meeting second order concavity conditions than models which attribute all of the differences in firm performance either totally to inefficiency or totally to heterogeneity. The results confirm the importance of allowing simultaneously for both heterogeneity and inefficiency in regulatory benchmarking, and they emphasise the need for specific time-invariant heterogeneity information, such as geographical data, on regulated utilities in different regions.

Membership in Hospital Organizations, Productivity Growth, and Technical Change for Non-profit Hospitals

Granderson, Gerald - Tauchen, Helen

Session 3 D Health I

Wednesday, June 27, 2007 14:00 - 15:30

Building A - First Floor - Room A121 M.E. PORTER

This paper analyzes how hospital affiliation in an organization (alliance, system), and other relevant factors, affects its productivity and cost. More specifically, how a hospital's affiliation affects (i) the rate of technical change, (ii) total factor productivity growth, (iii) production costs, and (iv) the cost input mix in treating patients, for non-profit hospitals. Membership in an alliance or system can help enhance efficiency by offering opportunities to specialize and coordinate the treatment of patients across organization (alliance, system) members. Becoming more specialized in treating various cases may contribute to lower hospital costs, and changes in the input mix hospitals use in treating patients. For example, hospital organization members specializing in outpatient primary care might use relatively less capital than (i) hospitals that specialize in more intensive in-patient services, or (ii) non-specialized non-member hospitals (alliance and/or system organization hospital members may employ a different input mix than non-organization hospitals. By fostering increased specialization in treating various types of patients, or in performing medical procedures, organization membership may enhance the rate at which technological change occurs. In addition, the potential improvement in technology, and possible changes in the input mix in treating patients, could impact the growth in total factor productivity. First, the paper investigates differences in technical change, productivity growth, and capital intensity between organization and non-organization hospitals. Membership in an organization is treated as exogenous, with observable characteristics of hospitals being used to control for differences in the types of hospitals that are in an organization. Second, the paper examines whether hospital affiliation influences its input mix of capital and labor. Third, the paper considers how HMO and PPO contracts affect hospital costs. Providing HMOs and PPOs discounts as incentives to sign hospital contracts may provide non-profit hospitals an incentive to reduce operating costs in order to operate within their budgets. Finally, the paper investigates the impact of hospital certificate-of-need (CON) regulation on hospital costs. States with CON regulations require evidence of need for either new construction or expansion of existing facilities. Such regulation was designed to prevent unnecessary duplication of hospital services, and thereby slow the increase in health care costs. Limiting entry into the market can affect the competitive structure of the industry, and thereby curb market forces that place pressures on hospitals to operate efficiently. With this viewpoint, eliminating CON regulation could lead to reductions in the cost of treating patients (via more competition in providing health care services). Using data from hospitals in states that eliminated the regulation (Indiana and Ohio), and states with CON regulation intact (Illinois and Wisconsin), the paper tests how eliminating CON regulation affects hospital costs. The data sample is a panel of 248 general medical and surgical hospitals in Illinois, Indiana, Ohio, and Wisconsin, from 1996 to 1999. Selecting hospitals from one region, the Midwestern United States, provides a data sample with similar institutional and demographic characteristics, and thus facilitates comparisons across states.

Resource Utilization in U.S. Hospital Markets

Valdmanis, Vivian - Ferrier, Gary - Leleu, Herve

Session 3 D Health I

Wednesday, June 27, 2007 14:00 - 15:30
Building A - First Floor - Room A121 M.E. PORTER

Hospital markets are often described as imperfect and it is difficult to measure inefficient use of resources. This is particularly true in the case of measuring efficiency in a macro-sense, such as state-wide hospital efficiency. Pareto inefficiency (i.e., the non-optimal use of resources) leads to waste and higher costs – a situation that burdens state governments. In this paper, we extend the usual analysis of hospital productivity. Previous works have focused on individual hospitals as the decision-making unit (DMU). We approach the problem of measuring hospital market efficiency by using each state as the DMU. In this way, we can exploit the decomposition of the Debreu coefficient of resource utilization into two components – underemployment of physical resources (technical inefficiency) and imperfection of hospital markets (structural inefficiency). The approach we propose here is also well-suited for hospital markets since demand for services must be provided. Because there is not perfect competition in hospital markets, we deem that the total market for hospitals in all states simultaneously define the structural efficiency to which individual states' hospital markets will be benchmarked. Measuring hospital markets will include the use of directional distance functions. Because we can control for exogenous factors, we avoid some of the typical problems of DEA, namely the inability to control for external shocks. We use the input-based approach with the direction designated by the available resource vector. Utilizing this approach we can follow the process of hospital market production from the underemployment of resources to inefficient production to the impact that imperfections in the market (e.g., regulation) to determine the effect each has on states' hospitals. The imperfections that arise in a hospital market include the certificate of need regulation, self-selection bias (some hospitals have to be located in rural areas to ensure services are provided) and non-price competition (the lack of for-profit competitors that may promote x-inefficiency among non-profit/public providers). We use the American Hospital Association data for U.S. hospitals from 1994 through 2002. By using a longitudinal data set, we can measure hospital market behavior through time in order to determine the stability of markets in our sample. We can also assess factors that are associated with market failure and resulting efficiency (both technical and structural). To preview our results, we find that states with CON legislation had the same average technical efficiency scores as states without CON regulations. However, when we regressed structural efficiency on exogenous factors – urban/rural, per-cent for-profit hospital in market, per-cent public hospitals in market, and CON, we find that in states with CON legislation exhibited 5% lower inefficiency and thus compared more favorably to the entire nation sample which we consider the relatively true market than hospital markets operating in states without CON. We also find that ownership status had a significant affect on structural efficiency for hospital markets in our sample during the early to mid-1990s but that these differences disappeared over time. Hospital markets located in predominantly rural states exhibited less structural efficiency. The policy implications for this work include a possibility for the re-allocation of resources so that individual state hospital markets more closely resemble the nation-wide hospital market.

Complications! Complications! Complications!: Measuring Efficiency in Healthcare

Lordan, Grace

Session 3 D Health I
Wednesday, June 27, 2007 14:00 - 15:30
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Modelling efficiency in healthcare with stochastic production frontier analysis can be cumbersome given that frequently outputs are multiple and exogenous. This analysis considers an approach where payroll is considered as an output in the health production function and services offered by the healthcare facility are seen as inputs. These services are generally modelled as outputs in the traditional production frontier approach. It is argued that this may be inappropriate when these services are exogenous and is even more troublesome with multiple output technology when a suitable aggregation method is not apparent. The objective of the function is then to minimise the payroll given the inputs. This approach is applied to micro panel data from primary care out of hours' services which operate on the Island of Ireland in both North and South of the Border. Over 50% of the sample population is observed. The organisations operate in a two tier set up whereby a number of centres are set within the OOH co-op structure. The model considers an approach to account for this multilevel structure as well as methods to control for latent heterogeneity. It deals specifically with latent heterogeneity associated with unobservable casemix and quality of care. These approaches are compared in terms of their statistical effect on efficiency values and their rankings as well as their theoretical merit.

Understanding (In)efficiency in Thai Publicly Owned Hospitals

Asavadachanukorn, Preecha - Yaisawarng, Saowaros - Yaisawarng, Suthathip

Session 3 D Health I
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The World Health Organization (WHO) has recognized that the health care systems in many countries are not capable of effectively addressing an increasing demand for health care and that health system development and reform are a serious challenge (WHO, 1999). WHO advocated an active government involvement in the health care reform, taken into account both resource limits and the limit of government. It listed the core objectives for health system development as "improving health status, reducing health inequalities, enhancing responsiveness to legitimate expectations, increasing efficiency, protecting individuals, families and communities from financial loss, and enhancing fairness in the financing and delivery of health care (WHO, 1999, pp. 32-33)." Beginning in April 2001, the Thai government gradually implemented countrywide universal health care coverage. This is a major health care reform that attempts to curb ever-increasing health care costs while addressing the core objectives listed by WHO. The program covers all Thai citizens not previously covered by any government-subsidized health insurance plan. This paper uses stochastic and deterministic approaches to analyze a sample of general and regional hospitals under funding by the Ministry of Public Health from FY2000 to FY2002. These hospitals provide tertiary care, representing 7.3 % of hospitals and 30.5 % of all beds in Thailand. Results from the quantitative analysis will be used to select hospitals for field work in which we interview hospital administrators, medical staff, and patients. Interviews are designed to collect both quantitative and qualitative information that could contribute toward better understanding of attributes that may prevent hospitals from achieving the best use of limited resources. Information from in-depth studies of these selected hospitals will be analyzed using various statistical methods. Our results could potentially offer insights for the government to design appropriate policies and/or incentive schemes to direct attention toward efficient delivery of high quality health care services that are accessible to all Thai citizens at the lowest cost.

Cost Structure, Ownership Effect and Competition: The Role of Deregulation and Prudential Re-Regulation

Zhao, Tianshu - Casu, Barbara - Ferrari, Alessandra

Session 3 E Deregulation in Banking
Wednesday, June 27, 2007 14:00 - 15:30
Building A - First Floor - Room A120 E. MALINVAUD

Despite the fact that the process of deregulation (and concomitant prudential re-regulation) has recently been a dominant feature in financial markets of both developed and developing countries, relatively little empirical work has been done on the impact of such process on bank competition and performance. This paper examines the impact of financial sector reforms on the cost structure characteristics and on the ownership-cost efficiency relationship in Indian banking. Following Battese and Coelli (1995) we employ a stochastic cost frontier approach on a balanced panel dataset which includes public sector, domestic private and foreign banks continuously operating in India throughout the period 1992-2004. We also examine the impact of reforms on competition in the lending market and on banks portfolio composition by estimating the persistence of price-marginal cost margin through a first-order autoregressive-distributed lag model, in line with the 'persistence of profitability' literature. Results suggest that Indian commercial banks have responded to the new regulatory environment by changing both the input mix and the output composition. The relationship between bank ownership and cost efficiency appears also to be affected. There is evidence of increased competition in the lending market in the latest stages of the reform process, at the time of tightening of prudential norms. The coexistence of deregulation and prudential re-regulation seems to safeguard the competition dynamics and consequently cost technology progress. However, we also find evidence of cross-subsidisation between other earning assets and loans, thus highlighting potential distortions in loan pricing and banks' portfolio choices.

Social Banking, Deregulation, and Profitability of Banks: The Indian Case

Mukherjee, Kankana - Das, Abhiman - Ray, Subhash

Session 3 E Deregulation in Banking
Wednesday, June 27, 2007 14:00 - 15:30
Building A - First Floor - Room A120 E. MALINVAUD

India instituted major economic reforms in 1991, a central aspect of which was financial sector reforms. Given that the banking sector accounts for the largest proportion of intermediation services in the economy, it is not surprising that the main thrust of the financial reforms was targeted toward this sector. With the objective of promoting a market-oriented competitive environment for the banking industry, several earlier statutory requirements and control restrictions were deregulated, new private banks were allowed entry and at the same time the process of supervision was strengthened to ensure soundness of the industry. Concurrent with improvements in the functioning of the financial sector, the Indian economy has experienced tremendous growth since the introduction of the economic reforms. In order to sustain a high rate of growth in the future and in order to make the benefits of growth available to larger sections of the population, policy makers have, over the recent decades and especially in recent years, placed a major emphasis on expanding the financial coverage in the country. To this end, government has encouraged and emphasized an increase in overall lending by banks. As part of the social banking introduced in the 1970s, another direction taken by regulators to achieve financial inclusion is to mandate a minimum proportion of lending that should be extended to the priority sector, of which the agricultural sector and small enterprises and businesses are the significant segments. Such regulations are in addition to those imposed to maintain soundness of the banking system. In spite of the major role assigned to banks to bear this social responsibility, little or no rigorous research has been conducted so far to assess the cost that this could entail for banks in the form of lost profits. This should represent valuable information for policy makers in order to assess the overall welfare effects of these regulations. In this study we use the nonparametric method of Data Envelopment Analysis to estimate the maximum profit attainable by Indian banks, first in the absence of regulatory restrictions aimed at expanding the financial coverage and then in the presence of such regulatory restrictions on the choice of inputs and outputs. This allows us to estimate the lost profit to banks as a result of compliance with the regulations. Given that the restricted production possibility set is nested within the unrestricted one, the measure of lost profit will always be non- negative. A comparison of the profit efficiency measures obtained from the alternative models would permit us to test the statistical significance of the impact of such restrictions on profitability through Banker's (1993) F tests. Our study covers the period 1997-2005 and includes both public sector banks and private sector banks. We also explore the variations in lost profits across banks with different ownership categories – State Bank of India and its associates, nationalized banks, and other private banks. Our preliminary results indicate that the maximum profits attainable by banks in the presence of the restrictions is, on average, about 27% less than the maximum profits attainable if such restrictions were not imposed.

Competition and Market Power in Physician Private Practices

Gunning, Timothy - Sickles, Robin

Session 4 A Health II
Wednesday, June 27, 2007 16:00 - 17:30
Building A - First Floor - Room A101 J.M KEYNES

This paper presents a theoretical and empirical framework for analyzing competition in physician private practices. Using the 1998 American Medical Association (AMA) Socioeconomic Monitoring Survey (SMS), we isolate the marginal cost of physician services at the physician level and test for the degree of collusion and monopoly power in physician private practices. The year 1998 is of particular interest, since The United States Department of Justice (DOJ) filed charges in federal court against a variety of large physician practices, consequently ruling that physicians could no longer engage in joint price negotiations. We investigate the grounds for such an indictment by the DOJ, which was based primarily on anecdotal economic and legal observations, rather than the results of empirical evidence from accepted econometric modeling. Furthermore, we show that market inefficiencies translate into a loss of consumer surplus per office visit, ranging from $7.88 to $20.66. Our results affirm the grounds for the DOJ's indictment and provide empirical evidence of market power by physician specialty as well as the critical importance of price sensitivity in measuring the degree of collusion.

Economies of Scale and Efficiency Measurement in the Swiss Nursing Homes Industry

Farsi, Mehdi - Filippini, Massimo - Lunati, Diego

Session 4 A Health II
Wednesday, June 27, 2007 16:00 - 17:30
Building A - First Floor - Room A101 J.M KEYNES

This paper examines the cost structure in the nursing home industry, an issue of concern to Swiss policy makers because of the explosive growth of elderly care costs and the aging of the population. We consider a stochastic frontier cost model by estimating a translog cost function using a balanced panel data of 1745 observations from 349 nursing homes operating over 5 years (1998-2002) in Switzerland. In this paper we compare the results from different panel data econometric techniques focusing on the various methods of specification of unobserved heterogeneity across firms. In particular, the potential effects of such unobserved factors on the estimation results and their interpretation have been discussed. The paper eventually addresses three empirical issues: (1) the measurement of economies of scale in the nursing home sector, (2) the assessment of the economic performance of the firms by estimating their cost efficiency scores, and (3) the role of unobserved heterogeneity in the estimation process. The findings suggest that economies of scale are an important potential source of cost reduction in a majority of Swiss nursing homes. Taking the size as given the efficiency performance of the individual units are often practically very close to the estimated best practice. Nevertheless, the efficiency estimates suggest that some of the nursing homes can significantly reduce their costs by improving their productive efficiency.

The Relationship between Physician Quality and Hospital Efficiency

Bernet, Patrick - Valdmanis, Vivian - Michael, Rosko

Session 4 A Health II

Wednesday, June 27, 2007 16:00 - 17:30

Building A - First Floor - Room A101 J.M KEYNES

Physicians make many of the decisions that impact the cost of caring for patients while hospitalized. They decide what tests are needed, which procedures should be done, how long the patient needs to be hospitalized, and physicians direct the efforts of nurses, technicians and other medical professionals. Since the efficiency of any business is at least partly determined by the quality of their workers, physician quality may be related to hospital efficiency. US health insurers already use economic credentialing to reward physicians who limit the cost of caring for patients. Although controversial, a similar move by hospitals would bring greater pressure on physicians to be more mindful of costs. This paper measures the relationship between hospital efficiency and physician quality, as measured by the ranking of their medical school and their years of experience. It further explores the direction of this relationship. Findings will better inform the debate over economic credentialing. Data on all Florida hospital discharges for an entire year are summarized by hospital (n = 205). This is then augmented with data from the AHA Annual Survey of Hospitals, the Medicare Cost Report, local demographic and competitive factors, and admitting physician background. Stochastic frontier analysis (Battese/Coelli simultaneous estimation model) will be used to estimate hospital cost inefficiency. The independent variables include outputs (admissions, outpatient visits, inpatient days in non-acute care units), input prices (price of capital and area wage rate), and product mix adjusters (Medicare case mix index, percentage outpatient visits that are surgical, teaching status, risk adjusted mortality rate). Preliminary analysis supports the use of a translog cost function and a half-normal distribution for the error term. Inefficiency effects variables include ownership status, Herfindahl Index, and payer mix variables. Additional explanatory variables are employed to control for other conditions that have been demonstrated to influence hospital inefficiency, such as network affiliation, teaching status, and HMO penetration rate. In addition, variables for physician medical school ranking and years of experience will be included to test the core hypotheses. A strong positive relationship between physician medical school ranking and efficiency could help hospitals make a case for more selective credentialing. And a strong positive relationship between physician experience and efficiency might inspire hospitals to pay greater attention to physician retention. Alternatively, if no relationships are found, the case for economic credentialing is weakened.

Motivating Physicians to Improve Their Efficiency: An Evaluation of a Pilot Scheme

Staat, Matthias

Session 4 A Health II

Wednesday, June 27, 2007 16:00 - 17:30

Building A - First Floor - Room A101 J.M KEYNES

The present study analyses the design of a project by an Austrian health fund. The fund carried out an efficiency evaluation of its contract physicians. The purpose of the evaluation was to identify the most inefficient physicians and to motivate them to improve their efficiency. The data comprise general practitioners (GPs) as well as specialists from various fields. From each sample, the physicians in the lower quartile of the distribution of efficiency scores would be contacted by phone. If the physician agreed, an appointment was made to discuss the results of the analysis. All physicians practice in the same region of Austria but the mortality rate differs somewhat across the region. Therefore, the fund chose to divide the more than 800 GPs into four samples by the mortality rate in the area of the physician practice. Also, specialists were evaluated within specialty groups but not across. This procedure of identifying the most inefficient physicians within each group is problematic. By dividing GPs into four subsamples on the assumption that the mortality rate matters for their efficiency one may miss some inefficient physicians and address some rather efficient physicians instead. This may be the case if the physicians with the lowest overall efficiency were mostly located within one and the same mortality cluster. A bootstrap procedure is used to test whether the differences in mortality across the region matter for the efficiency of the physicians. The hypotheses that the efficiency is the same across regions cannot be rejected. Moreover, only about half of the physicians in the lower quartile of the distribution of efficiency scores of the full sample are identified when dividing the sample into four subsamples by mortality. The samples for the specialist physicians contain different numbers of observations ranging from 26 to 115. Therefore, it is not possible to compare the results obtained across samples. To make the results comparable, the procedure introduced by Zhang and Bartels is used. When the results are corrected for differences in sample size the ranking of the specialist groups w.r.t. their efficiency changes significantly. Moreover, different specialist groups have vastly different case costs. Therefore, it may be more appropriate to focus on specialist groups with high case cost instead of evenly dividing resources to motivate higher efficiency across groups.

The 65 Percent Problem

Grosskopf, Shawna - Hayes, Kathy - Taylor, Lori

Session 4 B School Performance
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According to the popular press and a voluminous number of academic analyses, public schools in the United States are just not as productive as they should be. When a public institution doesn't use taxpayers' money efficiently, the citizens may look to the government to improve efficiency. The No Child Left Behind Act requires states to establish laws concerning the monitoring and improvement of educational outcomes. Each state has been given latitude to determine the precise accountability standards to be used. Most research finds that improvement in public schools has not occurred since the establishment of the NCLB. So states are looking for new rules to improve student performance. The Governor of Texas has issued an executive order requiring that school districts spend at least 65 percent of their funds on instruction. Charter schools—which in theory have stronger incentives to behave efficiently—spend a significantly larger share of their budgets on administration than do traditional public schools. This project will examine whether Texas schools systematically spend too small a share of their budgets on instruction, and estimate the expected gains in student performance from increasing the share of school district budgets devoted to instruction. Following Grosskopf et al. (2001), this project will use an input distance function to model school production and generate measures of school inefficiency. The input distance function is a dual to the cost function that requires data on input quantities rather than input prices, and is preferable to the cost function in cross-sectional settings where prices do not vary (such as when making comparisons across schools within a single labor market.) The analysis will use individual student data to generate measures of value added by schools, and individual payroll data to generate measures of the relative price of instructional labor. The researchers will estimate the educational frontier for traditional public schools, for charter schools and for both types of schools combined. From those frontier estimates, the researchers will determine whether or not Texas school districts are systematically spending too large a share of their budgets on administration, the expected gains from reallocating their budgets to be more efficient, and the expected increase in student performance from increasing the instructional share to 65 percent.

Measuring Efficiency of Tunisian School in the Presence of Quasi-Fixed Inputs: A Bootstrap DEA Approach

Essid, Hedi - Ouelette, Pierre - Vigeant, Stéphane

Session 4 B School Performance
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The objective of this pape ris to measure the efficiency of the secondary school in Tunisia. To do this we have used a DEA method with quasi-fixed inputs. In order to estimate the precision of our estimator we have developed a statistical model on which the Data Generating Process (DGP) has been defined. This DGP allowed us to use both a homogeneous and heterogeneous smooth bootstrap method to estimate the bias and correct the efficiency measures and construct confidence intervals. The results of the simulations show that, from a methodological standpoint, the homogeneous bootstrap estimator seems to overestimate the DEA efficiency estimators when compared with the heterogeneous bootstrap. From an economic point of view, the results show that the secondary schools in Tunisia tend to manage better the students when they are in specialized fields than when they are in general fields.

Performance Evaluation of Portuguese Secondary Schools

Portela, Maria - Camanho, Ana

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This paper describes the analysis of Portuguese secondary schools using data envelopment analysis (DEA). The schools' assessment focuses on the process of promoting good academic results for students given their potential on entry of secondary education and the socio-economic context of the school. The variables considered to reflect the students potential were their classifications of entry of the educational stage, whereas the socio-economic conditions where measured by the parents' qualifications and the percentage of students with education subsidized by the state. Two types of DEA analysis were performed: one using an output oriented model allowing factor weights to vary freely from school to school and another using a model that restricts factor weights to be equal for all schools. The first model is well suited for identifying worst performing schools, whereas the latter is best suited for identifying best performing schools. Our data set comprised a small number of schools (22) and in some cases there were missing values. We address the issue of missing data in this paper, and treat them following an existing procedure in the literature. The empirical DEA analysis made at the school level was followed by an exploratory analysis of contextual indicators that potentially affect schools' performance, in order to understand their impact on the educational process. The analysis described in this paper is intended to provide guidelines for school improvement, highlighting the characteristics that differentiate the most efficient schools from the least efficient, and indicating for each school the aspects that it should focus in order to promote students success in secondary education.

Total Factor Productivity and Technical Efficiency Measurement under Factor Nonsubstitution: An Application to US Electric Utilities

Genius, Margarita - Tzouvelekas, Vangelis - Stefanou, Spiro

Session 4 C Electricity Regulation II
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This paper develops an econometric model for measuring input technical efficiency when the underlying technology is characterized by the lack of substitution between inputs. In this particular case of nonhomothetic Leontief type technologies, factor prices do not matter and thus input technical efficiency actually coincides with Farrell's (1957) cost efficiency. However, Farrell's (1957) radial measure of input technical inefficiency is inappropriate as it may be possible to identify a technical (cost) inefficient bundle as being efficient. Instead Russell's (1985; 1987) orthogonal non-radial indices can adequately measure technical inefficiency in factor limitation models. To this end, a disequilibrium model augmented with a regime specific technical inefficiency term is proposed and its likelihood function derived together with the computation of time-varying technical efficiency under specific distributional assumptions. The paper proposes a tractable approach for analyzing the sources of TFP changes namely technical change, changes in technical (cost) inefficiency, and the effect of scale economies using the duality results of Lau and Tamura (1972) for nonhomothetic Leontief type technologies. The proposed stochastic nonhomothetic Leontief production frontier is applied to a panel of US electric utility firms for the period 1986-96.

A Synergy Effect between Electricity and Gas in US Energy Utility Industry: A Combined Use of DEA and DEA-Discriminant Analysis

Goto, Mika - Sueyoshi, Toshiyuki

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Many well-known researchers (e.g., Robert Wilson, 2002) have discussed that there is similarity between electricity and gas services in the US energy industry. Hence, they believe that there is a synergy effect between electricity and gas services. However, the size of gas business is not large enough to produce a synergy effect with electricity. Consequently, there was no previous research that empirically confirmed an existence of the synergy effect in the US energy industry. To examine whether there is a synergy effect of corporate diversification in the US energy industry, this study compares electricity-specific firms with other energy firms that provide both electricity and gas services in terms of these operational and financial performances. DEA is used to measure operational efficiency and DEA-DA (Discriminant Analysis) is used to measure financial performance. Comparing the two groups of US energy firms from 1990 to 2004, this study finds that operational and financial synergy effects do not exist between electricity and gas services in the US energy industry. This result is consistent with the research result of Lang and Stulz (1994), discussing that gdiversified firms are valued less than specialized firms h. Furthermore, this study finds that there is a linkage between operational and financial performances in the two utility services. We also find that the deregulation, enacted in 1996, has considerably influenced on the operational and financial performances of the US energy industry. The finding adds new empirical evidence to the research of Jandik and Makhija (2005) that have investigated the financial performance of the electric power utilities from 1980 to 1997.

Do Mergers Really Increase Efficiency? A Cost Efficiency Analysis of Electricity Distributors in the US

Hess, Borge

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Starting in mid-1990s, the US experienced a substantial merger wave in the electricity industry with more than 70 since then and a value of more than 180 bn US-$ for the period 1994-2002. (Edision Electric Institute, as cited in Kwoka and Pollitt 2005, p. 33). The analysis of mergers is strongly related to industrial organization because these models encourage antitrust agencies to assess the anticompetitive effect of a decreasing number of firms. The paper of Farrell and Shapiro (1990) analyzed the welfare effect of horizontal mergers in a Cournot setting and found that under some circumstances the anticompetitive effect can be overwhelmed by cost savings that are due to learning effects or generated by economies of scale. Thus, mergers are welfare enhancing if the efficiency gains at least cancels out the anticompetitive effect. Although this argument is well established in theory, evidence so far is scare. Although there exist a broad literature dealing with efficiency scores in electricity distribution, only the recent paper of Kwoka and Pollitt (2005) analyses the effects of mergers and acquisitions on efficiency. They used the non-parametric Data envelopment Analysis (DEA) for estimating technical efficiency scores for US distributors. Thereby, efficiency is calculated in a first stage and in a second stage, a Tobit regression is estimated to assess several merger effects on efficiency. Beside an inconsistence problem, the procedure used does not account for data noise. In contrast, we apply the parametric Stochastic Frontier Analysis (SFA) on an extended data set from the US to estimate cost efficiency and merger effects on efficiency are estimated simultaneously in a one stage procedure. We like to asses the overall or cost efficiency (CE) using the parametric, stochastic frontier technique SFA in a cost function framework. This allows for random unobserved heterogeneity among the different firms by using two error terms (stochastic and inefficiency errors) but a specification of a functional form is needed. The cost efficiency is the product of technical efficiency (TE) and allocative efficiency (AE); the first term describes the efficiency in the use of production technology, while the second term displays the efficiency in production factor allocation. A translog (transcendental logarithmic) function is chosen for estimating the cost function because its flexible form places no restrictions on the elasticity of substitution at the outset and the economies of scale are allowed to differ with the level of output. The variables of the cost function are the total costs, two outputs (the quantity of electricity delivered and the number of customers), and two input prices (price of capital and labor); a time trend and a network density variable are included in addition. Following Battese and Coelli (1995) in our models specification, a second equation is estimated to asses the effects of structural variables to on cost efficiency. These variables are dummies that indicate the time path of the merger for the buying and the acquired firm, as well as a time trend that indicates the industry-specific change of efficiency over time. Afterwards, we calculate the correlation of the estimates of different models as well as the scale efficiency of the different groups of firms. The estimation results of the cost function show relatively low cost elasticities with respect to the electricity delivered. The cost elasticities of the output ‘number of customers’ lie in the in the range of 80% to 100% that is in line with the literature. Over all model specifications, the results indicate that mergers change efficiencies of the merging parties’ significantly. The buying firms were bad cost performer in the pre-merger period (more inefficient compared to the control group of non-merging utilities) and gain from merging partly by increasing economies of scale and thus, becoming a good cost performer in the post-merger period. In contrast, the acquired firms were average cost performer prior to a merger and they loose in terms of efficiency becoming a bad performer. Hence, the overall effect of the merged firm remains ambiguous. Hence, we cannot confirm cost savings of a merger and their magnitude but we can state that economies of scale seem not to be a determining factor. The improvement by merging suggests that these firms have shifted technology and processes from sellers to buyers. The parametric approach we applied does not allow the channels to investigate by which the efficiency can be transferred from one company to another.

Productivity Development in the Swedish Electricity Distribution 2001-2005

Ek, Arvid Goran

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The review of the productivity development in the electricity distribution industry in Sweden is a part of the Energy Markets Inspectorates regulation of the electricity grids in Sweden. The model for the measuring consists of seven variables. Operative cost as input and six products (distributed energy and number of customers both divided in high and low voltage, maximum load for the year to the upstream grid and the total length of the grids lines. The methods applied are the Data Envelopment Analysis (DEA) and the Malmquist index. The number of grids participating in the panel consists of 154 firms. The median value for the productivity development between 2001 and 2004 was measured 9.0 %. The median for the efficiency change was measured to -1.0 %. The frontier shifted with a median value of 10.6 %. That is: the industry used rather uniformly less resources with approximately the same production. For the industry as a whole (the results weighted with the number of customers) the change in productivity was measured to 13.4 % with efficiency change of 1.8 % and frontier shift of 12.1 %. In order to check the results a translog regression estimation was done. The parameter value for the time variable was estimated to 8.1 % increase in productivity. The results also show a clear catching-up impact. A merger impact can be seen, but due to the low number of merged grids the result is not statistically significant. The productivity development was compared to the change in a relevant tariff (household with electricity heating). The result depends to a great deal on which deflation index that is used and if one look at the median value for the grids or for the industry as a whole with weighted values. Using a special factor price index to deflate the tariffs the development between 2001 and 2004 indicates that approximately 1/5 of the productivity development was given to the customers by reduced tariffs. Using consumer price index as deflator has the negative impact of increasing tariffs in real terms.

Technical Efficiency and Technological Gaps for Dairy Farms in Three Southern Cone Countries

Moreira, Victor - Bravo-Ureta, Boris

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This paper analyses the technical efficiency (TE) of dairy farms from Argentina, Chile and Uruguay using the meta production frontier (MPF) approach developed by Battese and Rao (2002) and refined by Battese, Rao and O'Donnell (2004). Stochastic Production Frontier (SPF) models are estimated separately for each country and pooled for all three countries using highly unbalanced panel data sets. A MPF model is also estimated with the pooled data using linear programming (LP). Alternative model specifications were evaluated and various statistical tests were performed to obtain the best model for the data under analysis. These tests reveal that the translog functional form dominates the Cobb-Douglas, the inefficiency effects display a half-normal distribution, TE is time invariant, and technical inefficiency is statistically significant. The null hypothesis that the dairy farms from the three countries operate on the same production frontier is strongly rejected, which implies that the production frontier estimated from the pooled data cannot be used to compare TE across countries. Therefore, comparisons need to be done with respect to a function that envelopes the three individual country frontiers, which is the idea behind the MPF framework. Thus, there are two distinct frontier models estimated: a set of three individual country frontiers and the MPF for the pooled data using LP. The difference or gap for a given farm between its country frontier and the MPF is referred to as the Technological Gap Ratio (TGR). The average TGRs for Argentina, Chile and Uruguay are 83.8%, 79.6% and 91.4%, respectively, and these results are significantly different from each other. Hence, the Uruguayan frontier is the closest to the MPF and the Chilean is the most distant. The average TE estimates for the country specific SPF models are 87.0%, 84.9% and 81.1% for Argentina, Chile and Uruguay, respectively. By contrast, the MPF estimated with LP shows consistently lower average TE levels: 72.8%, 65.8% and 73.4% for Argentina, Chile and Uruguay, respectively. The average TEs for Argentina and Uruguay are not significantly different and are higher than the value for Chile. In contrast, if TE is compared across the three countries based on a pooled stochastic frontier, the averages are equal across countries. Therefore, it is important to exercise care when comparing performance across countries (groups) because the reference frontier used can yield significantly different implications. Finally, all frontier models estimated exhibit increasing returns to size (RTS), with function coefficients for the individual SPF models equal to 1.231 for Argentina, 1.100 for Chile, 1.068 for Uruguay, and 1.115 for the MPF. These RTS measures imply that dairy farms in the three samples are operating at a sub-optimal size, which suggests continued structural changes in the industry toward fewer but larger farms.

Productivity Differentials on Dairy Farms in Nordic Countries – The Metafrontier Approach

Sipiläinen, Timo - Kumbhakar, Subal - Kuosmanen, Timo

Session 4 D Agriculture I
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Several methods have been suggested for analysing productivity differentials in agriculture between groups of farms or countries. Hayami (1969) and Hayami and Ruttan (1970) suggested the meta-production function approach. This idea has been further developed by Lau and Yotopoulos (1989) and Fulginity and Perrin (1993). Battese and Rao (2002) suggested the meta-frontier analysis for these comparisons. One of the advantages of meta-frontiers with respect to meta-production functions is that they are able to separate technological differences from the differences in technical ef-ficiency. Battese et al. (2004) and O'Donnell et al. (2006) have extended this idea and developed both parametric and non-parametric approaches. Alauddin et al. (2005) have also applied the frontier approach on the analysis of productivity differentials in agriculture between countries. There are several alternatives to define the meta-frontier concept. For instance, Battese et al. (2004) have assumed concave envelopments of the data for meta-frontiers. However, when we are studying a limited number of groups there is no obvious reason to believe that the meta-frontier should be a concave envelopment of data points - unless we may assume that the observations are samples from the same well-behaved meta-production function (i.e., from the same data generating process). In our paper, we extend the analysis and statistical testing to the concave nonparametric least squares estimation of the production function suggested by Kuosmanen (2006) and the parametric non-linear least squares including concavity (or non-negative marginal product) constraints for production functions. This concavity constraint is imposed only on the group frontiers but not on the meta-frontiers. Instead, the maximum reference output providing technology is the one that yields the maximum estimated output, given inputs. The estimation is based on average functions but technical efficiency can be solved either e.g., by maximum likelihood as a second step or by assuming time invariant farm specific efficiency. Thus, the efficiency correction is a shift of the frontier parallel to the average function. A common feature of these studies is that they use country level data. Instead, the aim of this paper is to analyse the regional productivity differentials on dairy farms in Denmark, Finland and Sweden. The farm level data set is an unbalanced panel of the EU's Farm Accountancy Data Network covering 7502 dairy farms in eight regions during the period of 1997 – 2003. The preliminary results suggest that there are no significant differences in mean technical efficiency between regions in spite of the fact that productivity differentials are considerable in favour of Danish farms. In addition, the Danish technology is not only dominating at the mean but also at most of the data points. The results also suggest that the productivity differentials of sample farms between regions were slightly diminishing during the period.

Efficiency in Turkish Agriculture: A Household Level Analysis

Dudu, Hasan - Çakmak, Erol Hasan - Öcal, Nadir

Session 4 D Agriculture I
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Agriculture has been on the reform agenda since mid-1990s in Turkey. The main motive was decreasing the burden of agricultural subsidies on the finances of the government.. Economic crisis of 2001 has made reforms inevitable. Various measures such as changing the subsidy schedules and supporting alternative crops are taken under Agricultural Reform Implementation Program (ARIP). ARIP was mainly concerned with macro structure of agriculture. Macro level measures taken in the framework of ARIP are not sufficient to accomplish the reform program undertaken after 2001. To alleviate the burden of support programs on the budget and on the consumers, macro level institutions should be designed to create necessary incentives for producers to increase their efficiency, since supporting inefficient producers forever cannot be a sustainable policy. Furthermore, when the two important factors that Turkish agriculture will face in the near future are taken into account, importance of micro-level measures becomes clearer. Turkey has already started negotiations with EU and agriculture will be one of the most important fields in negotiations. Turkey needs to increase the efficiency in production to become a decent member of the EU since EU is not likely to accept to bear the full cost of inefficiency of Turkish farmers from the common budget. On the other hand, WTO commitments will become more and more binding and Turkish agriculture will be more vulnerable to international competition. Turkish producers cannot compete with foreign producers under increased market access in domestic markets and in the international markets. Thus, any reform program that claims to unravel major issues in Turkish agriculture should give priority to the measures that will increase the efficiency of farmers in the core of its policies. This paper aims to shed a light on the efficiency structure of Turkish Agriculture to sustain a reliable source of reference to the designers of such a reform program. Stochastic frontier analysis models are employed to estimate efficiency levels in farm household level. A household level survey conducted in 2002 and 2004 with 5,507 households is used in the analysis. Firstly, an efficient production frontier is estimated by panel data models. By using these estimates, relative importance of production factors and their interaction with various farm specific factors are inspected. The parameters of production frontier show that agricultural production is crucially dependant on land and there is an excessive employment of labor in Turkish agriculture. Secondly, the efficiency scores are estimated at farm household level. The results are reported according to NUTS-I regional classification and many other farm specific characteristics. The western parts of the country are found to be relatively more efficient and there is a high deviation in mean efficiencies of different regions. There is an increase in mean efficiencies of all regions from 2002 to 2004. Besides, crop patterns, farm size, education level of household chief and irrigation are found to be effective on efficiency.

Farm Heterogeneity and Efficiency in Polish Agriculture: A Stochastic Frontier Analysis

Hockmann, Heinrich - Pieniadz, Agata

Session 4 D Agriculture I
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Technical and economic efficiency analyses of Agriculture in Central and Eastern European countries are numerous. Both, nonparametric but deterministic approaches (DEA) as well as stochastic but parametric approaches have been applied frequently. Besides the extent of inefficiency, the determinants of this indicator are also been identified. However, in our view, the analysis are fraught with severe problems (risk, farm heterogeneity, endogeneity) which hamper a straightforward interpretation of the inefficiency indicators and the deduction of policy recommendation. In this paper we will deal with the farm heterogeneity problem. Conventionally, SFA and DEA assume that farms are not heterogeneous but inefficient, since all inefficiency scores are estimated by assuming a homogeneous technology available to all producers. This suggests again that the impact of inefficiency in Central and Eastern European Agriculture is overestimated, and, in addition, that the reasons of inefficiency might not be well identified which in turn led to false policy recommendation. In this paper, instead of the conventionally applied random effect model we use a random coefficient specification of production technology that allows a decomposition of two parts unmeasured effect: cross individual heterogeneity and time varying inefficiency in panel data, and hence to avoid the heterogeneity bias. In DEA shadow price analysis could be used to identify those production inputs whose allocation was most severely affected by inefficiency. Because the random effect approach produces radial measure of inefficiency only, corresponding analyses are not possible within that framework. The random coefficient model, however, provides insights about increases of marginal productivities due to a reduction of inefficiency. Moreover, in order to provide information about the bias caused by too restrictive specifications, the conventional random effect model will also be estimated. We will conduct the analysis for Polish agriculture. A balanced data set is available consisting of seven years of observations (1995-2001) on 580 Polish agricultural farms giving 4080 observations. The respective accountancy information were provided by the Polish Institute of Agricultural and Food Economics - National Research Institute (IERiGZ-PIB). The analysed period was characterised by a relatively constant survey methodology and hence, stable variables composition, before it has been adjusted at the methodology used by the FADN. Polish agriculture is often labelled as ‘backward’ or ‘inefficient’. Its weak economic performance is explained by a high fragmentation, over-employment and utilisation of outdated technologies. These characteristics suggests the existence of multiple market failures, especially on the labour and capital market but on the product market as well. However, small scale did not disappear during transition. This suggest that such farms react flexible to severe conditions on the factor and product markets. Following these developments two basic questions arise, which will be addressed in our study: (1) Are small farms less efficient than larger farms, i. e. is scale efficiency a significant problem in Polish agriculture (2) Which inputs hamper the increase of efficiency in smaller and larger farms, and, when differences exists, what are the consequences for agricultural policy.

The Transition to the Single Market in the German Insurance Industry

Url, Thomas - Mahlberg, Bernhard

Session 4 E Insurance Applications
Wednesday, June 27, 2007 16:00 - 17:30
Building A - First Floor - Room A120 E. MALINVAUD

The Single Market project of the European Commission was supposed to change the financial service industry markedly. We provide a first attempt to assess its consequences on the insurance industry in Germany, one of the largest insurance markets within the European Union. For this purpose we apply stochastic Data Envelopment Analysis to a panel of German insurance companies and compute efficiency scores for the years 1991 through 2001. Results from tests on scale efficiency allow us to select the proper technology for a second step regression analysis applying a bootstrap approach where we relate efficiency scores to indicators for firm size, economies of diversification, organizational form, mergers, and entry as well as exit behavior. Furthermore, we compute a bootstrapped Malmquist index which allows us to assess the dynamic adjustment of German insurers to the challenges of the Single Market.

Efficiency and Productivity in Thai Non-life Insurance Industry

Yaisawarng, Saowaros - Asavadachanukorn, Preecha - Yaisawarng, Suthathip

Session 4 E Insurance Applications
Wednesday, June 27, 2007 16:00 - 17:30
Building A - First Floor - Room A120 E. MALINVAUD

Recently, insurance premium is growing at the rate faster than the growth rate of GDP in most countries, especially in the United States and the United Kingdom. Non-life insurance premiums represent approximately 40% of the world total premiums. The insurance industry is under scrutiny. A few existing studies use different approaches to analyze the efficiency of the non-life insurance industry in Europe, Japan, and USA. These studies also focus on different performance across organizational structures. In Thailand, the year-to-year growth rate of non-life insurance net earned premium was 5.3% in 2000 with an increasing rate that reaches 14.2% in 2005. The increase in the premiums may be attributable to the increase in number of policies issued and the sum insured. The 2005 annual growth rates in the number of policies and the sum insured, respectively, are 10.9% and 25.9%. These statistics not only suggest an increasing awareness of Thai population about the non-life insurance but also a need for more efficient operation. In addition, current Thai insurance law permits companies to invest in other insurance companies. As a result, it is anticipated that Thai insurance industry will experience more mergers in the future to improve its competitive strengths (in terms of size of insurance policy, market share and cost of operation) and to build confidence among insured. To improve competitive edge, it is important that non-life insurance companies pay close attention to the efficiency and productivity of service operations. This paper analyzes approximately 70 domestic companies and foreign branches that operate with license of non-life insurance and provide complete lines of non-life insurance business, excluding health and reinsurance from 1998 to 2004. We estimate a stochastic cost frontier and compute cost efficiency and productivity in the non-life insurance industry in Thailand. We employ a hybrid production and intermediary approach to specify output and input variables. Our results would enhance existing knowledge in the non-life insurance field and provide guidance for assisting companies improve their efficiency and productivity.

Deregulation and Cost Efficiency: The Case of European Insurance

Vencappa, Dev - Fenn, Paul

Session 4 E Insurance Applications
Wednesday, June 27, 2007 16:00 - 17:30
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The progressive liberalisation of the financial services sector in the European Union in the 1990s through a series of banking and insurance directives introduced true price and product competition in both life and non-life insurance for the first time. This has arguably influenced the relationship between market structure and performance in domestic insurance markets in several ways. First, is the presence of potential competition from insurers based in other EU countries exercising their rights under the “single passport”. Second, is the effect of entry by insurers from other EU countries setting up (or acquiring) new subsidiaries in the domestic market. Third, is the change in ownership and control resulting from the huge wave of mergers and acquisitions (M&As) of European insurers. The presumption behind the creation of a single market is that increased competition across national boundaries will drive down costs through reduced slack, and consolidation through M&As will further reduce costs as a consequence of scale economies. However, a corollary of the latter is that the increasing size of companies within their national markets will permit a degree of local market power and this might arguably weaken the competitive incentives to cut costs through a reduction of waste and the adoption of innovative processes. Therefore, how the deregulations affected firm performance in the insurance industry is an empirical question. In this paper, we attempt to answer this question by testing for the impact of the deregulation on the cost efficiency of European insurance companies. We use Standard & Poor’s Eurothesys accounting data on individual insurance companies in 16 European countries over the period 1994 to 2003. Using a one-stage estimation approach along the lines of Kumbhakar and Lovell (2000), we explicitly estimate and model the variances of both the one-sided and two-sided errors for a Flexible Fourier cost frontier. The one-sided error term of the frontier is modelled as a function of firm size, domestic market share, import penetration and the rate of M&As. The last two variables respectively capture the impact of foreign competition and consolidation on the cost performance of the firm. From the frontier, we compute estimates of economies of scale which we analyse by different size deciles. We then use a dual cost frontier approach (e.g., Esho and Sharpe, 1995; Kumbhakar and Lovell, 2000) to construct and decompose estimates of total factor productivity growth into its component sources. Our results suggest the following: •Increasing returns to scale are evident across all size groups and in both life and non-life sectors (particularly life) •X-inefficiency is prevalent, particularly in larger firms with higher domestic market shares and particularly in the life sector. •There is some evidence that import penetration and consolidation reduce X-inefficiency in insurance markets •The combination of increasing firm sizes and significant returns to scale has resulted in substantial increases in scale efficiency over time accounting for a major proportion of total factor productivity growth. •There is evidence to suggest that cost frontiers have been increasing over time, particularly in the non-life sector suggesting technical regress in this sector.

Benchmarking and Industry Performance

ten Raa, Thijs

Session 4 F Strategic and Industrial Issues in Banking
Wednesday, June 27, 2007 16:00 - 17:30
Building B - Second Floor - Room B253

If more productive firms grow relatively fast, an industry performs better, even when no firm exhibits technical or efficiency change. In other words, the two well-known sources of productivity growth--technology and efficiency--can be augmented by a third one, namely the industrial organization effect. In this paper the efficiency of an industrial organization and its contribution to performance are measured by benchmarking all firms on the industry. More precisely, efficiency is measured by the proximity between a firm and the best practices. The measure is shown to be consistent with the price index approach to performance measurement. Aggregation of firm efficiencies is imperfect. Industry performance is less than mean firm performance. The bias is used to measure the efficiency of the industrial organization. In benchmarking, change transmitted by a firm represents productivity growth and change transmitted by the best practices represents technical change. Although I use a nonparametric framework, which requires only input and output information, duality analysis reveals the Solow residual. In discrete time Malmquist indices capture the measurement of the industrial organization effect, efficiency changes, and technical change. The theory is illustrated by an analysis of the Japanese banking industry. The dynamic industrial organization effect of entry and exit can be accommodated.

Evaluation of Mix-Product Strategies among Different Market Environments: The Case of Retail Banking Industry

Hubrecht, Aude - Leleu, Herve

Session 4 F Strategic and Industrial Issues in Banking
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In this paper, we illustrate how directional output distance functions can be used to propose a decision support tool. The focus is on the operational interest of the profit and technical efficiency measures. The role of a decision support tool is to facilitate the formulation and communication of strategies. In the case of retail banking network, characteristics describing operations are to be simple, robust, easy to control, and adapted to the vertical organization of the bank branches network. We sample 1585 branches from a single bank focusing on issues of interest such as trading environments and centralized versus decentralized management. The global managers of the regional banks decide on the resources, localization of branches, and the mix-product strategy. Local managers make decisions about the branch under their control; their objective is to maximize the sales and to avoid the waste of the branch resources for a given localization. Global managers have to maximize the network profit, call Net Banking Profit. First, the proposed decision support tool we develop must meet the flowing criteria: it has to assist local and global managers in their decision making process, and second, it has to be pertinent and guarantee the coherence taken by decision makers at both levels. The third criterion states that it has to allow simulations to evaluate future mix-products strategy. Our model is predictive since our measures provide information about future Net Banking Profits. The managerial issue of this decision support tool is to facilitate local and global benchmarking practices. In sum, our measurement model (i) calculates efficiency measures, (ii) analyses interlinks between the individual technical branches efficiency and the regional Net Banking Profit, (iii) evaluates the coherence between mix-output strategies and incentives given by the global managers to the local managers, and (iv) discusses the regional bank size and the market environments impacts on the local and global performances. Our results suggest that the more experienced and larger regional banks are, the incentives given to the local management are stronger and the coherence among local and central decision makers is tighter.

The Shadow Price of Non Performing Loans in Tunisian Commercial Banks: A Directional Distance Approach

Chaffai, Mohamed - Lassoued, Samia

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Wednesday, June 27, 2007 16:00 - 17:30
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Risk is an important issue while conducting efficiency performance in the banking industry. Clark (1986) stipulates that ignoring risk leads to underestimate the cost efficiency scores of US banks. Mester (1996) and Hughes et al (1996) advocate that risk is a missing factor for measure of scale economies. If risk is considered, the authors find that even big banks operate under economies of scale. Because equity capital constitutes a buffer against portfolio losses, a risk averse-manager will hold higher amount of equity capital than a risk neutral banker, to manage its insolvency risk. However equity capital is costly. It follows that a risk-averse banker produces the same level of outputs with more resources, which increases consequently its cost inefficiency as well as its technical inefficiency. These studies used either a two-step approach by first estimating efficiency and then using a set of explanatory variables among other, these efficiency scores to explain the risk (Dietsch (1996)), or a one-step method by introducing the risk as an additional factor in the objective func¬tion when estimating efficiency (Altumbas et al (2000), Girardone et al (2004)). Recently authors have introduced risk as an undesirable output using a distance function model for bank efficiency analysis (Chang (1999), Chaffai et al (2004) and Park and Weber (2005)). A bank is supposed to produce jointly desirable outputs and the undesirable output measured generally by the nonperforming loans ratio. The production technology frontier is amended to satisfy several assumptions, namely the null jointness of the desirable and the undesirable outputs, the weak disposability of the undesirable output, the free disposition of the desirable outputs and the translation property (Färe et al (1993)). Chang used the hyperbolic distance function introduced by Färe et al (1989) to adjust the efficiency of 283 Taiwanese credit departments of farmers' associations operating in 1994. This distance function allows bankers to increase hyperbolically the desirable outputs and to contract undesirable output. However, such a distance function is calculated as the solution to a non-linear programming problem (Färe et al 1989). Chaffai et al (2004) used a method developed by Färe et al (2005) to study the efficiency of emergent countries' banks. They used a quadratic directional output distance function, which allows bankers to reach the frontier by raising desirable outputs and contracting the undesirable output, holding unchanged inputs. The study provides an estimate of the shadow price of nonperforming loans. Park and Weber (2005) used the direc¬tional technology distance function to estimate the Korean bank efficiency and productivity change; but no prices have been derived for NPL. The directional technology distance function can be estimated via two approaches: i) a linear programming deterministic frontier approach which attributes all deviations from the frontier to inefficiency and ii) a stochastic frontier approach in which deviations from the frontier are attributed to a noise component and to a one-sided efficiency component. In this study a directional technology distance function model with NPL retained as bad output is estimated for Tunisian banking industry. A parametric specification is proposed in order to derive the shadow price for NPL. Both the deterministic and the stochastic form of the directional technology distance function are estimated and compared for a panel of ten commercial Tunisian banks observed over the 1992-2005 period. Incorporating the risk in the model allows us to conduct a deep analysis on ownership and productive efficiency in banking. Most of the studies in this field ignore risk, Altunbas and al. (2001), Patti and Hardy (2005) and, Bonin and al. (2005). Preliminary results show that Tunisian commercial banks technical inefficiency averaged 4 percent. Hence they could eliminate wholly their inefficiency by expanding by 4% their good outputs and by reducing their inputs and the non performing loans by 4%. Private banks are slightly more efficient than public banks, the Wilcoxon rank-sum test showed significant difference between the inefficiency of the two bank types at 95% level of significance. The sample mean shadow price, that we can interpret as the opportunity cost of non performing loans was 5 percent. This value means that if banks could dispose the non performing loans freely, each bank could increase credits by 5 percent, reduce inputs and non performing loans by 5 percent. Shadow prices of the average private banks are found to be slightly higher than those of public ones which suggest that public banks are more risky. Finally, using the Kernel distributions and non parametric test, we found statistically significant difference between the shadow prices distributions of the public and the private banks.

A Smooth Nonparametric Conditional Quantile Frontier Estimator

Martins-Filho, Carlos - Yao, Feng

Session 5 A Nonparametric Statistical Estimation
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A101 J.M KEYNES

Traditional estimators for nonparametric frontier models (DEA, FDH) are very sensitive to extreme values/outliers. Recently, Aragon, Daouia, and Thomas-Agnan (2005) proposed a nonparametric alpha-frontier model and estimator based on a suitably defined conditional quantile which is more robust to extreme values/outliers. Their proposed estimator is simple to construct but produces a nonsmooth estimated alpha-frontiers even when the underlying technology induces smooth frontiers. In this paper, we propose a new smooth nonparametric conditional quantile estimator for the alpha-frontier model. Our estimator is a kernel based conditional quantile estimator that builds on early work of Azzalini (1981). It is computationally simple, resistant to outliers and extreme values, and smooth. In addition, the estimator is also shown to be consistent and square root asymptotically normal under mild regularity conditions. We also show that our estimator's variance is smaller than that of the estimator proposed by Aragon et al. A simulation study confirms the asymptotic theory predictions and contrasts our estimator with that of Aragon et al.

Statistical Inference in Conditional Robust Nonparametric Frontier Models

Daraio, Cinzia - Simar, Leopold

Session 5 A Nonparametric Statistical Estimation
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A101 J.M KEYNES

There is a growing interest in applied economics, management science and operations research for the measurement of the performance at macro (country level) and micro (firm or decision making unit) level. Recent advanced robust nonparametric efficiency measures have been shown as useful tools for overcoming the main drawbacks of traditional nonparametric efficiency estimators, such as Free Disposal Hull (FDH) and Data Envelopment Analysis (DEA). Daraio and Simar (2005, 2007), in fact, have shown with applications ranging from the economics of science to financial intermediaries (mutual funds, insurance companies), the richness of this approach and its flexibility for empirical works. In particular, the recently introduced conditional measures of efficiency are able to take into account the influence of environmental or external factors avoiding the problems of two stage approaches. In this paper we investigate on how the bootstrap can be used to improve the inference on these external or environmental effects (including bias correction and confidence intervals). Various simulated scenarios as well as a real data application show the usefulness of the approach.

Nonparametric Stochastic Frontier: The Multivariate Case with Stochastic Versions of FDH/DEA Estimators

Simar, Leopold - Zelenyuk, Valentin

Session 5 A Nonparametric Statistical Estimation
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A101 J.M KEYNES

Nonparametric frontier models are very appealing because they do not impose restrictive assumptions on the shape of the frontier and on the stochastic that governs the inefficiencies. Nonparametric estimators (DEA/FDH) are very popular and are based on envelopment techniques. Statistical inference is now available and robust versions (order-m and order-alpha quantile frontiers) have been developed to reduce the sensitivity of these estimators to outliers and extreme values. But the basic drawback of these models is that they do not allow for noise. Recently, Simar (2006) describes a Data Generating Process allowing to handle nonparametric stochastic frontier in a full multivariate setup and suggests a new estimator which improve the performance of FDH/DEA estimators in the presence of noise. The limitation of the approach is that the size of the noise (in term of noise to signal ratios) has to be small to moderate. In this paper, we propose an approach which allows to estimate nonparametric stochastic frontier in a more general setup, with no restriction on the size of the noise. This extends the local maximum likelihood approach developed in Kumbhakar, Park, Simar and Tsionas (2007) and Park, Simar, Zelenyuk (2006) in the full multivariate model described in Simar (2006). Our method is suitable for modeling and estimation of the marginal effects onto inefficiency level jointly with estimation of marginal effects of input. The approach is robust to heteroskedastic case and to various (unknown) distributions of statistical noise and of inefficiency. Stochastic versions of DEA/FDH estimators are also analyzed. The procedure is illustrated through some real and simulated data.

Bandwidth Selection Problems for Nonparametric Estimation of Conditional Efficiency Scores

Badin, Luiza - Simar, Leopold

Session 5 A Nonparametric Statistical Estimation
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A101 J.M KEYNES

The sensitivity of efficiency scores with respect to external (environmental) factors that might influence the production process, but are not under the control of the producer, is of central importance in productivity analysis. Extending previous results from Cazals, Florens and Simar (2002), Daraio and Simar (2005, 2007) suggest to define conditional efficiency scores where the attainable set in the input-output space may depend on the value of the external variable. This seems an attractive alternative to the two-stage methods where DEA-type efficiency scores are regressed in an appropriate way, in a second stage, against the explanatory environmental variables (see Simar and Wilson, 2007). The latter approach is very popular but it relies on a strong separability condition, asserting that the attainable set does not depend on the environmental variables which may influence the production process only through the distribution of the inefficiencies. On the other hand, traditional one-stage approaches (see e.g. Banker and Morrey, 1986) impose to specify a priori the role of these exogenous factors, favorable (as a free disposal input) or unfavorable (as an undesired free disposal output). Conditional efficiency scores overcome this drawback, but the corresponding nonparametric estimators heavily depend on the specification of a smoothing parameter (the bandwidth) since this approach involves the estimation of a nonstandard conditional distribution function. In this paper we investigate several approaches to select an appropriate bandwidth, and we compare, in this peculiar framework, the relative merits of the techniques proposed in the nonparametric regression literature.

Estimating Translated Demand Functions

Fare, Rolf - Grosskopf, Shawna - Hayes, Kathy - Margaritis, Dimitri

Session 5 B Advances in Production Theory I
Thursday, June 28, 2007 09:00 - 10:30
Building A - Second Floor - Room A201 J. MONNET

It is know from production theory as well as Monte Carlo studies that quadratic functional form outperforms the translog functional form. In this paper we use this knowledge in specifying and estimating demand functions. Our idea is to transform demand functions using a directional distance function or benefit function transformation . This transformation yields functions which satisfy translation rather than the homogeneity property which is associated with the translog form. This translation property is readily acoommodated in specification of the quadratic functional form, which we then use to estimate the transformed demand functions.

A "Calculus" for Data Envelopment Analysis

Chambers, Robert - Fare, Rolf

Session 5 B Advances in Production Theory I
Thursday, June 28, 2007 09:00 - 10:30
Building A - Second Floor - Room A201 J. MONNET

DEA models are not amenable to differential arguments for extreme efficient units. Consequently, function representations of the approximating technology are not differentiable in the usual sense. Dually, this nondifferentiability is manifested by multiple optima to the Charnes, Cooper, and Rhodes (1978) DEA problem. This paper shows how a "calculus" can be applied to DEA, and, in particular, how this "calculus" resolves the resulting weight choice problem uniquely. The "calculus" is based on the concept of willingness to pay and well-known results in the convex analysis literature (Rockafellar, 1970) for directional derivatives and their associated superdifferentials.

Properties of the Directional Distance Function as a Measure of Efficiency

Russell, R. Robert - Schworm, William

Session 5 B Advances in Production Theory I
Thursday, June 28, 2007 09:00 - 10:30
Building A - Second Floor - Room A201 J. MONNET

The literature on the axiomatic foundations of efficiency measurement was inaugurated by Fare and Lovell [1978 JET], who proposed three axioms: indication of (Koopmans) efficient input-output combinations, monotonicity, and homogeneity. Russell [1987 Karlsruhe volume, 1990 JET] added the axioms of continuity (in technologies as well as input and output quantities) and independence of units of measurement. The ensuing literature has shown that (a) there does not exist an index satisfying all of these axioms--or even the Fare-Lovell axioms--on all technologies satisfying minimal regularity conditions and (b) the traditional indexes--the Debreu-Farrell (DF) index, the Fare-Lovell (FL) index, and the Zieschang index--cannot be ranked in terms of the above axiomatic structure. Moreover, Russell and Schworm [2006 WP] have shown that restricting the set of technologies to those generated by the standard mathematical programming methods, DEA and FDH, does not materially improve the performance of these three indexes. Thus, the restriction to these data-generated technologies does not resolve the trade-offs among these axioms and therefore does not provide much guidance to the choice of an appropriate index. In recent years, an alternative index, the directional distance function (DDF), has gained prominence. This efficiency index, adapted from the theoretical work of Luenberger [1992 JME, 1992 JOTA], has not been subjected to the rigorous axiomatic analysis applied to the three traditional indexes, the one exception being the suggestion of Salnykov and Zelenyuk [2005 WP] that the DDF violates independence of units of measurement. To be sure, certain properties of the DDF have been proved, but some of these properties seem to be of little value in efficiency measurement (e.g., translation invariance) and others have been proved under assumptions that are inappropriate for efficency measurement (e.g., Luenberger's proof of continuity exploits continuity of the underlying utility function). The purpose of this paper is to assess the properties of the DDF from the perspective of efficiency measurement. We have completed our analysis of the properties of the DDF as an input-based measure of efficiency (Luenberger's benefit function). The major conclusion is that the DDF has nicer continuity properties than the traditional indexes: in fact, it satisfies continuity on the most general class of technologies and at the boundary of input space as well as in the interior. Continuity is an important property, because it provides some assurance that "small" errors of measurement (of quantities or technologies) result only in "small" errors of measurement of efficiency. On the other hand, the DDF violates the homogeneity axiom satisfied by the DF index and the Zieschang index, and it violates the monotonicity and indication axioms satisfied by the FL index. Restriction of technologies to the DEA and FDH classes does not augment the set of properties satisfied by the DDF. Finally, we distinguish between two forms of invariance with respect to units of measurement; the DDF satisfies only the weaker of the two notions, whereas the traditional indexes satisfy the stronger form.

The Partial Technical Efficiency Measure of Production

Li, Sung-ko

Session 5 B Advances in Production Theory I
Thursday, June 28, 2007 09:00 - 10:30
Building A - Second Floor - Room A201 J. MONNET

There are several technical efficiency measures in the literature. All of them refer to the efficient production with less of all inputs or more of all outputs. None of them, however, consider the importance of an input or output in the technical inefficiency of the firm. This paper introduces the concept of partial technical efficiency that measures the impact of each input or output on the technical inefficiency of a firm. This partial technical efficiency is independent of the definition of the technical efficiency measure. If the Farrell measure is used, the partial inefficiency of all inputs can be added up to the usual technical inefficiency. This new concept can help managers to set their priorities when they try to eliminate inefficiency. The applications of partial technical efficiency are illustrated by a real world data set.

Profit and Productivity: Differences Across Organizational Form

Grifell-Tatjé, Emili - Lovell, C.A.Knox

Session 5 C Methodological Advances in Banking Performance
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A103 M. CROZIER

We examine variation in financial performance, both across organizational form and through time. Because variation in financial performance may be driven by variation in productivity, we also examine variation in productivity, again across organizational form and through time. The organizational forms we consider are Spanish commercial banks, savings banks and financial cooperatives, and the time period is 1993-2004. We decompose multilateral variation in profit into price variation and quantity variation. We then decompose multilateral quantity variation into margin variation and productivity variation. Finally we decompose multilateral productivity variation into variation in technology, variation in cost efficiency and variation in scale. We find variation in financial performance across the three organizational forms, some of which is attributable to variation in productivity, although the nature of the relationship is sensitive to the financial performance indicator used. We also find that deregulation and liberalization have acted to narrow performance gaps among organizational forms. However evidence that the mechanism through which convergence has occurred is increased competition is not compelling.

Stochastic Frontiers with Bounded Inefficiency

Qian, Junhui - Sickles, Robin

Session 5 C Methodological Advances in Banking Performance
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A103 M. CROZIER

This paper introduces a new model of stochastic production frontier that incorporates an unobservable bound for inefficiency, which is naturally instituted by the market competition. Technically we use doubly truncated normal, truncated half normal, and truncated exponential distributions to model the inefficiency component of the error term. We derive the form of density function for the error term of each specification and the analytic formula for calculating the conditional mean of individual effects. We then extend the model to the panel data setting and specify a time-varying inefficiency bound as well as time-varying efficiencies. A Monte Carlo study is conducted to study the finite sample performance of the maximum likelihood estimators in cross-sectional settings. We apply the model to a study of US banks from 1984 to 1995 and find considerable differences in the estimates of the model parameters and efficiencies from alternative models.

Quality Adjusted Inputs, Outputs and Productivity Change in Indian Banking: A Hedonic Approach

Das, Abhiman - Kumbhakar, Subal

Session 5 C Methodological Advances in Banking Performance
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A103 M. CROZIER

Banking technology is typically characterized by multiple inputs and multiple outputs, associated with various types of attributes like different categories of deposits, loans, number of accounts, classes of employees, location of branches, etc. Presence of such attributes within each input/output obviously limits the utility of simple aggregation. Most productivity studies on banking, however, have excluded these quality differentials in inputs and outputs even though it is rightly acknowledged that quality is a key element of performance. This restricts the practical value of productivity studies in organizations like banks where maintaining and improving quality is critical to achieve performance objectives. This paper proposes an alternative methodology of using hedonic aggregation function within an input distance function approach and analyzes the impact of banking deregulation on efficiency and total factor productivity (TFP) change in Indian banking industry during 1996 to 2005. The study of efficiency and productivity of Indian banking is particularly interesting because of different and changing regulatory environment, the diversity of bank ownership and the critical role played by the banking system in supporting unprecedented growth of the Indian economy in recent times. The empirical results indicate that Indian banks have improved efficiency (61% in 1996 to 72% in 2005) during the post deregulation period and the gain in efficiency of state-owned banks has surpassed that of private banks. Improvement in capital base, as indicated by increased capital adequacy ratio, played an important role in ushering efficiency gain. The return to scale estimate, however, suggests that Indian banks were operating below their efficient scale and they could potentially increase their operations without increasing average costs. Overall, the TFP growth in the Indian banking industry was above 3% annually for the sample period 1996-2005. Both technical progress and technical efficiency change consistently played an important role in shaping the TFP growth of Indian banking.

Foreign Ownership and Efficiency: The Case of Ukrainian Banking

Dushkevych, Natalya

Session 5 C Methodological Advances in Banking Performance
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A103 M. CROZIER

In this paper we investigate intermediation-type efficiency of Ukrainian banking. We use the two-stage approach. In the first stage we estimate Farrell-type efficiency scores for each of the bank in the sample using data envelopment analysis. In the second stage we analyze what is influencing these efficiency scores by relating them to hypothesized explanatory variables in the (truncated) regression context. To improve inference we also use bootstrap-based bias correction of estimated efficiency scores and bootstrap-based confidence intervals, as suggested by Simar and Wilson (2006). We find that, on average, the size of a bank and the amount of physical capital per worker (capital deepness) positively influences bank's inefficiency scores. At the same time we also find that, other things being equal, efficiency of partially-foreign and state banks, on average, is not significantly different from efficiency of private domestic banks, while 100%-foreign banks tend to be more efficient than the latter. Moreover, we also find evidence that efficiency of banks purchased by foreign investors tend to increase over time.

Agglomeration Externalities and Technical Efficiency in Pig Production

Larue, Solène - Latruffe, Laure

Session 5 D Agriculture II
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A121 M.E. PORTER

The objective of the paper is to assess the effect of agglomeration externalities on farm technical efficiency, for pig producers in France. A few papers have investigated how agglomeration effects in an industry are translated into individual firms' performance improvement. For example Paul and Siegel (1999) find that agglomeration induces scale economies in the US manufacturing sector. Not only scale economies, but also technological progress, efficiency and profitability increase might be consequences of agglomeration. The most frequently cited sources of positive agglomeration externalities are knowledge spillovers, labour supply and demand matching, and input sharing (Rosenthal and Strange, 2004). Geographic concentration of livestock production has been observed from the 1970s in the United States and the European Union, giving rise to studies about determinants of production location. The growing concentration of pig production in Western France (three quarters of the total number of pigs in France), is a typical example of farm location influenced by the abovementioned positive agglomeration externalities (Daucé and Léon, 2003). The specific issue of the effect of agglomeration on technical efficiency in agriculture has however never been explored, the closest research being by Tveteras and Battese (2006) for aquaculture. Investigating the question for pig producers will not only contribute to the literature, but will also point out the opposite effect of negative externalities that are specific to pig production. In the frame of the law governing polluting activities, pig producers need to have a minimum area where their manure will be spread. The competition for land is the main negative agglomeration externality that is behind the opposite pattern of pig production dispersion that is starting to occur in Western France. Data Envelopment Analysis (DEA) followed by a second-stage regression will be used to investigate the question, with detailed data for 1,000 French pig producers in 2004, provided by the national Pork Technical Institute.

Technology Adoption in French Agriculture and the Role of Financial Constraints

Blancard, Stephane - Briec, Walter -
Boussemart, Jean-Philippe - Kerstens, Kristiaan

Session 5 D Agriculture II
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A121 M.E. PORTER

One of the main objectives of successive CAP reforms has been to increase the exposure of European agriculture to market forces. As a result, farmers have become preoccupied with increasing their competitiveness. The poor performers must catch up with the more efficient ones through the progressive adoption of best practice technologies. However, these long-run technological adjustments could be influenced by eventual farmers' short-run financial constraints that could slow down their ability to reach the benchmark. This contribution measures the role of these short-run financial constraints on the technological catching-up process in a study of 178 arable farms in the same French region (Nord-Pas-de-Calais). The study analyses data from 1994 to 2001, a period encompassing the Mac Sharry reform and the first measures of Agenda 2000. Starting from estimates of total factor productivity based on non-parametric distance functions, the second stage econometric results clearly indicate that the technological adaptation process among farmers is conditional upon the harshness of eventual short-run financial constraints.

Incorporating Quality of Service in a Benchmarking Model: An Application to French Electricity Distribution Operators

Plagnet, Marie-Anne - Crespo, Héléne - Perelman, Sergio - Romano, Elliot - Coelli, Tim

Session 5 E Electricity Regulation III
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A120 E. MALINVAUD

In this paper we use annual data on 92 French electricity distribution units (2003-2005) to estimate a benchmarking model that includes a quality of service indicator (number of interruptions). Our methodology involves the estimation of input distance functions using stochastic frontier analysis (SFA) and data envelopment analysis (DEA) techniques. The empirical results indicate that the inclusion of the quality variable has no significant effect upon mean technical efficiency scores, and the mean shadow price of one interruption is approximately ten Euros. Furthermore, we find that electricity distribution units face a clear trade-off between network investments and operational expenditures driven by quality performances. The analysis in this paper is the first preliminary step in a larger project which is investigating the feasibility of including quality measures into benchmarking models that are often used by regulatory authorities.

Efficiency Effects of Integrating Quality of Service in Incentive Regulation: Experience from Norwegian Electricity Distribution

Growitsch, Christian - Jamasb, Tooraj

Session 5 E Electricity Regulation III
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A120 E. MALINVAUD

Since the 1990s, incentive regulation of the natural monopoly activities of infrastructure and network industries has been on the rise. Theoretical arguments and empirical findings (Spence, 1975; Ter-Martirosyan, 2003) suggest that, in the absence of specific provisions, incentive regulation will lead to reduced quality of service and will deviate from the socio-economic optimum. Norway was the first country to incorporate cost of non-delivered energy as integrated part of benchmarking and incentive regulation of electricity distribution networks in 2001. At the same time, environmental factors are believed to affect the costs and quality of service provision of the networks. This paper analyses the effect of the new incentive regulation model on the efficiency of the Norwegian electricity distribution network utilities. In order to analyse the efficiency development of the utilities over time while controlling for firm specific unobserved heterogeneity, we estimate Greene's true random effects model (Greene, 2005) in a distance function setting and using translog functional forms. We use a panel dataset for 131 Norwegian electricity distribution utilities for the period from 2001 to 2004. We model the production and outage costs separately and calculate the factor elasticities. We also control for the effect of a number of technical and meteorological factors and examine their influence the firms' production technology and, applying the Battese and Coelli (1992) model, their effect on company specific inefficiency. First results show that the environmental factors applied in the Norwegian regulation scheme tend to explain cost of production much better than the cost of non-delivered energy. We also find that efficiency remains rather constant over time. Although the time trend indicates increasing cost for the sample period, the cross sectional average efficiency scores do not differ significantly.

Regulation of Distribution Companies – DEA with Separable Costs

Bjørndal, Endre - Bjørndal, Mette

Session 5 E Electricity Regulation III
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A120 E. MALINVAUD

The new Norwegian model for regulating electricity transmission and distribution, to be implemented from 2007, consists of a revenue cap, based on actual costs as well as a norm cost derived from DEA efficiency estimates. These efficiency estimates are updated yearly, based on cost and output data for year t-2. The efficiency estimates are calibrated so that the aggregate (industry) return on capital, based on book values for year t-2, is equal to a predetermined rate of return consistent with the perceived risk level of the industry. The DEA model used by the Norwegian regulator NVE is an input-based cost efficiency model, with constant returns to scale (CRS). A special variant of super efficiency is used, where the super efficiency of a company is limited by including its own data point for the previous year in the reference set. There are different models for distribution (up to 22 kV) and regional transmission (22 kV – 132 kV). Companies often have both, and must allocate costs between the different network levels in order to provide the input data for the efficiency analyses. In the paper we will focus on the model used for the roughly 135 distribution companies in the Norwegian system. Our concern has been the relevance of the results of the DEA model, i.e. how companies can learn from the outputs of the “black-box” model on where and how to improve, and the information value to the regulator. The starting point is a suggestion for a more norm based regulation, where a cost model separating customer-related (measuring, invoicing, customer service, etc.) and network-related costs (operation, maintenance, losses, etc.) applies. There are clear indications that such a separation of the cost base is valid and possible, and that it could and perhaps should be used in the regulation of the companies in the best possible way. In this paper, we study the effects of assuming separable costs, and what happens with two separate analyses, or if everything is combined into a single model/measurement. Mathematical results are provided for special cases, along with results from simulation experiments.

Incorporating Environmental Factors in the Regulatory Benchmarking Model for Electricity Distribution Companies in Norway.

Grammeltvedt, Thor Erik - Hansen, Wiljar -
Langset, Tore - Wiull, Stig Olav

Session 5 E Electricity Regulation III
Thursday, June 28, 2007 09:00 - 10:30
Building A - First Floor - Room A120 E. MALINVAUD

The Norwegian Water Resources and Energy Directorate (NVE) is responsible for the development and maintenance of the benchmarking model used in yardstick competition for the Norwegian electricity network companies. Although performing the same task of distributing energy from the transmission grid to the end-consumer, Norwegian electricity distribution companies operate under different environmental conditions. This paper outlines the procedure NVE has used to incorporate environmental factors in the regulatory benchmarking model. In cooperation with the industry, relevant factors influencing the individual cost level in electricity distribution has been identified. Employing geographical information systems and meteorological databases, a large amount of company specific geographical and climatic data has been collected. We have limited the number of relevant environmental factors and possible combinations of these by using factor analysis and correlation matrixes. Different regression techniques, such as SFA, OLS and GLS, have been applied in order to identify significant relationships between the total expenditure of the electricity distribution companies and the environmental factors. The sample of relevant environmental factors is extended with indices constructed by use of the coefficient from SFA. In the paper we examine two different methods of including the environmental factors in the DEA-model; i) scaling the environmental factors with the grid size of the DMUs and including this variable directly in the DEA model, ii) correcting the DEA-results based on a second stage regression on the environmental factors. The resulting DEA-model has been applied as part of the yardstick competition scheme setting the allowed revenue for the Norwegian electricity distribution companies from 2007.

How to Expand Capacity of Tunisian's Local Hospital in the Network Schema of Public Hospitals and Global Budgeting System: A Semi-Parametric Approach

Chokri, Arfa - Leleu, Herve - Mohamed, Goaïed

Session 6 A Semi-Parametric Approaches (YR)
Thursday, June 28, 2007 11:00 - 12:30
Building A - First Floor - Room A101 J.M KEYNES

In Tunisia, recent reforms of public hospital have been concentrated only on the development of university facilities, not considers local hospital, as part of the public network and no attempt have been made to estimate their productionâ€™s capacity. The potential of local hospitals, that absorb 10 % share of the available resources, is insufficiently exploited, since the technical services miss resources and specialized physicians, which limit the scope of diagnostic and therapeutic treatment. This study, based on data of a national survey, collected for all the 105 local hospitals, aims to non-parametrically estimate (i) the relative bootstrapped technical efficiency (ii) the utilization scores of capacity production and explains these scores variability using Tobit regression. The findings suggest the presence of substantial degree of technical inefficiency and unused production capacity. The average output efficiency is 1.15 %, with 0.02 as confidence interval large and 0.08 of biais variability. The unused capacity is 13%. Tobit regressions stress the role of the network schema and the budgeting system in expanding local Hospitals-specific utilization of production's capacity.

Dealing with Environmental Variables in Efficiency Analysis of Transition Banking: A Comparison of Semi-Parametric and Non-Parametric Approaches

Karligash, Kenjegalieva - Weyman-Jones, Thomas - Simper, Richard

Session 6 A Semi-Parametric Approaches (YR)
Thursday, June 28, 2007 11:00 - 12:30
Building A - First Floor - Room A101 J.M KEYNES

This paper presents a comparative analysis of semi-parametric and non-parametric frameworks of efficiency analysis with environmental variables, applied to the Eastern European 2004-accession countries' banking during 1999 – 2003. This covers the negotiation period to join the EU. In the semi-parametric two-stage framework we regress DEA efficiency scores on environmental variables using Tobit and single/double bootstrapped truncated regression procedures, whereas in the single-stage non-parametric approach we incorporate environmental variables directly into the model. Additionally, we perform both univariate and bivariate kernel density analysis of the efficiency scores estimated by the different models.

Semiparametric Estimation of Stochastic Frontiers under Regularity Conditions: A Single-Index Approach

Kortelainen, Mika

Session 6 A Semi-Parametric Approaches (YR)

Thursday, June 28, 2007 11:00 - 12:30

Building A - First Floor - Room A101 J.M KEYNES

A number of papers have explored semi- and nonparametric estimation of stochastic frontier models by using either kernel or some other smoothing techniques. Although the assumptions required by these approaches are typically quite weak, there is no guarantee that the estimated semi- or nonparametric model will satisfy regularity conditions implied by economic theory. Yet, in many empirical applications restrictions concerning monotonicity or curvature are not merely meaningful, but even required by the theory or common sense. On the other hand, as many of the previous approaches are based on the nonparametric estimation of the frontier, their convergence rate can be sensitive to the number of inputs, which is known as the curse of dimensionality problem. This paper presents a semiparametric stochastic frontier approach that avoids the curse of dimensionality and allows one to impose regularity constraints implied by economic theory. The proposed framework is based on the single-index model (SIM) and consists of three stages: (1) estimation of the single-index x'b, (2) estimation of a shape-restricted average production function g(x'b), and (3) estimation of the production frontier by shifting the average production function upwards. In the first stage, we utilize methods traditionally used in the estimation of single-index models, while the second stage exploits convex nonparametric least squares to estimate a shape-restricted production function. In stage three, the production frontier can then be estimated using either method of moments or pseudolikelihood techniques. Simulated examples and empirical application are used to illustrate the potential of the approach.

Convergence at the Industrial Level: Evidence from the OECD

Wu, Xiaoyu - Russell, R. Robert

Session 6 B Efficiency & Productivity in Manufacturing (YR)
Thursday, June 28, 2007 11:00 - 12:30
Building A - Second Floor - Room A201 J. MONNET

Convergence at the industry level has been by and large ignored in the literature. A pioneering and widely cited paper by Bernard and Jones (1996) (hereafter BJ) is severely undermined by the fact that the claimed non-convergence evidence in manufacturing is sensitive to the choice of the base year for purchasing-power parities (PPPs) used to convert data for international comparison purposes. As proper industrial level PPPs become available, we have opportunities to dig out sectoral convergence behavior more appropriately. Another weakness of BJ is that the simple a-convergence regression they perform does not say much about the underlying driving forces for convergence or non-convergence. This paper applies the growth-accounting exercise developed by Kumar and Russell (2002) (hereafter KR) to data on six first-digit sectors from 14 OECD countries. KR's approach exploits data envelopment analysis (DEA) and is free of parametric production function specification. Labor productivity growth is decomposed into components attributable to technical change, technical catch-up (efficiency change) and capital deepening. In this paper, data are drawn from the Groningen Growth and Development Center and the International Sectoral Data Base of OECD. The purpose of this paper is to provide intuition on growth and convergence of individual industries and their respective contributions to aggregate cross-country trends. Preliminary results have been obtained using imperfect data. The results will be quickly updated upon the arrival of better data no later than April.

Technical Efficiency Point and Confidence Interval Estimates of the Manufacturing Sector in African Economies: A Case of Kenya

Ngui, Dianah Mukwate - Becker, Claudia

Session 6 B Efficiency & Productivity in Manufacturing (YR)
Thursday, June 28, 2007 11:00 - 12:30
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Efficiency studies on African countries have based their conclusions exclusively on point efficiency estimates hence do not distinguish cases where efficiency is estimated precisely and cases where uncertainty associated with the estimates is low. This is despite the use of short panel data and /or cross sectional survey data prone to measurement errors. Using micro-data of the Kenyan manufacturing firms collected as part of a World Bank Regional Program on Enterprise Development (RPED) survey over the period 1993 –1995 and 2002/2003, this paper empirically analyses both technical efficiency point and confidence interval estimates of three manufacturing sub-sectors of the Kenyan economy: food, metal and textile at two periods in time;-1991/1992-1994/1995 and 2000/2001-2002/2003. After estimating various competing parametric frontier models, the primary finding is that interval estimates are wide and overlapping despite the model specification and hence, preventing the precise identification of the efficiency differences for each sub-sector in each period. Further, the results reveals that the width varies considerably among the analysed firms in each sub-sector and period of observation hence; making it hard to separate the firms into groups of high, average and low technical efficiency. The conclusion is that the pessimistic conclusion regarding the degree of inefficiency in the manufacturing sector of the African economies in general and of Kenya in particular has to be partly revised after confidence interval calculation.

Technical Change, Competitiveness and Poverty Reduction in the Ghanaian Apparel Industry

Ayitey, Donatus Kosi

Session 6 B Efficiency & Productivity in Manufacturing (YR)
Thursday, June 28, 2007 11:00 - 12:30
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Of grave concern since the beginning of the new millennium is how to find a lasting solution to extreme poverty and hunger facing a significant proportion of the world's population. Over 1 billion people in the world live on less than US $1 a day (UN HDR, 2003). Among measures agreed upon to deal with poverty at the 2005 G8 Summit in Gleneagles, Scotland, were to cancel the debts of the world's poorest nations, increase development aid to the poorest countries and the opening up of the develop nations' markets through the removal of agricultural subsidies and export tariffs. Perhaps, a more inviting approach to achieve the first Millennium Development Goal (reduce by one-half those faced with extreme poverty by 2015) is the suggestion that developing nations should build competitiveness in their manufacturing industries (Lall, 2001). This study extended Lall's idea by adding: ''start competitiveness building with pro-poor manufacturing industries by focusing on productivity growth'' in order to impact on the poor directly and to realize this objective faster. Building international competitiveness involves the ability of home firms to produce and sell in rivalry with those abroad. To do this, a firm must use technologies, skills and organizational forms that will minimize inefficiencies and match international level of quality, cost, flexibility and delivery. The rapid nature of technical change has made some writers to even believe in the advent of a new technological paradigm (Freeman and Perez, 1990). The competitiveness of firms in this age therefore, depends decisively on the technological innovation (Dosi et al., 1998). Technical change in the form of changes in physical, organizational or design technologies has thus become of crucial importance not only for competitiveness building of small and medium sized firms (SMEs) in developing countries but for those in developed nations as well. In effect, the relationships between the speed of operation, efficiency of production techniques and quality of products have been among the core drivers of technological choice and adoption by producers in cotton-textile-apparel industry. This micro-based evidence study, therefore seeks to establish proof of efficiency-improvement (catching-up with the leaders) and technical change (upgrading) in this industry in Ghana using frontier models founded on non-parametric and parametric/econometric methodologies. It particularly seeks to explore in one chapter, how these firms are building competitiveness and maximizing their survival overtime on two fronts; (1)through economies of technical change, increase capacity utilization, efficiency improvements and productivity growth in general [traditional sense] and (2) the extent to which they are meeting international product standards (e.g. quality etc.)--- [non traditional approach]. The study proceeds from the assumption that technical change is not only induced by changes in relative factor prices, factor endowments, quantity expansion but by quality improvement as well. For textile or apparel industry, it assumes that technical change is not localized in that a change of technique at one stage of production process spillover onto all other stages and this is reflected in the final quantity and quality of the product. It also lays emphasis on technical change in particular and SMEs productivity growth in general because they constitute over ninety percent of firms in the apparel industry in Ghana and their competitiveness has significant income redistribution and poverty reduction implications. To complement the theoretical or conceptual work, the empirical part of the study would start with a survey of SMEs in apparel industry in Ghana.

Measuring Efficiency in Healthcare:An Application to Out of Hours Primary Care Services on the Island of Ireland

Lordan, Grace

Session 6 C Health (YR)
Thursday, June 28, 2007 11:00 - 12:30
Building A - First Floor - Room A103 M. CROZIER

This paper is a cross border study that explores isolating the efficiency component and measuring its overall contribution to productivity in the case of out of hours (OOH) primary care services operating on the Island of Ireland. Out of hours GP care is supplied throughout the Island of Ireland by OOH co-operatives. Although Northern Ireland (NI) and the Republic of Ireland (ROI) have their own individual health systems the OOH organisations themselves are relatively homogenous in structure. The data for this study has been gathered and collated by the author and relates to eight of twelve co-operatives operating in ROI and five of the seven co-operatives in NI. The primary aim of this paper is to estimate efficiency for these organisations using stochastic frontier analysis (SFA) SFA was chosen as the method for analysis as it allows distinction between 'noise' effects and efficiency effects. This paper outlines the means that SFA methodology can be used to derive sensible and robust efficiency estimates for OOH primary care organizations operating on the Island of Ireland. The paper also examines the sensitivity of these estimates to the choice of functional form for the health production function, the choice of error distribution for the efficiency terms, the means in which heterogeneity is incorporated into the analysis and the way output is defined. Individual efficiency estimates, rankings, cross border rankings and comparisons are reported to allow recommendations to be made on how these organizations can improve their production process.

Evaluating the Performance of Public Health Units Using DEA

Lavado, Rouselle

Session 6 C Health (YR)
Thursday, June 28, 2007 11:00 - 12:30
Building A - First Floor - Room A103 M. CROZIER

This paper examines the usefulness of DEA in determining the efficiency of public health units in the Philippines. Public health units serve as the backbone of the Philippine health system by making health care universally accessible to individuals and families in their respective communities. The main question that this section attempts to answer is how efficiency improvements can be pursued among health centers given the limited financial support that the Local Government Units can provide. The efficiency of 30 rural health units and city health offices is examined using a dataset from a baseline survey conducted by the Department of Health in 1999. The performance of health units on Maternal and Child Care Programs is evaluated. To facilitate a detailed comparison of each unit, the Maternal and Child Care Programs are divided into seven sub-programs. These programs are (1) prenatal care, (2) delivery, (3) postnatal care, (4) breastfeeding, (5) family planning, (6) immunization, and (7) nutrition. The dataset allows for the computation of expenditure efficiency and technical efficiency. The input for expenditure efficiency is the health budget per capita while quantitative inputs such as the number of doctors, nurses, midwives, and Barangay health workers per 100,000 population is utilized for technical efficiency estimation. The study found that there are units that are not using their budgets efficiently. Expenditure efficiency score for each sub-program ranges from 31 to 51 percent. This implies that there is much room for increasing outcomes given the current budget. Output-oriented technical efficiency score ranges from 76 to 91 percent, also implying that with their given level of medical staff, health units can increase their outcome achievements by 9 to 24 percent. To illustrate the possible use of DEA in benchmarking exercises, aside from determining the performance level of each health unit, the paper also outlined the targets for input reduction and outcome increases so that inefficient units can reach the efficient level of performance. It also identified which among the health units are peers. By identifying targets and peers, this study hopes to go beyond the standard method of assessing performance.

Productivity Growth in Agriculture: Regional Evidence from Romania

Aldea, Anamaria - Vidican, Georgeta

Session 6 D Agriculture (YR)
Thursday, June 28, 2007 11:00 - 12:30
Building A - First Floor - Room A121 M.E. PORTER

The agricultural sector has always been an important component of the Romanian economy. Currently, agriculture accounts for as much as 13 percent of the Gross Domestic Product, almost half of overall employment, with 40% of the land in agricultural use. However, the overall productivity of Romanian agriculture remains low. Just few months after integration in the European Union economic and institutional structures there are strong pressures for change following years of stagnation and decline. The poor performance of agriculture is most clearly evidenced by a large segment of subsistence farms, much lower standards of living in rural areas compared to urban areas, and deterioration in agricultural production. There is considerable agreement in the literature that promoting agricultural development and output growth in the agricultural sector is an effective and sustainable economic development strategy Hence, attention to productivity gains arising from a more efficient use of existing technology is justified. The purpose of this paper is to measure the relative efficiency of Romanian agriculture at county level, and to examine the factors that affect productivity levels. We make use of data from the National Institute of Statistics during 1992-2004 and the Agricultural Census in 2002. Linear programming models will be used on aggregate regional data over a 14-year period to construct a nonstochastic Malmquist index to assess agricultural productivity growth in Romania's regions after the post-socialist land reform. A Tobit regression analysis will be used to assess the impact that variables such as the degree of production commercialization, share of land under irrigation, land quality, degree of land fragmentation, and county development level, have on differential county performance. The advantage of examining productivity growth at the regional level is that some factors may be disguised in national data. Romania is a country with a diverse geography and history of agricultural practices. Therefore, examining how agricultural productivity changed over time across regions bares important policy implications for economic diversification and rural development.

A Comparison of Stochastic Frontier Approaches to Estimating Inefficiency and Total Factor Productivity: An Application to Irish Dairy Farming

Carroll, James - Newman, Carol - Thorne, Fiona

Session 6 D Agriculture (YR)
Thursday, June 28, 2007 11:00 - 12:30
Building A - First Floor - Room A121 M.E. PORTER

This paper compares standard stochastic frontier models for panel data with a number of recently developed models designed to remove unobserved heterogeneity from the inefficiency component. Results are used to construct a generalised Malmquist total factor productivity (TFP) index. We conclude that the choice of approach makes little difference where the purpose of the study is to analyse aggregate trends in TFP and its components. However, where inefficiency estimates and their dispersion are of interest, attention should be paid to how the analyst's interpretation of inefficiency relates to the underlying assumptions of the model that is used.

Distinguishing Technologies and Measuring Performance in Farm Production: The Case of Pennsylvania Dairy

Emvalomatis, Grigorios - Stefanou, Spiro

Session 6 D Agriculture (YR)
Thursday, June 28, 2007 11:00 - 12:30
Building A - First Floor - Room A121 M.E. PORTER

Traditionally, subsidies in the agricultural sector have been based on output levels, leading to an uneven distribution of the benefits which favours large farms. The argument for these non-discriminatory policies is that larger farms more likely to survive in a competitive environment. This argument assumes that there is a unique “best” technology which results to an average cost function with a unique minimum. Under different technologies small and large farms might achieve the same short run average cost. This paper investigates the existence of multiple technologies in the dairy industry in Pennsylvania and aims at analyzing the efficiency and viability of farms that employ these technologies. A second objective is to identify the characteristics of the farms that use different technologies. Towards this end, a latent class, variable cost, stochastic frontier is specified and estimated. Since most of the farms produce feed as an intermediate output (and data on the amount or value of the feed produced are not available), a feed production model is embedded in the specification. In this sense, the variable cost function depends on the value of feed used, which in turn is a function of the production inputs. The parameters of both the variable cost and the feed production functions are estimated in one step using the EM algorithm. The model allows for cost inefficiency in the overall production process. Following the model estimation, the minima of the average cost functions are calculated and compared. The analysis is carried out using a balanced panel of 60 Pennsylvania (US) dairy farms observed for 6 years (1987-92). The sample contains farms with herd sizes ranging from 40 to 100 cows. This variability in farm size plays a crucial role in identifying different classes of technologies in the sample. Preliminary results indicate that there are two classes of farms. Most of the estimated coefficients have the sign implied by economic theory. However, due to the high degree of non-linearity of the model, the magnitudes of the marginal effects depend heavily on the initial values chosen for the optimization algorithm. Currently, work focuses on achieving the global maximum of the likelihood function (by using many different combinations of starting values) and analyzing the productivity of the two classes, given the estimated parameters.

The Cell as an Economic Unit: Comparing the Efficiency of Metabolic Networks

Castelli, Lorenzo - Pesenti, Raffaele - Segrè, Daniel - Silli, Maddalena

Session 7 Poster II
Thursday, June 28, 2007 12:00 - 12:00 (next day)
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Our study explores the possibility of applying Data Envelopment Analysis (DEA) to the emergent field of Systems Biology, where constraint-based modelling techniques are increasingly used to study properties of living organisms. Here, we implement a DEA two-input-one-output scenario to evaluate the efficiency of a set of cells living under different environmental conditions. For the purpose of our analysis, a cell is represented as a production unit that consumes two resources and produces one outcome. The output data of the DMUs analyzed with DEA are obtained by means of Flux Balance Analysis (FBA), a mathematical formalism that aims at modelling cellular metabolism in order to predict its behaviour. Using linear programming techniques FBA optimizes a biologically meaningful objective function, e.g. cellular growth, within a feasible space of solutions, which represent the allowable states a cell can reach. This space is defined by a set of constraints reflecting biochemical properties of the cell and the characteristics of its surrounding environment. Previous studies have shown that a sensitivity analysis of the FBA objective function provides an interesting insight on the relationships between the cellular strategy for optimal growth and the resource availability in the environment. We show that an alternative sensitivity analysis of cellular performance can be addressed using DEA variable returns to scale models. This is based on the fact that DEA BCC efficient frontier approximates the piecewise concave linear function (usuallay referred to as Phenotypic Phase Plane - PhPP) representing the FBA parametric sensitivity analysis. In addition, the marginal rates of substituability and transformability allow to identify the different faces of the PhPP. Our new formulation can help understand the constraints and tradeoffs underlying the evolution of metabolic efficiency in biological systems.

On the Use of Ratios in DEA

Emrouznejad, Ali

Session 7 Poster II
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Data Envelopment Analysis is designed for evaluating DMUs that perform similar tasks and for which measurement of inputs and outputs are available. On the other hand, many applications have been reported in the literature that uses ratios (or percentage) rather than absolute numbers as inputs and outputs in DEA. A justification to use DEA is that the production possibility set (PPS) is unknown. The DEA approaches therefore estimates PPS from the set of observed DMUs and evaluate the observed productions relative to the estimated technology. Convexity is one of the underlying assumptions for estimating PPS. This paper shows that the convexity axiom fails when at least one of the input or output variables is ratio. A modified DEA model is presented takes into account the convexity of DMUs when there is a ratio variable included in the assessment model

Training Effects on Productivity and Wages Considering the Average Human Capital of Workers in the Production Function

Dumas, Audrey

Session 7 Poster II
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Our survey proposes a new measure of productivity of a worker considering the average human capital in the production function. Actually, workers can exchange skills and competencies within the company and then a transmission effect can be noticed. Profit maximisation for a competitive firm leads to equality between wage and productivity composed of individual performances and a collective component. Management of human resources, and especially payment policies, assign a collective dimension through various bonuses. According to transmission effect, an externality of On-the-Job training can be assumed between workers of the same company. In other words, training increases productivity of the trainer but can also affect the efficiency of other workers. However, traditional analysis of On-the-Job training by Becker's model start from profit maximisation and its equilibrium conditions, and thus assume equivalence of the wage-productivity relation at individual and company level. Our paper investigates then the mechanisms of On-the-Job training at company level taking into account training externality. First of all, the training effects on productivity and wages depend on the magnitude of the externality and thus on the number of trainers in the company. Secondly, employers can extract a rent from training externality and then can support partly the costs of general training. Furthermore the higher training investment and wages of higher firm and the selection process of trainers by employers can be explained partly by the training externality. Finally, Becker's model corresponds to a special case of our analysis when only one worker is trained. Our article proposes lastly an evaluation strategy for the average effects of training on wages in this new analytic framework. All estimation methods of average treatment effects set actually iid (independent and identically distributed) hypothesis separating workers from each other. On the one hand, bonuses should be taken into account in the wage measure. On the other hand, training of other workers should be included in the wage equation. Using French databases, « Formation Continue 2000 » and « Enquêtes Emplois » 2000 and 1999, some predictions of our analysis can be tested. The results confirm the existence of training externality.

Economic Growth and Foreign Direct Investment Inflows: A Stochastic Frontier Analysis

Villano, Renato - Dollery, Brian - Wijeweera, Albert

Session 7 Poster II
Thursday, June 28, 2007 12:00 - 12:00 (next day)
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Despite plausible theoretical grounds for presuming a positive relationship between foreign direct investment inflows (FDI) and economic growth, existing empirical evidence on this nexus is inconclusive. In an effort to add to the empirical literature, this paper estimates the relationship between FDI and the rate of growth of GDP using a stochastic frontier model and employing panel data covering 45 countries over the period 1997 to 2004. We find that FDI inflows exert a positive impact on economic growth only in the presence of a highly skilled labour; corruption has a negative impact on economic growth; and trade openness increases economic growth by means of efficiency gains.

The Efficiency of US Gas Transmission Operators: Lessons for Regulators

Jamasb, Tooraj - Pollitt, Michael - Triebs, Thomas

Session 7 Poster II

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Building B - Ground Floor - Room EMF

The drive for competitiveness has lead energy regulators in Europe and elsewhere to liberalize energy markets and reform the regulation of the natural monopoly segments. Reform often means moving away from traditional cost-plus or rate-of-return regulation towards incentive regulation. In practice, many regulators require efficiency increases based on some notion of yardstick competition as pioneered by Shleifer (1985). This paper is concerned with the benchmarking of gas transmission companies in the context of incentive regulation. A practical obstacle for yardstick competition or benchmarking is that most countries have a limited number of transmission utilities, a situation that does not satisfy the data requirements of most analytical benchmarking techniques. International benchmarking is one of the possible solutions. Besides giving a framework for benchmarking individual companies with US data, this paper looks at the pattern of efficiency scores across time to analyze the effectiveness of US regulation as indicated by the convergence or divergence of efficiency scores. Generally, the literature on the US gas transmission industry says that, gas transmission markets are increasingly competitive but their regulation less and less stringent. Earlier studies by for instance Granderson (2000) showed however, that at least up to the late 1980's there was no marked convergence. Thus, the purpose of this paper is threefold. First, we show that publicly available data of the type produced by US gas transmission operators enables regulators that lack data to produce meaningful efficiency scores. Second, we investigate whether US transmission companies' efficiency scores have converged since the mid-1990's. Last, this paper contributes to the limited literature on the nature of the production of gas transmission services. Understanding the nature of gas transmission has to precede effective regulatory benchmarking. An unbalanced panel of US gas transmission companies for 1996-2004 is used to produce individual time-varying efficiency scores. The model is a quasi cost function where revenue is a proxy for total expense and prices are omitted. The estimation techniques are taken from several stochastic frontier models developed for panel data. The models are fixed and random-effects models as discussed by Schmidt and Sickles (1984), introduced by Cornwell, Schmidt, and Sickles (1990), and a maximum likelihood model introduced by Battese and Coelli (1992). We use a translog functional form. We report yearly inefficiency scores, as well as correlations between the scores generated by the various models.

Accounting for Environmental Differences in Estimating Productivity Change in the Australian Wool Industry

Villano, Renato - Fleming, Euan - Fleming, Pauline

Session 7 Poster II
Thursday, June 28, 2007 12:00 - 12:00 (next day)
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Practitioners estimating changes in productivity and efficiency in the production of goods and services have long recognised the potentially complicating effects of different production conditions on each production unit, but have taken few steps to account for their impacts on individual estimates of productivity and efficiency. In some instances, the environmental differences are technologically based but in most cases they are a function of spatial variations in the environmental conditions in which firms operate. This is especially true in resource-based industries such as agriculture where biological and climatic conditions in which farmers operate can vary widely even for farmers are operating the same enterprise. In this paper, we highlight the potential for incorrectly estimating productivity changes in wool production in regions of Australia by failing to account for spatial environmental differences. Using data for a ten-year period from 1994/1995 to 2003/2004, we estimate changes in productivity (measured as total factor productivity) for four distinct sheep-producing regions in Australia (South-West Western Australia, Northern New South Wales, Southern New South Wales and South-West Victoria. First, we follow the standard procedure of estimating a stochastic frontier production function model for each region. Second, we estimate a deterministic stochastic metafrontier production function model that envelops the stochastic frontiers of the three regions such that it is defined by all observations in the different regions in a manner consistent with the specifications of the stochastic frontier model. The latter approach enables us to estimate the environment-technology gap ratio, which measures the ratio of the output for the frontier production function for each region relative to the potential output that is defined by the metafrontier function. In this way, we are able to take account of spatial differences in the environment in which wool enterprise is undertaken in each region, and differences in production technology that are induced by these environmental differences. As a result, a more accurate estimation is possible of changes in total factor productivity between farms in different regions.

Do Performance and Environmental Conditions influence Cross-Country Banking Activity in Europe?

Lozano-Vivas, Ana – Pastor, Jesús T.

Session 7 Poster II
Thursday, June 28, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

Our paper shows how the efficiency scores of the commercial banks of a given European country will change if they decide to move to a different European country. Our experiment is performed over a sample of 700 banks belonging to 11 European countries. We propose to perform a specific analysis for each pair of countries. We consider each time three types of DEA models. The internal model, which considers the banking inputs and outputs and the banks of a single country. The basic model, which considers the same variables as the internal model but the banks of the two countries under study, and the complete model which adds to the basic model the set of environmental variables. These three models allow us to measure the technical as well as the environmental variable gaps between the two considered countries. In this way, we are able to predict the new efficiency score of any bank that decides to operate in a different country. The results indicate, as expected, that being technologically advanced appears to be a significant deterrence to foreign competition and that adverse environmental conditions constitute a real barrier for foreign banking industries.

Exploring Production-Theoretical Insights for Economic-Environmental Trade-Off Analysis

Van Meensel, Jef - Lauwers, Ludwig

Session 7 Poster II
Thursday, June 28, 2007 12:00 - 12:00 (next day)
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Empirical data analysis on environmental and economic outcomes of production processes may lead to ambiguous findings. On the one hand, hardly any mutual relationship between both outcomes may be found. On the other hand, each outcome individually may have a strong relationship with the underlying productive efficiency. This can be demonstrated for pig-finishing: while both gross margin and nitrogen excretion are strongly correlated with the efficiency of converting inputs into saleable outputs, no correlation is found between the economic and environmental outcome (Lauwers et al., 2006). In these cases, the notion of eco-efficiency as a ratio indicator may be necessary for differentiating the integrated economic-environmental performance among firms. However, ratio-indicators do not allow for analysing the trade-off between economic and environmental performances. Conventional measures of productive efficiency can be adjusted to account also for environmental performances. By treating pollution for example as a bad output, an integrated performance measure can be derived and decomposed into environmental and input-output efficiency (e.g. Färe et al., 1996). This approach, however, implies some production-theoretical assumptions: bad outputs are considered as weakly disposable and production and pollution are treated as separable. Consequently, substitution possibilities between productive inputs to reduce pollution are not taken into account, limiting the ability to capture adequately the trade-off mechanisms between economic and environmental performances. Some work has already been done on efficiency modelling that considers pollutants as outcomes of the production process, similar to the economic result of the technical input–(saleable) output relationship. This approach introduces emission minimizing behaviour similar to the economic optimising assumptions in productive efficiency models (e.g. Coelli et al., 2005). This allows for weighing of economics and environment. The question arises to what extent this weighing of outcomes allows for a theoretically consistent trade-off analysis. The objective of this paper is to work out a theoretical framework for economic-environmental trade-off analysis. First, based on production-theoretical insights, it will be shown that certain phases may exist in the economic-environmental trade-off relationships. Second, existing adjusted productive efficiency approaches will be evaluated according to their ability to capture these trade-off phases. Third, it will be shown that technological progress through induced innovation can enlarge the set of positive trade-off possibilities. Economic-environmental trade-off phases consist of technical efficiency improvement, input substitution, introducing new technologies and output reduction. These phases can be introduced in a so-called marginal abatement cost curve. Conventional parametric and nonparametric frontier methods, adjusted following the approach by Coelli et al. (2005), exhibit some serious shortcomings to capture these phases. Data envelopment analysis, for example, yields a stepwise marginal abatement cost curve due to the stepwise character of the production frontier. The stepwise production frontier also limits the ability for analysing induced innovation. Stochastic frontier analysis requires the choice of a functional form. This choice is mostly too pragmatic from a methodological or calculus viewpoint. Moreover, for analysing induced innovation, more flexibility is needed to account for non-Hicks-neutral technical change.

Comparing Statistical Properties of Frontier Estimates When Some Outputs Are Undesirable

Salnykov, Mykhaylo

Session 7 Poster II
Thursday, June 28, 2007 12:00 - 12:00 (next day)
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Traditionally in productivity economics the production frontier is estimated using Shephard-type distance functions. Recently, it has been shown that when some outputs are undesirable, it makes the most intuitive sense to use an Output Directional Distance Function (ODDF), one Shephard-type functions. It has been shown that ODDF is a complete characterization of technology under a fairly weak set of axioms. Therefore, an estimation of ODDF is equivalent to estimating the best practice frontier. However, there are still two types of ambiguities related to the use of ODDF: the choice of directional vector and the estimation technique. Although a choice of the directional vector represents a serious specification issue, still ODDFs with some directional vectors should be preferred primarily due to the ease of interpretation and a number of desirable properties ODDFs with these vectors satisfied. A much more blurred issue is the estimation methodology for ODDF. Traditionally, ODDF is estimated using parametric approach, which is executed through Translog or Quadratic specification of the ODDF, or nonparametric approach, which takes a form of either Data Envelopment Analysis (DEA) or Freely Disposable Hull (FDH). Although these estimation methodologies are used interchangeably, some researchers questioned whether they yield comparable estimates of the efficient technological frontier. For example, Coelli and Perelman (1999) identified that when all outputs are desirable, parametric and nonparametric methodologies yielded different frontier estimates. Salnykov and Zelenyuk (2004) arrived to a similar result in the case when some outputs are undesirable. However, it has never been studied whether bias-corrected estimates of the efficiencies are different when different methodologies are used. In the current study, we attempt to fill this gap by testing parametric and nonparametric alternatives on the estimation of ODDF as well as Stochastic Frontier Analysis (SFA) approach using a set of computer generated data for 100 decision making units (DMUs) that produce both desirable and undesirable outputs at sub-efficient levels (with “true” inefficiency values being purely random, but known). We employ a bootstrap technique that recently proved to be extremely useful for estimating and fixing bias of distance function estimates when all outputs are desirable. We introduce statistics that measure how good each technique is in estimating “true” values of inefficiencies. Our preliminary findings reveal that in general bias corrected parametric estimates and SFA estimates are less precise than DEA estimates. However, none of the estimates are clearly more statistically efficient than the alternatives. The study suggest that in general DEA technique should be preferred to parametric and SFA techniques when estimating efficiencies for technologies when some outputs are undesirable.

Total Factor Productivity of Ukraine: First Decade

Demchuk, Pavlo

Session 7 Poster II
Thursday, June 28, 2007 12:00 - 12:00 (next day)
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Following the work “Economic Efficiency of Ukrainian Regions: How Far are They Apart?” (Demchuk and Zelenyuk (2007)) we continue the investigation of the Ukrainian economy. In this paper we investigate the development of Total Factor Productivity (TFP) for the whole economy during 1996-2002. We find that Ukrainian economy is characterized by the slightly increasing returns to scale in 1996-2000 and reaches constant returns to scale in 2001-2002. We estimate the rate of technological progress to be on average 8.3% per year, with as high as 13.1% in 1998 and the lowest 3.5% in 2001. We also investigate the main factors influencing it.

Accounting for Undesirable Outputs and Non-Discretionary Inputs in the Olive Oil Industry Efficiency Analysis

Dios-Palomares, Rafaela - Prieto Gijarro, Ángel M. - Martínez-Paz, José Miguel

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Thursday, June 28, 2007 12:00 - 12:00 (next day)
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Olive oil industry sector represents an important component of the South of Spain Economy. In this work, three main aspects have been considered, such as technical efficiency, quality and the environmental effects of the production process. These are essential variables for the actual sector development, being the basis of the necessary repositioning strategy of olive oil in national and international markets. We estimate the efficiency level taking into account that oil production necessarily induces undesirable outputs production resumed in two different indices. Bad quality collects aspects such as extra virgin olive oil proportion on the total production, critical points and traceability and the environmental index includes bad impacts on soil, water, and air, also considering noise and neighbourhood disturbances. We have performed a multioutput non parametric frontier analysis on the basis of direct information on a 88 olive oil industries sample. Olive oil production has been considered as a desirable outputs being bad quality and environmental impact the undesirable outputs. The inputs are labour, capital and cashflow. Besides, we consider that firms with a cooperative legal regime perform different from the other. So, this variable must be taken into account as a categorical non discretionary one, in order to allow for different performances in the use of the resources. Efficiency level is estimated by mean of a new approach that encompasses the simultaneous consideration of conventional outputs e inputs with undesirable outputs and no discretionary variables. This is overcome combining the DEA model in the directional distance framework with a tree stage method (Dios et al, 2003) that disentangles the environmental effect and the efficiency score. A bootstraps truncated regression is also applied in order to detect possible influences of some firm`s characteristics in the efficiency level.

How Did Mandated Quality Investments Influence the Productivity and Profitability of English and Welsh Water Companies?

Maziotis, Alexandros - Saal, David - Thanassoulis, Emmanuel

Session 7 Poster II
Thursday, June 28, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

The water and sewerage companies in England and Wales are regulated with an RPI+K price cap system, which reflects improvements in efficiency and further capital investment programs for complying with drinking water quality and environmental standards. The purpose of our research is to extend the work of Saal & Parker (2001) by better decomposing the sources of economic profits in the privatized water and sewerage industry. We therefore employ a methodology that explicitly captures the impact of quality investments on economic profits, and which is flexible enough to allow for firms with zero outputs. We use an unbalanced panel of Water and Sewerage Companies (WaSCs) and Water only Companies (WoCs) for 1993-2006 and decompose profits into a quantity and a price effect. Further adaptation and estimation of a frontier allows us to take into account the impact of efficiency change, technical change, scale change in a company's profits. In this case, Data Envelopment Analysis (DEA) is used to calculate the Malmquist index, which decomposes into technical change, a scale effect and efficiency change. We further incorporate in the profit decomposition the impact of changes in quality and allow its application where firms produce zero outputs by using a Fisher index to calculate the quantity and price effect.

DEA - The Mathematical Programming Approach to Efficiency Analysis

Thanassoulis, Emmanuel
(Aston University, Aston Business School)

Talk based on the forthcoming book:
H. Fried, C.A.K. Lovell, S. Schmidt (eds.)
The Measurement of Productive Efficiency and Productivity Change, NY: Oxford Univ. Press

Session 8 Keynote II
Thursday, June 28, 2007 14:00 - 15:30
Building B - Ground Floor - Room B050

Comment on: DEA - The Mathematical Programming Approach to Efficiency Analysis

Tind, Jørgen
(University of Copenhagen, Dept. of Applied Mathematics and Statistics)

Session 8 Keynote II
Thursday, June 28, 2007 14:00 - 15:30
Building B - Ground Floor - Room B050

Comment on: DEA - The Mathematical Programming Approach to Efficiency Analysis

Wilson, Paul
(Clemson University, Dept. of Economics)

Session 8 Keynote II
Thursday, June 28, 2007 14:00 - 15:30
Building B - Ground Floor - Room B050

Quantile Estimation of Production Profile

Huang, Cliff - Fu, Tsu-tan - Yang, Yung-Lieh

Session 9 A Advances in Production Theory II
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A101 J.M KEYNES

In this paper, quantile regression models are suggested as an alternative description of a production technology. The quantile of continuous order defines the production profile, the technical efficiency quantile of the population, and the quantile-base individual technical efficiency relative to the quantile order. Quantile-base production frontier and efficiency are easy to derive and estimate, and does not envelop all sample observation points. It is more robust to extreme observations than DEA or FDH. Furthermore, quantile regression does not make distribution assumption. It is more robust to the misspecification of error structure than DFA or SFA. In this paper, the quantile regression methods are extended to semi-parametric smooth coefficient models. A local linear fitting scheme to estimate the smooth coefficients is proposed in the quantile framework. An empirical application of the model to the manufacturing industry in Taiwan demonstrates the potential to the estimation of production technology and efficiency measures.

Cost Allocation and Convex Envelopment

Hougaard, Jens Leth - Tind, Jørgen

Session 9 A Advances in Production Theory II
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A101 J.M KEYNES

This paper consideres allocation rules. First, we demonstrate that the cost shares of the Aumann-Shapley and the Friedman-Moulin cost sharing rules are easy to determine in practice using convex envelopment of registered cost data and parametric programming. Second, from the linear programming problems involved it becomes clear that the allocation rules, technically speaking, allocate the non-zero value of the dual variable for a convexity constraint on to the demand vector. Hence, the allocation rules can also be used to allocate inefficiencies in non-parametric efficiency measurement models such as Data Envelopment Analysis (DEA). The convexity constraint of the BCC model introduces a non-zero slack in the objective function of the multiplier problem and we show that the cost allocation rules discussed in this paper can be used as candidates to allocate this slack value on to the input (or output) variables and hence enable a full allocation of the inefficiency on to the input (or output) variables as in the CCR model.

The Estimation of Dual Cost Functions for Stochastic Technologies

Chambers, Robert

Session 9 A Advances in Production Theory II
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A101 J.M KEYNES

This paper does several things. First, it considers dual cost functions for a stochastic technology that require no prior restrictions on producer beliefs about the state of the world or producer attitudes towards risk. Second, it relates these dual cost functions to "special-purpose" cost functions previously considered in the empirical production literature. Third, it shows that the marginal-cost structure for a stochastic technology, defines a stochastic discount factor for any stochastic financial asset that is available to producers at the time production decision are made. Fourth, it shows that this link to financial markets can be used to econometrically identify cost structures for homothetic stochastic technologies using time-series data. Finally, using aggregate data from US agriculture, an empirical version of the homothetic technology is fit with encouraging results.

Stochastic Nonparametric Envelopment of Panel Data with Fixed and Random Effects

Kuosmanen, Timo

Session 9 A Advances in Production Theory II
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A101 J.M KEYNES

Stochastic nonparametric envelopment of data (StoNED) approach (Kuosmanen 2006) combines the virtues of data envelopment analysis (DEA) and stochastic frontier analysis (SFA) within one unified framework of frontier analysis. Following Banker and Maindiratta (1992), StoNED unites the nonparametric piece-wise linear DEA-type frontier with the stochastic SFA-type inefficiency and noise terms. The estimation of the StoNED model is based on a nonparametric least-squares technique. In practice, the computation of the nonparametric least squares problem boils down to solving a straightforward qudratic programming problem. Both Banker and Maindiratta (1992) and Kuosmanen (2006) focus on the cross-sectional setting. This paper extends the StoNED approach to the panel data setting. In general, the panel data offers better opportunities for disentangling inefficiency from stochastic noise: when each firm is observed several times, the effects of random noise can be averaged out. In the panel data setting, the parametric assumptions about the distributions of the inefficiency and noise terms are not necessary. In the SFA literature, the two main approaches for dealing with panel data are the fixed effects approach (Schmidt and Sickles 1984) and the random effects approach (Lee and Tyler 1978). This paper adapts both fixed and random effects treatments to the nonparametric StoNED framework. Dynamic model specifications and alternative error structures are also investigated. An application to the wholesale and retail industry illustrates the approach.

Nonparametric Efficiency Analysis under Economies of Scope

De Rock, Bram - Cherchye, Laurens - Vermeulen, Frederic

Session 9 B Nonparametric Specification Issues
Thursday, June 28, 2007 16:00 - 17:30
Building A - Second Floor - Room A201 J. MONNET

We suggest a methodology for nonparametric efficiency analysis that takes as a starting point that multi-output production refers to economies of scope, which in turn originate from joint input use and input externalities. We institute nonparametric tests for efficient production behavior under such conditions, and show the relationship with exiting DEA models. An example application illustrates the methodology.

Dynamic Measures of Economies of Scope

Oude Lansink, Alfons - Silva, Elvira - Stefanou, Spiro

Session 9 B Nonparametric Specification Issues
Thursday, June 28, 2007 16:00 - 17:30
Building A - Second Floor - Room A201 J. MONNET

Measuring economies of scope facilitates the assessment of the benefits from output diversification versus specialization for farms in a sector and provides a metric for explaining and predicting trends towards specialization or diversification. Previous studies aiming at measuring economies of scope have employed both static and dynamic approaches to measuring economies of scope. Dynamic approaches account for the interdependence of production decisions over time, but have only been applied in a parametric context. To remedy the shortcomings of previous approaches, this paper uses a dynamic directional distance function approahc and develops a measure of Economies of Scope measuring the benefits of diversification. This measure is then decomposed into Pure Economies of Scope, allocative efficiency, congestion efficiency and pure technical efficiency. The approach outlined above is applied to a sample of Dutch cash crop farms, covering the period 1995-1999 where up to three outputs (rootcrops, cereals and other outputs) and six inputs (i.e. pesticides, fertilizers, other variable inputs, land, labor and capital) are distinguished.

Nonparametric Test of Congestion

Cavaignac, Laurent - Peypoch, Nicolas - Barros, Carlos

Session 9 B Nonparametric Specification Issues
Thursday, June 28, 2007 16:00 - 17:30
Building A - Second Floor - Room A201 J. MONNET

In this paper we show how the Färe, Grosskopf and Lovell (1985) input congestion nonparametric test can be performed to reach a statistical conclusion. To achieve this goal, we use Simar and Wilson (1998, 2000) radial distance functions bootstrap technique. An empirical illustration on airports congestion is provided. The results show the interest of implementing this test. More specifically, they highlight the fact that the use of the strongly disposable input distance function would lead to overestimated efficiency measures. Moreover, the technology is globally congested and nine of the forty airports are found to be input congested.

The Validity of Input Aggregation in DEA Models: A Statistical Test

Ray, Subhash - Mukherjee, Kankana

Session 9 B Nonparametric Specification Issues
Thursday, June 28, 2007 16:00 - 17:30
Building A - Second Floor - Room A201 J. MONNET

Selecting the right number of distinct inputs and outputs for the specification of the underlying technology is often quite difficult in applied production analysis. In many cases, for a variety of reasons, several inputs (or outputs) may be aggregated into a single composite input (or output). In applications of Data Envelopment Analysis (DEA), maintaining a large number of inputs in the model may result in all or most of the decision making units (DMUs) to be rated as efficient. As explained by Leibenstein and Maital (1992) this is a result of the dimensionality of the input /output space relative to the number of observations. Meaningful aggregation of multiple inputs or outputs, therefore, reduces the number of constraints in the linear programming model, thereby increasing the “degrees of freedom”. However, while input aggregation has some advantages when it is valid, it does pose problems in cases when it is not. The theoretical implications of such aggregation have been addressed in some previous studies. A review of the literature reveals that while including too many distinct inputs in the DEA model may lead to problems associated with overspecification, aggregating inputs into a fewer number of inputs to be included in the model may lead to biased measures of technical efficiency. The validity of input aggregation in any specific application is therefore an empirical question. However, the statistical side of this issue has been far less explored. In a recent paper Banker et al. (2005) proposes a method of estimating allocative inefficiency when only aggregate cost or revenue data and quantity data (but not price data for individual inputs or outputs) are available. They provide a test of allocative efficiency through an application of Banker’s (1993) F-test based on the DEA technical efficiency residuals from the aggregate and the disaggregated models. This paper extends the literature in several ways. First, we address the problem of input aggregation in DEA models within a more general framework. We show a direct link between input aggregation in DEA on one hand and the test of parameter restrictions implied by input aggregation in an explicitly specified production function on the other. Second, more importantly, departing from the existing practice of assuming identical prices across firms, we allow the input prices to vary and show how the DEA LP problems for the aggregated model have to be modified to accommodate this variation. Finally, we apply the proposed method to the Indian manufacturing sector using state level data. We then carry out a statistical test of the validity of input aggregation using Banker’s (1993) F test. In this case it can also serve as a test of allocative efficiency. We find that the validity of aggregating production workers and non-production workers into a composite labor input using state specific prices for aggregation cannot be rejected.

South East Asian Banking after the Crisis: A Non-Parametric Analysis of the Impact of Environmental Factors

Mohd Khan, Shazida - Casu, Barbara

Session 9 C Banking Applications
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A103 M. CROZIER

The banking systems of South East Asian countries have undergone rapid changes in the years following the 1997 financial crisis. The restructuring process which followed the crisis is specific to the individual countries involved and the outcomes have differed widely. This paper aims to shed some light on the effect of different policies on the performance of South East Asian banking by assessing the relative efficiency of banking institutions operating in Indonesia, Korea, Malaysia, the Philippines and Thailand over the period 1999 – 2005. Specifically, we employ a slacks-based model (SBM) to measure bank efficiency in a DEA context (Tone, 2001), in addition to the standard Banker, Charnes and Cooper model (BCC). Following Drake et al (2006) we incorporate the different operating environments in the estimation of technical efficiency by using the slack-based second stage Tobit regression model. The results show a significant relative impact of country specific factors and environmental variables on bank efficiency measures, which have particularly important policy implications.

Consolidation and Innovation in U.S. Banking: A Dynamic Reallocation Approach

Bos, Jaap - Kolari, James W.

Session 9 C Banking Applications
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A103 M. CROZIER

In this paper, we investigate innovation dynamics in a consolidating market. We study consolidation in the U.S. banking market in the last 20 years, when the number of independent banking organizations more than halved. Innovation dynamics in such an environment can be very complex due to inter-firm reallocation effects. As a result, the standard measures of technical change that are used in the literature, may not suffice. Therefore, we introduce changes in the firm-level technology gap ratio as a new measure of innovation. Subsequently, we use a bootstrapped dynamic reallocation model to study the importance of reallocation effects for innovation in U.S. banking. The average annual rate of technical change measured with our new approach is somewhat higher than that indicated by traditional measures. We find that the share effect dominates, indicating that the rise of the large banks was an important driver of innovation. A third of this share effect is efficiency driven: efficiency increases contributed significantly to innovation. The industry net exit effect becomes a crucial positive factor after 1995 (when Riegle-Neal takes effect), however it is temporarily reversed in 1999, picking up in 2001.

Introducing Regulation in the Measurement of Efficiency, with an Application to the Canadian Air Carriers Industry

Ouelette, Pierre - Petit, Patrick - Vigeant, Stéphane

Session 9 D Transport
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A121 M.E. PORTER

This paper proposes a method to measure efficiency in highly regulated capital-intensive industries in the presence of state-owned enterprises. We generalize the Data Envelopment Analysis method to include regulation in the model, as well as the quasi-fixed nature of capital and its links with the firms' investment decisions. The framework is then applied to the Canadian air carriers industry to study the impact of regulation changes on the efficiency of the various carriers, between 1960 and 1999. Our results show that deregulation explains a large part of the measured inefficiency.

Efficiency Measurement of Road Maintenance

Ozbek, Mehmet Egemen - De la Garza, Jesus M. - Triantis, Konstantinos

Session 9 D Transport
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A121 M.E. PORTER

The road maintenance performance measurement systems developed and implemented by researchers and state departments of transportation (DOTs) mainly focus on the effectiveness measures, e.g., the level-of-service. Such measurement systems do not elaborate on the efficiency. Not knowing how "efficient" state DOTs are in being "effective" can lead to excessive and unrealistic maintenance budget expectations. The specific objective of this paper is, through the use of data for the Commonwealth of Virginia, to illustrate the modeling and data challenges of identifying (i) the relative efficiency of different units in performing road maintenance services, (ii) the reasons of the efficiency differences between units, (iii) the effects of the uncontrollable factors on the road maintenance efficiency of units, (iv) the benchmarks (peers) and best practices that pertain to the inefficient units. Results that pertain to the specific highway sections within the Commonwealth will be presented. The possible use of these results in affecting decision making in state DOTs with respect to asset management interventions will be discussed and suggestions for alternative modeling approaches will be provided.

Cost Efficiency and Economics of German Public Bus Operators - A Parametric Approach

von Hirschhausen, Christian - Wilhelm, Axel -
Nieswand, Maria - Geissler, Marika

Session 9 D Transport
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A121 M.E. PORTER

The highly regulated public transport in Germany has been under financial pressure for the past years. Cross subsidies from local energy companies ("Stadtwerke") has become a common tool to support the provision of public transport, which is naturally running deficits. Furthermore, support from local governments has been diminishing over the years given the tightness of public budgets. On the other side, institutional changes in policy not only on German, but European level, with respect to funding structures of public transport will enhance these negative financial effects for operators. The most straightforward solution to handle this challenge is to increase operators' efficiency resulting in cost reductions. Stipulating competition in the sector is a possible solution providing incentives for cost efficient operation of companies. While the UK was the first to open public transport towards competition in the early 1980s, the US followed subsequently as well as the majority of European countries such as Norway, Sweden and Switzerland during the 1990ies (Cox, Duthion (2001); Filippini, Maggi, Farsi (2001)). Success of market reforms is commonly measured by using benchmarking methods. Additionally, they are an appropriate tool to evaluate industry's or operators' characteristics in preparation or ex post phases of changing market structures. Especially economies of scale, economies of scope and network density are of interest since they are providing information to support decision making units. There is ample empirical evidence analyzing bus operators: Observations by Williams and Hall (1981) for US bus operators, Filippini et al. (2001) for operators in Switzerland, and Piacenza (2006) for the Italian market indicate positive economies of scale and scope. The only investigation of 13 German urban bus transport for the time period of 1970 until 1983 dates back to the early 1990ies. Hanusch and Cantner (1991) estimate a stochastic translog cost frontier using only labor and capital costs as input thereby neglecting fuel input. The findings show efficiency levels of 80 to 84% depending on the model specification. Our paper analyzes 163 German bus operators providing public transportation services for 1994- 2004. We use the number of busses, employees and energy as input factors, and seat-km, passenger-km, bus-km, respectively, as outputs. A translog cost function is estimated by employing the parametric stochastic frontier analysis (SFA) whilst assuming fixed output levels. Input prices are calculated separately (not as residuals from total costs) by utilizing present physical data provided by the Association of German Transportation Companies (VDV). Employing FRONTIER 4.1 we allow for different output variables (seat kilometer, wagon kilometer and passenger kilometer) and different model specifications (Battese, Coelli (1992) and Battese, Coelli (1995)) including on the one hand variables describing the cost structure and on the other hand structure variables accounting operators' inefficiency. First results show clearly the existence of scale economies for the German public bus transportation sector that increase with raising companies' size. Furthermore, the calculation depicts strong variation of operators' cost efficiencies scores (from 38% to 95% with median cost efficiency of 89%) but independently from companies' size. We also detect an improvement of average cost efficiencies over time. We recommend merging units within the sector.

Designing Incentives in Local Public Utilities, an International Comparison in the Drinking Water Sector

De Witte, Kristof - Marques, Rui Cunha

Session 9 E Water Utilities
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A120 E. MALINVAUD

The merits of competition are abundantly demonstrated in economic theory. However, a monopolistic configuration may still be desirable in certain activities. Particularly operations with large sunk costs or increasing returns to scale could lead to a natural monopoly. Irrespective of ownership, whether private or public owned utilities, every natural monopoly involves welfare cost to society. The problem is similar to a principal-agent problem under asymmetric information. The monopolistic utilities (the agents) have private information about their ability to transform inputs into outputs. As society (the principal) wants a guaranteed service at the lowest price possible, the utilities can extract information rents. The objective of society is to minimize the extraction of information rents while assuring a satisfactory service. Policy makers can apply a range of incentive schemes in order to reach this goal. The different institutional frameworks reflect different regulatory and ideological views. In this article, we want to examine the role of incentive schemes in the drinking water sector. We investigate whether regulatory and benchmark incentive schemes ameliorate the efficiency of utilities which are encouraged by incentives. We try to make abstraction of ideological conflicts by only considering efficiency. Whatever the ideological background, no one can accept inefficiencies. We compare the incentive schemes of five different countries: benchmarking the drinking water sector as in the Netherlands, privatization as in England and Wales, a strong regulatory framework as in Australia, municipal provision with private sector participation as in Portugal or different levels of public management as in Belgium. Our results show large differences in first stage inefficiencies. On average, the benchmarked Dutch drinking water companies are performing better (average efficiency score of 0.84) than the privatized English and Welsh utilities (0.79). However, the strict regulatory model of Australia (0.75), the municipal provision in Belgium (0.70) and especially the Portuguese municipal provision with private sector participation (0.61) are lagging behind. The second stage procedures examine to which extent the inefficiencies could be attributed to (un)favorable social, physical and institutional environmental factors. Therefore, we have employed censored and truncated Tobit models and a double-bootstrap procedure. The results detect the negative effect on efficiency of the proportion of industrial customers and groundwater extraction, the consumption per capita and the effect of a corporate structure. The portion of leakage, the gross regional product, only supplying drinking water, the delivery in only one municipality and the regulatory and benchmark incentive schemes yield a positive effect on efficiency. Finally, we have incorporated the social, physical and institutional environmental factors in the efficiency scores. The obtained scores reflect efficiencies as would the utilities work in exactly the same environment. With the exogenous influences equalized, the variation left between the DMUs can mainly be attributed to managerial influences. Here again, the Dutch, English and Welsh utilities perform more efficiently. In order to capture the effects of the regulatory and benchmark incentive schemes on the average efficiency of the analyzed countries, we have estimated efficiencies as the utilities would work in exactly the same environment but with different incentive schemes. The results provide significant evidence for the positive effects of incentives schemes to efficiency. The analysis demonstrates that in absence of clear and structural incentives the average efficiency of the utilities even falls in comparison with utilities which are encouraged by incentives. In methodological terms, this paper follows the literature on Data Envelopment Analysis (DEA). This non-parametric technique is particularly useful in the efficiency measurement of public utilities where knowledge of the production function is relatively scarce. However, the first DEA models, developed by Charnes et al. (1978) and Banker et al. (1984), did not allow for statistical inference. Only recently, by the work of Simar and Wilson (1998), was statistical inference introduced. We apply their methodology, which is based on bootstrapping, to determine the bias-corrected first and second stage results. These outcomes are compared to the ones arising from the more traditional Tobit regressions with censored and truncated samples. Order-m efficiencies are applied to detect the outlying observations in the sample. The bandwidth of the Kernel estimates is employed to stipulate the homogeneity of a country's drinking water sector. We conclude by incorporating environmental variables directly into the efficiency estimates. Besides applying a one-stage model, we therefore introduce a procedure which is based on the residuals of the Tobit regression.

Cost Efficiency of Slovenian Water Distribution Utilities: an Application of Stochastic Frontier Panel Data Methods

Zoric, Jelena - Filippini, Massimo - Hrovatin, Nevenka

Session 9 E Water Utilities
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A120 E. MALINVAUD

In Slovenia, the current price regulation of water distribution utilities still closely resembles the traditional rate-of-return regulation. Nonetheless, the rules on price regulation recently issued by the government (i.e., Rules on Price Determination of Obligatory Local Public Utilities for Environment Protection, 2004) envisage the use of benchmarking of costs and quality, identification of the best practice performance and determination of prices based on justified costs. However, the rules have not yet been put into practice, nor has been the benchmarking method specified. In the paper we consider the possible use of stochastic frontier benchmarking methods and suggest how the results could be used in the price-regulation process. To obtain preliminary estimates on cost inefficiency of Slovenian water distribution utilities, several stochastic frontier panel data models are used. A translog cost frontier function is estimated based on an unbalanced panel data set of 52 utilities over the 1997-2003 period. Since reliability of efficiency scores is crucial for an effective implementation of incentive-based price regulation, we further examine the consistency of obtained inefficiency scores. As suggested by Farsi, Filippini and Greene (2005) we try to establish whether a possible inconsistency problem can be explained by different ability of the models to account for unobservable heterogeneity in environmental and network characteristics across companies. In order to find out whether distinguishing unobserved heterogeneity from inefficiency significantly influences the results, the cost inefficiency estimates obtained from both conventional panel data models and the newly proposed “true” fixed and “true” random effects models by Greene (2005a, b) are compared. Finally, we propose how the results from benchmarking analysis could be employed in regulating water prices in Slovenia.

The Impact of OFWAT Incentives on Company Performance

Portela, Maria - Thanassoulis, Emmanuel -
Horncastle, Alan - Maugg, Tobias

Session 9 E Water Utilities
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A120 E. MALINVAUD

Following the privatization of water utilities in the UK in 1989 a water regulator, (OFWAT) was set up to safeguard the interests of water consumers in the face of monopoly powers enjoyed by the privatized companies, while also ensuring companies survive financially to meet demand for water services. The regulator assesses the scope for efficiency savings at water companies at periodic reviews and limits the prices they can charge their customers. In this context Ofwat has developed a regulatory regime to incentivise firms to improve their productivity so that benefits can be shared between consumers and shareholders. There have been, since 1994, some changes to the incentive regime used by Ofwat. In this paper we assess the impact on company behaviour of two changes in particular introduced by Ofwat: (i) The introduction of the rolling mechanism in 1999 whereby efficiency gains made by companies can be retained for their benefit for a full cycle of 5 years rather than only to the next periodic review and; (ii) the changing balance between setting a lower efficiency savings target as opposed to permitting firms to retain outperformance profits for longer. Both changes were introduced by Ofwat with the aim of increasing company productivity. We used Malmquist indexes computed through DEA efficiency measures to analyse whether this aim has been achieved. We complement the Malmquist indices analysis with non-parametric tests to check whether changes can be regarded as statistically significant.

Taking Into Account Environmental Variables in Frontier Models, a Metafrontier Approach to the Drinking Water Sector

De Witte, Kristof - Marques, Rui Cunha

Session 9 E Water Utilities
Thursday, June 28, 2007 16:00 - 17:30
Building A - First Floor - Room A120 E. MALINVAUD

Benchmarking frontier models are used to quantify the relative performance of decision-making units. The resulting scores and rankings become more and more relevant in competitive markets. In the public sector they constitute the best way of checking the value for money generated. Sometimes benchmarking is even the only tool to measure and encourage the performance improvement. In the water sector benchmarking is traditionally sorted into metric and process benchmarking (Kingdom et al., 1996). Metric benchmarking can be further classified into different ways. One of them is into non-frontier and frontier models whether it is admitted that the organizations are or are not technically efficient, or in other way, whether the benchmarks are based on the average adjustments or on the samples best practices. The major problems of the frontier methods are the quality of the sample and the influence of the environmental factors. The frontier itself determines all the scores and if it does not correspond to the real best practices free from the non-discretionary effects the efficiency obtained could lead to distorted conclusions. So, the ideal would be to determine the worldwide frontier. As this is not possible here, we compute the efficient frontier of a set of five countries. However, to obtain reasonable and comparable results we must consider the technological gap between the different countries and the influence of environmental variables. This paper discusses the benchmarking frontier models and uses the concept of a metafrontier to compare the technical efficiencies of water services that may be classified into different groups, depending on the country of origin. Although the theoretical framework on metafrontier models is appealing, its literature is largely underdeveloped. In an attempt to extent the analysis, we define the 'group specific technical efficiency' (GTE), which combines the theories of group and metafrontiers. As in group frontiers the DMUs are not compared with respect to the same standards, thus they cannot be used to detect differences in efficiency between the groups. The metafrontier pools all the observations, but it does not take into account differences in environmental factors. The GTE compares the efficiency of observations by correcting the meta-efficiency scores for the inefficiency of a DMU relatively to its group frontier. Due to dissimilarities in sample sizes, the group frontier cannot be measured by the popular 'Data Envelopment Analysis' and the 'Free Disposal Hull' tools from the efficiency measurement literature. To solve this problem, we suggest using the order-m efficiencies of Cazals, Florens and Simar (2002). This nonparametric estimator of the technology set is related to the FDH estimator but envelops only 'm' data. To correct for environmental factors, the metafrontier is estimated by using the conditional efficiency measure of order-m by Daraio and Simar (2005). - Incentive schemes in the drinking water sector are strongly ideological driven. To judge objectively whether the structural incentive schemes of benchmarking or regulation are superior on few structural incentives, we compare the efficiency of the drinking water sector in the Netherlands, England and Wales, Australia, Belgium and Portugal by the metafrontier framework. The results point out that relatively to the group frontiers, the Dutch, English and Welsh drinking water utilities are working more efficiently than the Belgian and Portuguese companies. The corrected metafrontier scores and the GTE confirm these results.

The Impact of Operational Risk toward the Efficiency of Banking: A Comparison of Taiwan's and China's Banking Industries

Cheng, Cheng-ping - Chen, Bih-Shiow

Session 9 F Asian and Middle East Banking
Thursday, June 28, 2007 16:00 - 17:30
Building B - Second Floor - Room B253

The enactment of three great risks (credit risk, market risks and operation risk) of Basel II would impact on the banking system worldwide. It is thus an urgent research topic to evaluate the influence of three great risks on the financial sector. Since there is tightly economic linkage between Taiwan and China, this study intends to compare the impact of the operational risk toward the efficiency of Taiwan¡¦s and China¡¦s banking system. We use a stochastic frontier approach, mostly based on the econometrics method of Battese and Coelli (1995), to process the empirical research. Taking banking as an intermedium of financial activities, we employ the intermedium-method to select multiple inputs and multiple outputs of the model. A translog cost function will be set to estimate the cost frontier and cost inefficiencies of banks. At the same stage, we investigate the impact of operational risks of samples banks associated with other environmental variables toward the cost inefficiency of sample banks. Finally, considering the institutional differences of Taiwan¡¦s and China¡¦s financial systems, we further exploit the metafrontier method of Battese (2004). We estimate the cost frontiers of China¡¦s and Taiwan¡¦s banking industries respectively, and then we will find the common frontier (metafrontier) of China and Taiwan¡¦s banking industry. The research data is from the data bank of Taiwan Economic Journal (TEJ), the annual statistical report of Chinese financial industry, and so on. Regarding estimating the key variable of this research, operational risk, we use the top-down method, instead of traditional bottom-up method, to process the estimation. Other environmental variables used to account for the factors that impact on the inefficiency of sample banks include the ages of financial institutes, the corporate governance variables, and other specific variables of the institutes.

The Efficiency Productivity of Jordanian Banking Sector in the Presence of Negative Output

Emrouznejad, Ali - Anouze, Abdel Latef

Session 9 F Asian and Middle East Banking
Thursday, June 28, 2007 16:00 - 17:30
Building B - Second Floor - Room B253

Jordan's banking sector is fully privately owned and well-developed. DEA is selected as primary method for evaluating performance of banking sector in Jordan. However the standard DEA is applicable only to technologies characterized by positive inputs/outputs. Having some negative output a new DEA model (Semi Oriented Radial Measure) has been developed. The result shows that the majority of banks are fairly inefficient. Jordanian bank efficiency is deteriorated during the study period. The overall pure technical efficiency on average is 79%. Further analysis and investigation is carried out to fully evaluate the efficiency and productivity of Jordanian banking sector.

On Measuring the Efficiency of Banks in Taiwan: A Stochastic Metafrontier Analysis

Sun, Chia-Hung

Session 9 F Asian and Middle East Banking
Thursday, June 28, 2007 16:00 - 17:30
Building B - Second Floor - Room B253

A number of approaches have been used to estimate the levels of technical efficiency for Taiwanese banks. Most popular ones include conventional stochastic cost frontier model and data envelope analysis (DEA). Not surprisingly, the estimates of technical efficiency vary depending on the chosen methods but the assumption of applying the same technology is common to all. That is, banks in Taiwan, including state-owned, private and foreign-owned, face the same production frontier. This is certainly untrue. In general, state-owned banks tend to be less profitable than private banks as a result of supporting the government's policies. Although the scale of foreign bank branches in Taiwan is relatively smaller than Taiwanese banks, sizes of these foreign banks are much lager and well-known internationally. This paper applies a stochastic cost metafrontier proposed by Battese et al. (2004) to estimate Taiwanese banks' efficiency. A likelihood ratio test will be used to see whether banks applying different technology.

A Comparison Between DEA and SFA Method in Japanese Banking Industry

Le, T.P.

Session 9 F Asian and Middle East Banking
Thursday, June 28, 2007 16:00 - 17:30
Building B - Second Floor - Room B253

There are large differences between DEA and SFA regarding methodology, a non-parametric and parametric method. Based on a sample of Japanese banks, a large difference between the results of two methods has been found at bank level; the DEA has shown that big banks are better performers than small banks while the SFA methods showed that small banks are much better. At industrial level, the aggregated results of two methods yielded mostly no significant differences, almost identical. The competition among banks was found; in size and distance among banks although the econometric method are popular, GMM and OLS. Smaller banks do seem to be suppressed by bigger banks in the regional area and in general banks seems to follow the competition with their three closet competitors.

Robust Non-parametric Quantile Estimation of Efficiency and Productivity Change in U.S. Commercial Banking, 1985--2004

Wilson, Paul - Wheelock, David

Session 10 A Banking: Industry Analysis
Friday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A101 J.M KEYNES

This paper describes a non-parametric, hyperbolic, unconditional quantile estimator that unlike traditional non-parametric frontier estimators is both robust to data outliers and has a root-n convergence rate when used to estimate quantiles lying close to the full frontier. We use this estimator to examine changes in the efficiency and productivity of U.S. banks between 1985 and 2004. We find that larger banks experienced larger efficiency and productivity gains than small banks, consistent with the presumption that recent changes in regulation and information technology have favored larger banks.

Measuring Market Power and Efficiency in Latin American Banking

Garza-Garcia, Jesus G. - Girardone, Claudia - Chortareas, Georgios

Session 10 A Banking: Industry Analysis
Friday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A101 J.M KEYNES

Since the mid-1990s the Latin American banking sector has experienced profound changes due to financial liberalisation, a significant increase in foreign investments and greater mergers activities, often occurring following financial crises. The wave of consolidation and the rapid market concentration that took place in most countries has generated concerns about the increase in banks' market power and the potential negative effects on consumers. This paper advances the existing literature by testing market power and efficient-structure hypotheses for a sample of over 3,000 bank observations operating in ten largest Latin American countries over 1997-2005. Results suggest that the inclusion of non-parametric estimates of cost efficiencies in the market power models (namely the Structure-Conduct Performance and the Relative Market Power hypotheses) is crucial in explaining the bank profit-structure relationship in Latin American countries. Specifically, we find evidence that when X- and scale efficiencies are included in the model, concentration and market share are never positively related to bank profitability, thereby excluding the possibility of collusion effects derived from market power. On the other hand, cost and scale advantages as well as higher capital ratios, seem to be the most significant factors in driving higher than normal profits for Latin American banks.

Consolidation in the European Banking Industry: How Effective is it?

Lozano-Vivas, Ana - Kumbhakar, Subal -
Fethi, Meryem Duygun - Shaban, Mohamed

Session 10 A Banking: Industry Analysis
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Building A - First Floor - Room A101 J.M KEYNES

As banks engage in domestic and cross-border merger and acquisition (M&A) the banking industry becomes more and more consolidated. In this paper we examine effectiveness of domestic and cross-border consolidations in the European banking industry. Effectiveness is measured in terms of several criteria, viz., improvement in efficiency, ROA, ROE, and reduction in riskiness (through diversification). Domestic consolidation takes place within the country, and cross-border consolidation takes place when banks from different countries merge. Both types of consolidation can take place to get advantage of efficiency gain, scale economies, synergies, etc. Since there are cultural differences in cross-border consolidations, the benefits of domestic and cross-border consolidations are like to differ. We examine this in details in terms of the criteria mentioned above. To examine possible efficiency improvement we use a cost function approach (stochastic cost frontier). In each case we examine evolution of efficiency using the history of merged and acquired banks (before and after M&A). For ROA and ROE we do a similar comparison using the SF approach, which allows the possibility that efficiency differential might affect ROA and ROE. We measure the impact of M&A on riskiness by examining the diversification of the portfolio of bidder and target banks (before and after). Finally, we examine compatibility of these different effectiveness measures for both domestic and cross-border consolidation.

Efficiency in Islamic and Conventional Banking: An International Comparison

Abdul Majid, Mariani - Saal, David

Session 10 A Banking: Industry Analysis
Friday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A101 J.M KEYNES

The paper investigates the efficiency of a sample of Islamic and conventional banks in 10 countries that operate Islamic banking for the period 1996 to 2002, using an output distance function approach. We obtained measures of efficiency after allowing for environmental influences such as country macroeconomic conditions, accessibility of banking services and bank type. While these factors are assumed to directly influence the shape of the technology, we assume that country dummies directly influence technical inefficiency. Our preliminary results show that Sudan and Yemen consistently have relatively higher inefficiency estimates compared to other countries. Conventional banks are more efficient than Islamic banks in countries that operate both bank types, except for Malaysia, Tunisia and Bahrain. Except for Jordan, the mean of the inefficiency distribution for each country is significantly different from zero and we also find significant differences between several countries, suggesting cross country differences in estimated efficiency. Except for Sudan, where banks exhibits relatively strong returns to scale, most sample banks exhibit moderate increasing return to scale and our results therefore provide little evidence for strong returns to scale in banking. Islamic banks are however found to have higher scale elasticity than conventional banks in countries that operate both bank types except for Malaysia and Jordan. This suggests that a larger scale of operation will be essential if Islamic banks wish to eliminate disadvantages attributable to their relatively small size.

Farming Type and Performance: A Comparison of Conventional and Organic Dairy Production in the United States

Mosheim, Roberto

Session 10 B Agriculture III
Friday, June 29, 2007 09:00 - 10:30
Building A - Second Floor - Room A201 J. MONNET

Organic farming has emerged recently as a particularly dynamic sector in US agriculture. Organic agriculture in general appeals to producers because the adoption of certified organic production systems potentially lowers input cost and raises income as well as conserves nonrenewable resources. Consumers, in turn, buy organic both because of health and environmental concerns. Organic agriculture is sometimes understood as internalizing externalities, and some governments offer subsidies. Organic dairy farming lags a bit behind the trend toward consolidation and large farm size shown in the overall industry. The organic dairy industry is small relative to the conventional dairy sector and questions of efficiency and scale economies are of crucial importance as the sector develops. This is especially important since organic farms in the United States receive little help in the form of subsidies (for contributing to or generating a positive externality) as opposed to many European countries. According to Greene (2006), close to one percent of the more than nine million dairy cows in the U.S. were managed under a certified organic system in 2005. Organic dairy farms differ from conventional dairies in relying on practices that are ecologically friendly, such as pasture-based management and avoidance of antibiotics and hormones in livestock production, that are potentially better for human health. From an economic perspective, the rise in the consumption of organic dairy products has made such production very lucrative and has attracted the interest of large producers and small farms alike, making it an avenue for survival for the latter. I will employ a parametric shadow distance function since common objectives like cost minimization are hard to defend and producers (both organic and non-organic) face a myriad of regulations and constraints that might be difficult to incorporate explicitly. Data employed is USDA's Agricultural Resource Management Survey for 2005. The survey contains 1,476 observations on conventional and 362 on organic. Efficiency and scale variation will be explained using variables that offer a contrast between the two organizational types.

Using Production Theoretic Concepts to Construct Soil Quality Indicators

Hailu, Atakelty - Chambers, Robert

Session 10 B Agriculture III
Friday, June 29, 2007 09:00 - 10:30
Building A - Second Floor - Room A201 J. MONNET

This paper shows how a soil quality indicator can be constructed as a Luenberger indicator by using a directional distance function to represent the crop production technology. The approach leads to a suggested formula for aggregating individual soil quality attributes into an indicator. The method presented here is theoretically consistent and provides a better alternative to many of the ad hoc procedures currently being employed to construct soil quality indexes by soil scientists. The directional distance function estimation and the test of hypoetheses on soil inidcator functional forms are conducted within a Bayesian framework. Crop trials data from Western Australia is used to illustrate the procedures.

Estimating the Organizational Cost of Managing the Farm

Tauer, Loren

Session 10 B Agriculture III
Friday, June 29, 2007 09:00 - 10:30
Building A - Second Floor - Room A201 J. MONNET

Demetz has stated that the real tasks of firm management are to devise or discover markets, products and production techniques, and to manage the actions of employees. A neoclassical production function definition of the firm has little to contribute to understanding these management tasks because it assumes that all markets, products, production techniques, and prices are fully known at zero cost. The only management task left is the selection of profit-maximizing quantities of inputs and outputs, but those decisions are effortless and costless to make since the necessary price information required is assumed readily available to all. It would thus be useful to develop a theory that relates a firm's inability to operate on the production frontier and choose the least-cost combination of inputs on that frontier to managerial ability. In this paper I develop a conceptual framework where a firm is not on the frontier of a production set partially because the organizational costs of moving to that frontier are greater than the benefits from increased efficiency. Williamson has referred to these organizational costs as the governance costs of internal organization, which are simply the costs of organizing within a firm. Production inefficiency may also exist because some firms are ignorant of production possibilities. The distinction between production and organizational inefficiency is made by measuring the efficiency of a firm dominated by another single firm (FDH), and then dominated by linear combinations of firms. I argue that any inefficiency relative to any other single firm is due to production ignorance because another firm has demonstrated it is possible to produce more efficiently. In contrast, inefficiency relative to any linear combination of firms reflects production plans that are organizationally inefficient since a firm could reorganize as a linear combination of firms and produce more efficiently. If we assume that the firm has complete information to the extent of this organizational inefficiency, then that firm has not replicated the linear combination of firms because the cost must be at least as great as the gain in efficiency. Otherwise, that firm would have organized its production accordingly. Alternatively, a firm could expend resources on reorganization up to the amount of the inefficiency and still accrue a net gain in efficiency. In contrast, single firm dominant inefficiency is assumed due to production ignorance since it is illogical to believe that a firm would have knowledge of increasing its outputs using the same inputs (or decreasing inputs producing the same outputs) and not act on that knowledge These inefficiencies are calculated using a data set of New York dairy farms. Overall technical inefficiency (as measured by a standard DEA model) reduces output by 16 percent on average, but more than half of that (9 basis points) are due to the governance costs of internal organization. The remaining 7 basis points are due to production inefficiency.

The Decomposition of Cost Efficiency for the Italian Wine Industry: Co-Operatives vs Investor-Owned Firms

Maietta, Ornella Wanda - Perali, Federico

Session 10 B Agriculture III
Friday, June 29, 2007 09:00 - 10:30
Building A - Second Floor - Room A201 J. MONNET

The impact of ownership on efficiency has been the subject of considerable theoretical debate and of rich empirical investigation. Co-operatives are perceived by Furubotn (1976), Alchian&Demsetz (1972) and Jensen&Meckling (1979) as inferior organizations due to free-riding, underinvestment, higher control problems and political element into the management decisions. On the other side, some theories emphasize the link between profit sharing and workers' effort (Jones&Svejnar, 1982; Cable&Wilson, 1990; Sessions, 1992). Profit sharing may also influence workers' productivity indirectly through the workforce attributes (Hart, 1995; Maietta&Sena, 2004). Finally, economies of vertical integration may be important for processing cooperatives (Ferrantino et al. 1995). As a consequence, the empirical literature, dealing with the efficiency of co-operatives in relation to investor-owned firms, is very rich (for example, Ferrier&Porter, 1991; Dong&Putterman, 1997; Jones et al., 1998; Oustapassidis et al., 1998; Zhang et al., 2001; Mosheim, 2002). Objective of this paper is to contribute to the above-mentioned debate by estimating the economic efficiency of co-operatives and investor-owned firms through the shadow cost approach (Atkinson &Cornwell, 1994; Kumbhakar, 1996, 1997) which allows to decompose cost efficiency levels into the technical and allocative components and, at the same time, to estimate the shadow input prices. The approach is applied to a sample of Italian firms, belonging to the wine industry, which includes farmer co-operatives with a high degree of vertical integration.

Cost Efficiency of Electronic Firms in China

Xuejie, Bai - Hu, Jin-Li

Session 10 C Exploring Sources of Manufacturing Efficiency and Productivity
Friday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A103 M. CROZIER

Electronics is one of major industries in mainland China to foster its speedy economic growth. It is also an industry which has been continuously absorbing huge foreign venture. This study gathers data information of twenty major listed electronics firms in China from 2001 to 2005. The Battese and Coelli's (1995) panel data, stochastic frontier model is applied to simultaneously estimate the stochastic cost frontier and determinants of cost inefficiency. Our major findings are as follows: (1) Cost efficiency of the sample firms tends to decrease over time and most of them not cost inefficient. (2) The R&D expenditure significantly improves cost efficiency of Chinese electronics firms. (3) The scale of an electronic firm significantly improves its cost efficiency. (4) The multi-operational characteristic (scope economy from multi-operation) significantly improves cost efficiency.

Analysis of Technical Efficiency of Manufacturing Firms in Spain

Arias, Carlos - Álvarez, Antonio

Session 10 C Exploring Sources of Manufacturing Efficiency and Productivity
Friday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A103 M. CROZIER

There are a number of challenging issues in the modelling and measurement of efficiency of manufacturing firms. For example, the definition of output can create serious problems of firm heterogeneity because a single industry code can include firms producing quite different outputs. Other seemingly relevant issues are the qualification of the labour force or the measurement of fixed inputs such as capital. Panel data allows for some treatment of firm heterogeneity by considering individual effects or even random coefficients. However, the temporal dimension of the data requires deflating variables measured in money terms. The main objective of the present paper is to estimate production functions of manufacturing firms and test a set of hypothesis on technology characteristics and efficiency levels. Industry, localization, age of the firm, R&D activities and labour skills qualifications might affect both the frontier and the level of efficiency. We estimate production functions for several manufacturing industries in Spain using a panel data set in the period 1990-2002 constructed using the results of an industrial survey.

Drivers of Productivity Differentials between Southern and Northern Manufacturing in Italy: Technical Inefficiencies or Allocative Distortions?

Petraglia, Carmelo - Erbetta, Fabrizio

Session 10 C Exploring Sources of Manufacturing Efficiency and Productivity

Friday, June 29, 2007 09:00 - 10:30

Building A - First Floor - Room A103 M. CROZIER

A major concern of Italian economy is the dualistic pattern experienced by productivity gains which, ultimately, might be interpreted as the main source of historical per-capita income differentials between southern and northern regions of the country. Alternative explanations on the Italian dualistic way of productivity gains fall – with full knowledge of the crudeness of the approximation – into two groups, the "market oriented" and the "structural and technological gap" views. The key argument used by "market oriented" scholars is the higher degree at which market forces fail to allocate efficiently available productive resources in the South. On the other hand, scholars within the "structural and technological gap" view emphasize the role played by structural poverty of southern economy in term of a less favorable environment which considerably reduces technological possibilities of southern firms. Due to the complexity of the issue as both for the number of variables involved into the analysis and its historical persistence, it would be misleading to favor only one of the mentioned views as fully explanatory. This would imply loosing useful insight provided by the other. Contributions within both approaches should instead be considered as both providing economic insight to disentangle the issue with respect to specific time periods, economic sectors and so on. However, as policy implications are concerned, it is easy to recognize that the availability of empirical support to both views will be helpful to the preparing of an effective policy agenda aimed at enhancing productivity of southern firms. In line with this, our aim is to shed light on the drives of productivity gap dividing southern economy from the rest of the country by means of econometric techniques recently developed within the so-called stochastic frontier approach. Estimates of technical and allocative inefficiency are provided for a representative balanced panel of about 1200 Italian manufacturing firms built by merging of two waves of Mediocredito-Capitalia Surveys on Italian manufacturing sector over the periods 1998-2003. Technical and allocative inefficiency have been measured using Shephard (1953) input distance function approach (Rodriguez-Alvarez, Fernandez-Blanco, Lovell, Int. J. Production Economics 92, 2004: 99-111). The input distance function can be readily viewed as a natural measure of technical inefficiency, it is dual to the cost function and therefore can be used to estimate input shadow prices and allocative distortions among inputs. Furthermore, it only requires data on input quantities instead of input prices, implying a valuable advantage as price information is difficult to derive especially for capital (most firms of the sample are not listed in the Italian Stock Market). The technical inefficiency and allocative distortion estimates will allow us to provide some conclusion on the effectiveness of business incentives allotted to southern manufacturing system, or rather it laid the foundation for a worsening of the North versus South differentials.

Do Infrastructure and Banking Efficiency Boost Productivity? Evidence from Italian Manufacturing Firms

Mastromarco, Camilla - Zago, Angelo - Aiello, Francesco

Session 10 C Exploring Sources of Manufacturing Efficiency and Productivity

Friday, June 29, 2007 09:00 - 10:30

Building A - First Floor - Room A103 M. CROZIER

We investigate the determinants of output growth using data for Italian manufacturing firms. Applying stochastic frontier techniques, we decompose output growth into factor accumulation and TFP growth. The latter is further decomposed into technological change, efficiency change, and scale effects. We find that both input accumulation and factor growth are important in explaining output growth. In addition, the efficiency change (technological catch-up) is the most significant component of productivity growth. Using a specific formulation of the asymmetric error component, we also show that banking efficiency and public infrastructure have statistically significant and economically relevant effects on the technological catch-up.

Developing Berth Planning System of Hyundai-Steel Dang-jin Port : Focused on Port Productivity

Young Yeon, Hwang

Session 10 D Engineering Applications of Efficiency Analysis
Friday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A121 M.E. PORTER

Port takes charge of central role in logistics flow from supply and demand of raw material to shipping of finished products in steel enterprise. In this study, change of port productivity by development of Berth Planning System of Dang-jin port in Hyundai-steel(That company is well-known for the goods produced by electric furnace in Republic of Korea) was researched. Specially, productivity of port by efficient berth plan was analyzed based on Net Berth Productivity (NBP) which is value divided traffic by real working hours. The result shows port efficiency was improved after development of the Berth Planning System. There from it can aware that efficient berth plan has a good effect on the port efficiency.

Benchmarking Performance in Warehouse Operations

Andrew, Johnson - McGinnis, Leon

Session 10 D Engineering Applications of Efficiency Analysis
Friday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A121 M.E. PORTER

Benchmarking performance is a common practice in the area of logistics. However, the measures used are often a set of single-input / single-output ratios to quantify technical efficiency. Over the past six years our researcher team has worked with many individual warehouse managers to identify how non-parametric efficiency measurement can be applied to warehouse performance specifically. Data has been collected on nearly 400 warehouses, creating a cross-section of micro-level data of a size that has not been available previously. By means of a two-stage approach efficiency can be quantified in the first stage and correlations between performance and a variety of practices and attributes can be identified in the second stage. Our investigation finds that additional modeling procedures were needed for outlier detection and model specification. The focus of this talk will be the development of these tools. Finally the continued areas for development of warehouse operational performance models will be discussed.

Software Production Efficiency Measurement without Software Size Parameters Using DEA

Paradi, Joseph - McEachern, Christopher

Session 10 D Engineering Applications of Efficiency Analysis
Friday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A121 M.E. PORTER

Existing software metrics are not fully representative of the software process. There has been difficulty in developing an industry-standard, a priori measure of complexity that adequately describes this aspect of the process. It is also difficult to represent the multi-dimensionality of software development with a single metric. The goals of this research included the provision of new insights into the one of Canada's large banks' software production function by identifying their best performing projects on three different dimensions: time-to-market, cost estimation, and cost minimization. We proposed and tested three hypotheses: 1.Level of vendor contribution impacts efficiency 2.Level of business risk impacts efficiency 3.Main business driver or sponsor group impacts efficiency This study uses Data Envelopment Analysis (DEA) to evaluate the 26 software projects completed at the bank. Internal measures of project risk, complexity, and customer satisfaction are used to assess three facets of the software process: time-to-market, cost estimation, and cost minimization. Very few DEA studies have accounted for risk/complexity in modeling software development (except if we consider function points as a proxy for this). This study does not rely upon an explicit measure of software size to account for software development output. But, we did use the bank's internal project risk assessment as a measure of output in place of traditional metrics. Three input oriented BCC models were used in this work: Time-to-market, Absolute budget variance; and Cost minimization. A positive relationship between the level of vendor contribution and project efficiency as all four projects with a high level of vendor contribution were identified as fully efficient across the three models (hypothesis 1). A good number of high business risk projects were identified as efficient in all three models (hypothesis 2). However, no evidence of a relationship between project efficiency and business driver or sponsor group (hypothesis 3) and this may be attributable to the influence of centralized IT management and services. A number of recommendations were made to bank management, including better project management data reporting compliance (only 26 of the 71 projects originally targeted for this study had sufficient project management data available). Move to a numerical scale for the risk/complexity ranking to offer better analytical treatment of the results. The Bank's current risk/complexity worksheet makes a transformation necessary for use in analytics and this could be changed. Rolling up the assessment into an overall rank (High, Medium, or Low) is not a good representation of the risk/complexity inherent in the bank's software process. In fact, this constitutes a loss of data in the decision-making process. Finally, separate the dimensions of risk and complexity in the assessment, and add dimensions of benefits/capabilities.

Real-Time Efficiency/Performance Evaluation: Iterative Aerospace Scheduler Algorithm Optimization for Multi-Payload Next Generation Commercial Satellite Imagers

Eichensehr, Phil - Triantis, Konstantinos

Session 10 D Engineering Applications of Efficiency Analysis
Friday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A121 M.E. PORTER

Engineering is concerned with the design of products, services, processes, or in general with the design of systems. These design activities are managed and improved by the organization's decision-makers. Therefore, the performance evaluation of the production function where engineering plays a fundamental role is an integral part of managerial decision-making. In the last twenty five years, there has been limited research that uses performance and efficiency evaluation approaches in engineering and specifically in the design of systems. The objective of this research is two fold. The first objective is to provide an overview of how aerospace simulation is used for system, in this case commercial satellite imagers, design and development. The second objective is introduce the concept of "n" scheduling algorithms per interval of time and the use of real-time efficiency model to select the most efficient use of resources per scheduling interval. Real-time efficiency models can select the best scheduling option given the weather, natural or man-made disasters, target geographic diversity, and/or platform constraints like pointing, quality, and communications. The data requirements of this performance evaluation concept are discussed as well as brief illustration with results are provided. K

Estimating Panel Stochastic Frontier Models with Fixed Effects by Model Transformation

Wang, Hung-Jen - Ho, Chia-Wen

Session 10 E Parametric Panel Production Analysis
Friday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A120 E. MALINVAUD

Traditional panel data applications of stochastic frontier models assume time-invariant technical inefficiency, which forces all the time-invariant cross-sectional heterogeneity into the estimated inefficiency. As Greene (2005) puts it, ¡§(i)nefficiency measures in these models may be picking up heterogeneity in addition to or even instead of inefficiency.¡¨ A model separating inefficiency and time-invariant cross-sectional heterogeneity is thus called for. In this paper we consider a panel stochastic frontier model in which technical inefficiency is time-varying and is separating from unobserved and fixed individual effects. As with all the fixed effect models in the econometric literature, two potential problems arise when individual effects are assumed to be fixed: (1) the incidental parameter problem which causes inconsistency in the parameter estimates, and (2) the estimation problem which makes the model impractical when hundreds or thousands of cross-sectional units are involved. We propose a class of stochastic frontier model to which the fixed effects can be eliminated from the model by first-differencing or by within-transformation. The resulting model is thus immune from the incidental parameter problem, and the number of parameters to be estimated is no more than that in a conventional cross-sectional model. The model transformation normally cannot be done to stochastic frontier models because the complex error structure prevents a close form solution of the likelihood function after model transformation. One of the contributions of this paper is to propose a class of stochastic frontier models based on Wang and Schmidt (2002) to which the transformation is permissible. Monte Carlo experiments on the models are conducted, and the results show very good performances of the models.

On the Sensitivity of US Electric Utilities' Efficiency Estimates – A Distance Function Approach

Hess, Borge - Growitsch, Christian

Session 10 E Parametric Panel Production Analysis
Friday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A120 E. MALINVAUD

Previous applications of different benchmarking techniques, both in academia and regulation practice, have shown substantial differences among the models' results. To analyse the sensitivity of efficiency estimates of a panel data set of 109 US electricity distribution utilities for the period 1994-2005, we compare the results of the Generalized Least Squares (GLS) frontier model proposed by Schmidt and Sickles (1984) and the Maximum Likelihood Estimation (MLE) frontier model of Pitt and Lee (1981) with the true random effects frontier model introduced by Greene (2004, 2005). There are two advantages in using panel data in efficiency analysis: they produce consistent individual efficiency scores (cp. Horrace and Schmidt, 1996; Jensen, 2000); and they allow for a differentiation of inefficiency and heterogeneity of firms. However, established panel data models, for instance the random effects estimation by Pitt and Lee (1981) or the Schmidt and Sickles (1984) fixed effects model have neglected in doing so. Instead, both strands of models have interpreted time invariant unobserved heterogeneity as inefficiency (cp. Farsi et al., 2006). Only recent research has distinguished between inefficiency as being time-variant1 and firm heterogeneity being constant over time (Greene, 2001, 2004, 2005). The maximum likelihood estimators proposed by Greene have been referred to as 'true frontier models', especially his true random effects model has been applied successfully in network industries' analyses (Farsi et al., 2005, 2006). In contrast to previous research comparing different estimation methods, we apply a distance function approach. Originally proposed by Shephard (1953, 1970), distance functions have several advantages compared to production or cost functions. Their major benefit in describing a multi input multi output production technology is that they allow refraining from specifying a behavioural objective (such as cost minimisation or profit maximisation). Analogous to previous research, we found substantially higher efficiency scores for the Greene model, indicating that the other formulations underestimate firms' efficiency due to an insufficient consideration of firm specific heterogeneity. In contrast to other studies, the efficiency estimates in our paper do not differ considerably. As the distance function's coefficients are however rather similar to Farsi et al's cost function's results, we suggest that efficiency estimates are more sensitive to the underlying data set than to the assumptions about the inefficiency and heterogeneity terms. Nevertheless, the applied techniques seem to have only an impact on the level of efficiency, not the ranking.

Reforming Railways:
Theoretical Insights and Practical Lessons

McMahon, Paul (UK Office of Rail Regulation) -
Bouf, Dominique (Laboratoire d'Economie des Transports) -
Rivera Trujillo, César (Instituto Mexicano del Transporte) -
Holvad, Torben (European Railway Agency)

Session 10 F Round Table

Friday, June 29, 2007 09:00 - 10:30
Building B - Second Floor - Room B253

This roundtable aims to explore key issues of transport regulatory reforms with specific reference to railway reforms that have taken place over the last two decades in Europe and elsewhere. In particular, it will provide an overview of: why regulatory reforms were deemed necessary; the specific reform elements; lessons from implementation; the expected and actual impacts of the reforms; recommendations.
The roundtable will be composed of three parts. Firstly, two presentations will be given by Dominique Bouf (theoretical aspects of reforms) and Paul McMahon (practical implementation aspects). This will be followed by a panel debate to discuss the issues raised in the preceding presentations. Finally, a question and answer session will conclude the roundtable.

Separating Catch-up and Technical Change in Stochastic Frontier Models. A Monte Carlo Approach

del Corral, Julio - Álvarez, Antonio - Alejandro, Fernández

Session 11 A Methodological Advances in Efficiency & Productivity I (YR)
Friday, June 29, 2007 11:00 - 12:30
Building A - First Floor - Room A101 J.M KEYNES

In the empirical analysis of economic growth an interesting topic is whether backward countries move towards the technological frontier (what it is known as technological catch-up). A common approach to testing for the existence of catching-up is the estimation of stochastic frontiers. However, it is not clear under which conditions technological catch-up can be disentangled from technical change in stochastic frontier models. For this reason, in this paper we use Monte Carlo techniques in order to study the ability of several stochastic frontier models to correctly identify these two effects. Specifically, the following models are compared: the traditional pooled stochastic frontier as well as the models suggested by Battese and Coelli in 1992 and in 1995. The Monte Carlo experiments are based on three alternative data generating processes. In the first one, we generate the data imposing that there is catch-up but no technical change. In the second one, we generate the data assuming that there is only technical change. Finally, in the third one we impose that there are both catch-up and technical change. Given that results can be sensitive to the relative importance of inefficiency over statistical noise, we present the results under different scenarios concerning this parameter.

Improving Statistical Inference on Malmquist Productivity Indices

Curi, Claudia - Daraio, Cinzia - Mancuso, Paolo - Simar, Leopold

Session 11 A Methodological Advances in Efficiency & Productivity I (YR)
Friday, June 29, 2007 11:00 - 12:30
Building A - First Floor - Room A101 J.M KEYNES

Extending the Fare et al. (1992) approach on Malmquist index of productivity, which can be decomposed into indices describing changes in technology and changes in efficiency, Simar and Wilson (1999) provided a statistical interpretation to their Malmquist productivity index and its components, and presented a bootstrap algorithm to estimate confidence intervals for the indices. Applying recent developments introduced by Daraio and Simar (2007), we improve the Simar and Wilson (1999)'s bootstrap approximations by using cross-validation techniques for the choice of the bandwidth. We also investigate if local bandwidth selection (based on a k-nearest neighbor) is preferable to global bandwidth selection in this particular set up. Illustrations with simulated examples and real data are provided.

Dynamical Analysis of Malmquist Productivity Index

Daskovska, Alexandra - Simar, Leopold - Van Bellegem, Sebastien

Session 11 A Methodological Advances in Efficiency & Productivity I (YR)

Friday, June 29, 2007 11:00 - 12:30

Building A - First Floor - Room A101 J.M KEYNES

Productivity growth has been the subject matter for intense research over the last five decades. Productivity should always be something that we want to increase as much as possible, therefore changes in productivity are of great importance. The Malmquist Productivity Index (MPI) suggests a convenient way of measuring the change in performance of a given production unit between two consequent time periods. One of the most frequent questions asked by statisticians, econometricians, or just company owners, is: "We know how a company (country, etc.) has been performing during some years (i.e. until now). How can its performance for coming year(s) be predicted in terms of productivity? The approaches proposed in the literature suggest estimating productivity changes in a purely static way. However, this analysis hides a potentially valuable information given by the evolution of productivity over time. Therefore, the dynamic analysis of productivity is called for, taking into account the behavior of productivity over time. One of the most fundamental requirements performing statistically justified and consistent forecasting is called circularity. Unfortunately, the MPI is not circular and thus problematic as long as we aim to analyze productivity over time. The new decomposition of the index into circular components is defined in the study, and makes it possible to forecast the MPI by forecasting each "circularized" component separately, and combining the results afterwards. A new working dynamic forecasting procedure is proposed and illustrated. If one wants to make some inferences on MPI, bootstrap often appears to be the most attractive possibility. Smoothed bootstrap in that case should be adapted to our situation, including possible time-dependent structure of the data. Since we have panel data with the possibility of temporal correlation (i.e. present performance of the country is influenced by its past performance), a bivariate kernel (instead of univariate kernel as in the case of a single cross-section of the data) should be used to estimate the joint density of distance functions. We could further elaborate the procedure, allowing for three or more subsequent time periods to be correlated. The MC simulations, comparing smooth bootstrap on correlated couples with the smooth bootstrap on correlated triples, suggest that one indeed benefits from taking the temporal correlation into account.

Measuring the Technical Efficiency of Railways in North America Before and After Privatization

Rivera-Trujillo, Cesar - Mendoza-Diaz, Alberto

Session 11 B Transport (YR)
Friday, June 29, 2007 11:00 - 12:30
Building A - Second Floor - Room A201 J. MONNET

This paper estimates and compares the technical efficiency of freight railways in North America before and after their privatization, during the period 1980-2004. A stochastic production function is used in order to separate inefficiency from statistical noise and the model takes into account time-varying technical inefficiency. The impact of the rail privatisations and concessions during the analysed period is investigated using a single-stage regression model. The results showed that the United States and Canada are the most efficient railways in the region, while Mexican railways were the most backward in terms of technical performance. However, a significant improvement in the technical efficiency is found given the privatisation in México.

Next Stop: Increased Efficiency? - A Non-parametric Efficiency Analysis of German Public Transport Companies

Cullmann, Astrid

Session 11 B Transport (YR)
Friday, June 29, 2007 11:00 - 12:30
Building A - Second Floor - Room A201 J. MONNET

This paper provides a comparative efficiency analysis of 150 German communal public transport bus companies (1990-2004). We perform nonparametric efficiency analysis in order to obtain information on technical efficiency differences of the bus companies, and an indication of the scale economies prevalent in the sector. We apply the deterministic data envelopment analysis (DEA) and the free disposal hull estimator (FDH); in addition, we perform recently developed stochastic DEA (order-m estimation). We find that the German bus companies seem to be characterized by increasing returns to scale and that technical efficiency increased over time from 1990 to 2004.

German Higher Education Institutions and Efficiency - Empirical Evidence from a Data Envelopment Analysis Accounting for Heterogeneity

Olivares, Maria

Session 11 C Applications of Efficiency Analysis (YR)
Friday, June 29, 2007 11:00 - 12:30
Building A - First Floor - Room A103 M. CROZIER

In contrast to Anglo-Saxon countries financing of German institutions of higher education is almost completely secured by public funding. Due to the increasing scarcity of public budgets and the interest of accountability, the question arises whether these institutions are productive or not. For this reason, there is an essential need to gather more information about the performance of higher education institutions (HEIs). Therefore, the interest concerning the measurement of efficiency of universities has been increasing both in the academic as well as in the public discourse. For analyzing efficiency, there are two general types of frontier methods: stochastic frontier analysis (SFA) based on econometric techniques and data envelopment analysis (DEA) based on mathematical programming. One shortcoming of using SFA is the specification of an explicit functional form of the cost or production function. However, a production function is not easy to formulate for the case of a multiple-output, non-profit sector such as higher education. While DEA is a non-parametric approach, no assumptions are required regarding the distribution of inefficiencies or the functional relationship of inputs and outputs. Instead, it uses the input and output data themselves to compute the production possibility frontier by using linear programming. While numerous recent international investigations are published using DEA and SFA, there are only few studies that focus on the German higher education system. For example, Warning (2004, 2005) and Kempkes and Pohl (2006) examines publicly funded universities using cross-sectional data and panel data from the German Federal Statistical Office utilizing DEA and SFA, respectively. However, both studies measure the efficiency at the level of a university. But, since academic departments differ in terms of resource composition and major output targets, this may lead to a bias of the efficiency scores. Not considering those differences of departments' characteristics like endowment and performance will yield to an inappropriate measurement of efficiency. This analysis focuses on the estimation of efficiency scores at the department level that are virtually built while accounting for heterogeneous production conditions by using a DEA model. Contrary to former studies, this research utilizes two different techniques to identify similar departments with respect to endowment and performance structures: 1) academic units (in German Lehreinheiten) with respect to subject groups defined by the Federal Statistical Office of Germany and 2) Lehreinheiten composed according to a cluster analysis. The latter approach focuses on characteristics that may affect the production function (attributes like number of full-time equivalent students), and clusters units that are close in terms of a distance metric. The results of both approaches are then subject of a comparative investigation. The data used in this study are from 47 northern German HEIs separated according to universities, universities of applied sciences and universities of fine arts and music provided by the Higher Education Information System (HIS)/Germany [fn.1] throughout the period 2000-2004. Differentiating three to four types of virtual departments (e.g. economics/social science, technical engineering, humanities/arts) for each HEIs leads to more than 100 observation units. The data are drawn from a panel dataset that belongs to a project that focuses on the development of performance and equipment resource indicators for universities for the purpose of national and international comparisons. The utilized data provide proxy variables that can be used to operationalize input and output measures: First, the number of graduates (fulltime-equivalents) is used as an approximation of the teaching output and the amount of research grants as an approximation of research activities and the number of doctoral students (last issue is only considered for universities). The amount of full-time equivalent employees, both scientific and non- scientific, as well as other expenditures (exclusively research grants) serve as input variables. On the workshop in Lille I will appreciate the opportunity of presenting this analysis that focuses on the efficiency of HEIs with respect to the heterogeneity of departments.

Technical Efficiency under Risk Aversion and Interconnection between Uncertainty Components: Assessment from Olive-Growing Farms in Tunisia

Ben Jemaa, Mohamed Mekki

Session 11 C Applications of Efficiency Analysis (YR)
Friday, June 29, 2007 11:00 - 12:30
Building A - First Floor - Room A103 M. CROZIER

The paper consists on the estimation of a stochastic frontier model for a panel of 178 olive-growing farms in Tunisia between 1995 and 1997 in which we derive and estimate the risk preference function when producers maximize expected utility of profit in the presence of production risk in the Kumbakhar (2002)'s fashion. The production risk is due to both an uncertain rate of technical efficiency and yield uncertainty. The model allows for the estimation of a system of output supply and input demand functions where the equality between input's marginal productivity and its respective price is relaxed in order to assess the impact of efficiency risk on input allocation and then the adjusted measure of allocative inefficiency. The main innovation in this work is that farmers are assumed concerned with uncertainty caused by their degree of efficiency. That implies that technical efficiency influences input quantities which influence output variability and production uncertainty. The connection between the two roots of uncertainty are therefore parameterized by the relaxation of the assumption of independence between the two components of the composed error term of the stochastic frontier. Independence assumption is relaxed by introducing estimable parametric forms to represent association between the error components, each with special, leading cases that represent independence. In doing so, the data themselves are allowed the opportunity to determine statistically the adequacy of the independence assumption. Joint behavior of the error terms are parameterized by employing the copula approach to statistical modeling. This technique derives from a representation theorem due to Sklar (1959), in which the joint distribution of random variables can be expressed as a function of its univariate margins: that function being the copula. The copula represents the dependence structure that associates random variables; it captures entirely their joint behavior. The specification described above allows for a deep analysis of farmers' behaviors under risk aversion. Shifts in inputs motivated by yield stabilization and then risk reduction are distinguished from allocative inefficiency. The specification precludes the accuracy of the estimates of technical inefficiency to be compromised by an inability to distinguish between technical inefficiency due to shortcomings in managerial abilities and sub-optimal outcomes brought about by the risk-reducing behavior of risk-averse producers.

A Critique of the Minimax Approach to Efficiency Measurement

Tofallis, Chris

Session 12 Poster III
Friday, June 29, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

There has been some interest in obtaining a common set of input and output weights which can be applied to all the units being assessed. Arguments for this approach include that it permits a common basis of comparison, and that it is easily understood. One method for deriving these common weights in a supposedly equitable manner which is fair to all units, involves a minimax objective function: minimise the maximum deviation from full efficiency across all units. We show that this approach suffers from serious drawbacks. In particular: a) The location or selection of the common frontier (and hence the common weights)is strongly influenced by the units with poorest performance. b) Removal of an irrelevant alternative (i.e. a clearly inefficient unit) will cause rank reversal in efficency scores.

Stochastic Nonparametric Envelopment of Data: Cross-Sectional Frontier Estimation under Regularity Conditions

Kortelainen, Mika - Kuosmanen, Timo

Session 12 Poster III
Friday, June 29, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

The field of production frontier estimation has been divided between the parametric Stochastic Frontier Analysis (SFA) and the deterministic nonparametric Data Envelopment Analysis (DEA) approaches. To narrow the gap between SFA and DEA, various semi- and nonparametric stochastic frontier models have recently been proposed. While these studies come a long way in combining some of the virtues of DEA and SFA, they tend to be limited to certain special settings such as continuously differentiable frontiers and panel data. More importantly, the conceptual link between the parametric and nonparametric branches is still missing: none of these techniques present a stochastic extension of DEA in the same way as SFA extends the deterministic econometric frontier models. This paper tries to fulfill the existing gap in literature by presenting a new framework for frontier estimation in a cross-sectional setting that combines the main features of DEA and SFA. The proposed model includes a composite error term consisting of noise and inefficiency components subject to traditional SFA assumptions, but does not assume a prior specification of the functional form for production frontier. In contrast to other semi- and nonparametric SFA models, we follow the nonparametric route of DEA by imposing monotonicity and curvature conditions for the nonparametric frontier. In our framework, the resulting function will always take a piecewise linear form analogously to the DEA frontiers. For the estimation of the model, we propose two different techniques - method of moments and pseudolikelihood - both of which are based on convex nonparametric least squares. We also discuss some useful extensions that allow one to estimate cost functions and model heteroskedasticity and alternative assumptions about the returns to scale. The performance of the proposed estimation techniques is examined using Monte Carlo simulations and an illustrative application.

Innovations in the US Textile Industry: The Nonwoven Sector

Christoffersen, Susan - Datta, Anusua

Session 12 Poster III
Friday, June 29, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

We examine the performance of a growing sector of the textile industry: nonwoven fabric mills. This sector represents what was once a niche market and now exemplifies perhaps the future of textiles in the US. From disposable diapers to bleach wipes, medical and industrial apparel to house wrapping, new products are entering the market; these products are made possible by technological advancements in adhesion techniques, fiber modifications and delivery advancements. Using data for 39 years (1958-1996), we estimate a translog cost function and calculate the elasticity of substitution between capital, labor, energy and materials; as well as a time-series of the elasticity of scale and the impact of technological change. We identify significant changes in the industry; the innovative nonwovens sector may provide a much needed new paradigm in textile manufacturing.

Technical Efficiency and Market Competitiveness in Electric Utility Industry

Nemoto, Jiro - Goto, Mika

Session 12 Poster III
Friday, June 29, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

This paper examines the effects of deregulation and market competitiveness on technical efficiency in the electric utility industry. Although we have an enormous number of studies on this issue, it is still unclear whether moving toward competition enhances technical efficiency. Within the parametric approach, this is partly due to a restrictive specification of technical efficiency using one-parameter distribution such as the exponential or half normal. Those distributions are probably not flexible enough to capture the effects of changes in market competitiveness. On the other hand, more flexible two-dimensional distributions such as the truncated normal or gamma compound the complexity of model so that the conventional approach encounters a difficulty because of many local maxima of the likelihood function. To circumvent this problem, we employ a Bayesian approach based on the MCMC method to measure technical efficiency specified by a two-parameter distribution. The results are compared to those obtained by the maximum likelihood approach with a simpler specification. Furthermore, we are also interested in robustness of the efficiency measurements between parametric and nonparametric approaches. Possibility of reconciliation will be explored.

The Productive Performance of Public Health Care Centres in Cienfuegos, Cuba

García Fariñas, Anai

Session 12 Poster III
Friday, June 29, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

During more than forty years the Cuban government has supported the development of the primary health services (1). Our public health centres name “policlinics” were created between the 60´s and the 70´s. In Cuba, the resources dedicated to National Health Service have been increased, Ex. the expense for inhabitants was 111,31 pesos in 1995 (2) and in 2003 it had increased to 180,26 pesos (3). The multidimensional nature of the production and inputs of the primary health care services, as well as the difficulty of modelling the productive process, they favor the employment of flexible technical to asses the efficiency like the Data Envelopment Analysis (DEA) (4-7). The medical care in the Cienfuegos is organized in two levels, primary and secondary attention. In the primary level of attention it has 22 health centres with a total of 525 Family Doctors. It is a fact that there has been an upward tendency in the assignment of resources to these units during the last years at the same time that improvements are observed in the health population's state. However don't exist evidences that support the efficiency with which those results are achieved. In this research the objectives was to characterize the productive efficiency of the public health care centres in Cienfuegos during the first trimesters of 2006, for that which one had as specific objectives to determine the index of efficiency of each unit, to identify the potential improvement of efficiency for each unit and to identify the variables of more contribution to the efficiency. The study was developed during the first trimester of the year 2006. The universe of the study was the 22 public health centres. These they were subdivided in two groups according to the classification used by the National Comity of Ambulatory Services of the Ministry for Public Health:14, Type I (bigger complexity) and 8 type II (smaller complexity). In each group a sample was not selected bigger than 12 units starting from the specifications of the software (Frontier Analyst 3.2.2 DEMO). In both groups they were not considered the mountain public health centres (Crucesita, type II and San Blas, type I). For random simple sampling the public health centre Fabio Celmo was eliminated of the study. Finally the study sample was 12 public health centres in the group Type I and 7 in the type II. The inputs and outputs variables they were taken of a previous study.: index of avoidable infantile mortality for the public health centres, vaccination covering, Index of the population's satisfaction, index of under weight when being born, proportion of patient of Tuberculosis (TB) diagnosed in the public health centres were the outputs variable and as inputs were used: number of family doctors, number of family nurses, specialist of ginecobstetricia, vacunatorio nurse, drugs expenses and wage expenses. We assumed the output maximization model considering that for the National Public Health System the efficiency most be focused in the increment of the outputs without a necessary reduction of the resources. It was also assumed scale constant returns because our sample was small and very homogeneous. The efficiency index distribution in both evaluated groups can be considered good if one has in consideration that it is established that they should be expected that a third of the units of the sample is those that are qualified of efficient (8). In our study, a frequency of efficient units of 41.6% was obtained in the PHC type I and 42.8% in the PHC type II. This result endorses the relationship between the number of selected variables and the size of the sample. Still when the objective of this study was the outputs maximization it should be pointed out that all the inputs indicators show slacks in at least 2 units what constitute an evidence of the necessity of evaluating the real necessity for each units. Independently of the PHC type we can conclude that there is productive inefficiency. The potential improvement it is concentrates on the increment in the detection Tuberculosis cases by the PHC in both groups. The slacks observed points toward a necessary revision of the PCH resources and of its relationship in the productive process to obtain the continuous improvement of the population's health state. DEA method was useful to identify the efficiency levels in each unit as well as to determine where the reservations are located for a better administration.

Social and Financial Performances in Microfinance Industry. Empirical Evidence from the Application of DEA and a Mutivariate Analysis to 28 Peruvian Microfinance Institutions

Cornée, Simon - Thenet, Gervais

Session 12 Poster III

Friday, June 29, 2007 12:00 - 12:00 (next day)

Building B - Ground Floor - Room EMF

The purpose of this paper is to extend earlier research on the assessment and the understanding of microfinance institution (MFI) efficiency. It also aims at demonstrating that there can be a positive link between social performance (SP) and financial performance (FP) in microfinance industry. MFIs are organisations that respond to a double bottom-line – i.e. complying with both SP and FP goals. To date, their efficiency has been solely assessed by means of financial ratios. It is suggested that efficiency measurement of MFIs should include other indicators to better appraise the entirety of their activiy. The two-step methodological approach combines the Data Envelopment Analysis (DEA) tool and a mulivariate analysis. These methods are applied to MIXMARKET data that correspond to a sample of 28 Peruvian MFIs. In the first instance, DEA efficiency scores are obtained and ranked for every specification – particuliar set of inputs/outputs. A relevant remark must be formulated: the complete model (including all inputs and outputs) incorporates both financial and social variables. In the second instance, the multivariate analysis carried out enables to go further into the interpretation of the DEA scores, that is to say beyond the sole comparison of simple efficiencies. The two principal components extracted are significant vectors of information in so far they help understand better why a DMU reaches a certain level of efficiency under a given specification. In other words, the choice of a peculiar specification impacts the efficiency assessment. These results confirm preceding findings revealed with the same methodological design. Moreover, this investigation is believed to make a contribution to the question posed by the contradictory studies upon the relationships between SP and FP. It provides empirical evidence that there is no trade-off between SP and FP and even it supports the hypothesis that the link between SP and FP is positive. Finally, it offers additional insights about this relationship by opening the “black box” of an MFI’s sources of efficiency: best practices are idendified, route to performance traced and status effect highlighted (Regrouping of DMUs on the graph according to their status). To conclude, this work is part of an attempt to show that DEA approach is relevant to assess efficiency and productivity beyond ratio analysis by incorporating other types of variables. The research can be replicated to other sectors whose activies entail the necessity of measuring double or triple bottom-line efficiency.

On the Reliability of Approximating Shadow Prices by the VRS Piecewise Linear Frontier

Li, Sung-ko - Sun, Jingchun

Session 12 Poster III
Friday, June 29, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

In the literature, the piecewise linear frontier exhibiting variable returns to scale (VRS frontier) is popular in the study of efficiency measurement. Its flexibility attracts many researchers to adopt it in empirical studies to capture the main properties of the underlying 'true' production frontier. Li and Ng (1995) explored further that they estimated the shadow prices of a group of production units using the gradient vector at a point on the production frontier. If the gradient vector is a good approximation to the 'true' shadow prices, it can be used in many applications. However, it is well-known that the VRS frontier is sensitive to data changes, especially for extreme values. The slope of any point on the frontier is expected to be even more sensitive. Furthermore, at an extreme point of the isoquant, the gradient vector is not unique. This paper explores the properties of the gradient vector of the VRS frontier as an approximation to the shadow prices of the 'true' production frontier. Since it is very difficult to study the gradient vectors analytically, we use the method of Monte Carlo experiments to study the merits and drawbacks. It is found that, with some modification, the gradient vector of the VRS frontier performs reasonably well in large samples.

A Study of the Efficiency of Malaysian Anchor Banks: A DEA Analysis Approach

Yoong Hon, Lee - Cheah, Eng Tuck - Lin Yu, Koay

Session 12 Poster III
Friday, June 29, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

This paper aims to examine the efficiency of 10 Malaysian Anchor banks from 2001 to 2005. The period 2001 to 2005 represents the 5 years following the implementation of the Financial Sector Masterplan (FSMP). The objective of the FSMP is “to develop a more resilient, competitive and dynamic financial system with best practices, that supports and contributes positively to the growth of the economy throughout the economic cycle, and has a core of strong and forward looking domestic financial institutions that are more technology driven and ready to face the challenges of liberalization and globalization.” This paper uses Data Envelopment Analysis (DEA), a non-parametric linear programming method to develop efficiency scores derived from input and output variables selected to model bank behaviour. We also derived the Malmquist Index from the data which measures changes in productivity relative to a base year. From the results, we noted that the FSMP did seem to stimulate efficiency growth in terms of technological innovation among the banks, but did not seem to have much impact on the technical efficiency (improvements in management) or scale efficiency (improvements towards optimal size). These findings suggest that there are still gaps to be filled by the inefficient banks in the sample in order to be competitive in the more liberalized and globalised environment in the future.

Effects of FDI Flows on Aggregate Productive Efficiency: An Application on a Panel of the OECD Countries

Kodjo-Komina, Kodjo - Kinda, Tidiane

Session 12 Poster III
Friday, June 29, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

This article uses the data of panel incorporated to empirically examine the effects of flows of the foreign direct investments (FDI) on technical efficiency in the OECD countries. Thus, the main idea is to evaluate the impact of the outwards and inwards FDI on the technical efficiency of the OECD countries. In order to be able to estimate these effects, we borrowed of Battesse and Coelli (1995), the method of the adjusted measurement of technical efficiency by assessing a frontier production stochastic where the FDI are assumed to be simultaneously affected the technology production and technical efficiency. Well before preceding the estimation, we can consider two alternative approaches to apprehend the technical inefficiencies proposed in the literature of the econometrics of the production. The first assumes that the FDI can modify the shape of the technology, and the other shows that they directly affect technical efficiency. Of our share, a comparison will be made between these two approaches. Our preliminary results show that the countries facing inwards FDI, therefore with an environment favourable to the FDI, have more important score efficiency than those facing an unfavourable environment with the FDI. This, shows us a gap efficiency between the receiving countries of the FDI and those exposed to the outwards FDI. The application of the method adjusted to the outwards FDI gives similar results to the countries exposed to the overflows FDI. When the unfavourable countries at the outwards of FDI face a favourable environment (FDI), they find almost the same level of efficiency as those exposed beforehand to this favourable environment.

Transportation Procurement Support Using Data Envelopment Analysis

Brusset, Xavier - Agrell, Per - Bogetoft, Peter

Session 12 Poster III
Friday, June 29, 2007 12:00 - 12:00 (next day)
Building B - Ground Floor - Room EMF

This paper illustrates DEA as a tool to screen multidimensional bids from carriers in an auction involving several routes with prospective volumes and frequencies. The point is to select a group of carriers which will be admitted to a second round on the basis of their situation on an efficiency frontier in a multi-dimensional space. For this demonstration, a database from a real case in a Request For Proposals at a big industrial company is used. The bids involve prices, routes, tonnage to be transported, frequency and flexibility. Since prices can be used by carriers to indicate their interest in a route as well as their competitiveness, price will be used not only as a proxy for efficiency but also as an indicator of the keenness of a carrier for a particular route (information private to the carrier). The advantage of the method is to be able to distinguish the most efficient carriers not on the basis of the loads tendered but for any future load including those that may not have been tabled in the tender.The new loads not included in the initial tender will still be carried with

Sustainable Value Analysis with Best Practice Benchmarks: A Nonparametric Frontier Approach

Kuosmanen, Natalia - Kuosmanen, Timo

Session 12 Poster III

Friday, June 29, 2007 12:00 - 12:00 (next day)

Building B - Ground Floor - Room EMF

Sustainability of firms and other production units has attracted increasing attention in the recent years, and a number of different indicators and methods have been suggested. Measuring corporate contributions to sustainability is challenging due to the holistic nature of sustainable development, which includes economic, environmental and social dimensions (e.g. Cherchye and Kuosmanen 2006). Most sustainability measures are nothing more than combined lists of indicators, possibly aggregated to some composite index by using some ad hoc weighting rule. Figge and Hahn (2004, 2005) introduced sustainable value analysis (SVA) as a systematic economic approach for measuring sustainable value creation of firms and other production units. SVA is based on the opportunity cost of capital (in a broad sense), and it conforms with the strong notion of sustainability, defined here as the amount of production that can continue indefinitely without degrading stocks of natural, physical, human or intellectual capital. In SVA, a firm is said to create sustainable value if it uses its bundle of different forms of capital more efficiently than the average firm of the economy would had used it. Thus, the sustainable value is a monetary measure that expresses the excess value created by the firm while preserving a constant level of capital use. Despite its intuitive appeal, SVA has at least two important shortcomings: First, by assessing sustainable value relative to the average practice of the economy, SVA can guide the managers and policy makers towards improved performance, but it does not necessarily reveal the full efficiency improvement potential. Firms that perform better than the average practice may still be inefficient relative to the best practice frontier of their industry. Second, in the multi-impact case, the different types of capital stocks are aggregated assuming perfect substitution, using the average substitution rate of the economy. This ignores the varying substitution possibilities of different sectors and industries. To overcome these two shortcomings of SVA, in this paper we propose to replace the average practice benchmark by industry-specific best practice benchmarks. We show how the best practice sustainability frontier can be estimated by nonparametric frontier techniques which have been extensively used in the eco-efficiency analysis (e.g. Kuosmanen and Kortelainen 2005). To assess the value-creation potential of the natural, economic and social resources, we resort to the absolute shadow pricing approach developed by Kortelainen and Kuosmanen (in press) and Kuosmanen and Kortelainen (in press). The new SVA approach is applied to the assessment of sustainability performance in a large sample of Finnish farms.

The Econometric Approach to Efficiency Analysis

Greene, William
(New York University, Stern School of Business)

Talk based on the forthcoming book:
H. Fried, C.A.K. Lovell, S. Schmidt (eds.)
The Measurement of Productive Efficiency and Productivity Change, NY: Oxford Univ. Press

Session 13 Keynote III
Friday, June 29, 2007 14:00 - 15:30
Building B - Ground Floor - Room B050

Comment on: The Econometric Approach to Efficiency Analysis

Sevestre, Patrick
(Université de Paris 1, Dept. of Economics)

Session 13 Keynote III
Friday, June 29, 2007 14:00 - 15:30
Building B - Ground Floor - Room B050

Comment on: The Econometric Approach to Efficiency Analysis

Simar, Leopold
(Université Catholique de Louvain, Institut de Statistique)

Session 13 Keynote III
Friday, June 29, 2007 14:00 - 15:30
Building B - Ground Floor - Room B050

Target and Technical Efficiency in DEA - Controlling for Environmental Characteristics

Olesen, Ole B. - Petersen, Niels Christian

Session 14 A Methodological Aspects in Nonparametric Analysis
Friday, June 29, 2007 16:00 - 17:30
Building A - First Floor - Room A101 J.M KEYNES

In this paper we propose a target efficiency DEA model that allows for the inclusion of environmental variables in a one stage model while maintaining a high degree of discrimination power. The model estimates the impact of managerial and environmental factors on efficiency simultaneously. A decomposition of the overall technical efficiency into two components, target efficiency and environmental efficiency, is derived. Estimation of target efficiency scores requires the solution of one large non-linear optimization problem and provides both a joint estimation of target efficiency scores from all DMUs and an estimation of a single common scalar expressing the environmental impact on efficiency for each environmental factor. We argue that if the indices on environmental conditions are constructed as the percentage of the output having certain attributes present, then it is reasonable to let all reference DMUs characterized by a composed fraction that is lower than the fraction of output possessing the attribute of the evaluated DMU enter as potential dominators. It is shown that this requirement transforms the cone-ratio constraints on intensity variables in the Banker-Morey model into endogenous handicap functions on outputs. Furthermore, a priori information or general agreements on allowable handicap values can be incorporated into the model along the same lines as specifications of assurance regions in standard DEA.

Computation Algorithms for DEA Models with Weight Restrictions

Podinovski, Victor

Session 14 A Methodological Aspects in Nonparametric Analysis
Friday, June 29, 2007 16:00 - 17:30
Building A - First Floor - Room A101 J.M KEYNES

In traditional DEA models the efficiency of units, their efficient targets and reference sets of peers are usually assessed by a two-stage optimisation procedure. The first stage projects the unit on the boundary of the technology and the second maximises the sum of input and output slacks. Alternatively, a roughly equivalent one-stage algorithm is sometimes utilised in which the slacks are accounted for by adding them to the objective function with very small weighting coefficients. There is evidence that exactly the same procedure is sometimes used with models incorporating weight restrictions. We show that this may lead to some inconsistent results and errors in the assessment of efficient targets. This issue is of particular concern when weight restrictions are based on prices of inputs and outputs and essentially reflect the trade-offs between them. In such cases it is usually expected that the efficient targets are producible members of the technology, the assumption that we show is unfortunately not true. We present a new method that has been developed specifically for models with weight restrictions. It is illustrated using a simple example. The new method should be of interest to the developers of DEA software and anyone who uses weight restrictions in their work.

Alternative Approaches to Include Exogenous Variables in Efficiency Analysis: A Comparison Using Monte Carlo Experimentation

Cordero-Ferrera, Jose Manuel - Pedraja Chaparro, Francisco - Santín González, Daniel

Session 14 A Methodological Aspects in Nonparametric Analysis
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The theory for measuring efficiency of a group of Decision Making Units (DMUs) has developed multiple methods to include the effect of external or non-discretionary variables in the analysis. A review of different options in the specific literature of Data Envelopment Analysis (DEA) allows us to identify several methodologies with different structures. First, we have one-stage models, in which non-controllable factors are simultaneously considered with inputs to obtain efficiency scores in a single DEA (Banker and Morey, 1986). Second, two-stage basic models use a DEA to estimate efficiency scores in an initial evaluation without including non-discretionary inputs and then regress them against those factors in order to identify significant variables and their effect on efficiency scores (Ray, 1991; McCarty and Yaisawarng, 1993). Third, Simar and Wilson (2007) propose another semi-parametric model in which a double-bootstrap method is used to avoid possible bias in the estimation of regression in those two-stage models. Finally, there are models that use a multi-stage approach to take into account the effect of non-discretionary inputs. These procedures decompose the slacks of inputs or/and outputs using DEA (Muñiz, 2002) or regressions (Fried et al., 1999) and then the original values of the variables used in an initial DEA are modified according to the effect of those factors. The latter can be improved if a bootstrap method is used (Cordero et al., 2006). In view of the existence of so many methodological options, we wonder about which alternative is the best option to include external variables in this type of evaluation. The aim of this paper is to test the performance of those alternative methodologies using simulated data from a Monte Carlo experiment. Although this issue have been dealt with in some previous studies (Ruggiero, 1998; Yu, 1998, Muñiz et al.; 2006), we have extended the analysis in several directions. Firstly, we have included models which had not been considered previously in this type of analysis because they have been developed lately. Secondly, we have considered two alternative scenarios to generate data: a single-output framework with a flexible technology (translog function) and a multi-output framework with a parametric output distance function approach, following Perelman and Santin (2005). Finally, we compare the results obtained with two different sample sizes so that we can check whether or not a model has a different performance depending on the number of DMUs. The results obtained show that the model that decompose the slacks using regressions is the best option. We have also checked that using a bootstrap method to estimate those regressions we can obtain a significant improvement. Finally, the results obtained with all the models are better when a single-output framework is considered.

Separation of Uncontrollable Factors and Time Shift Effects from DEA Scores: Multi-Stage Data Adjustment Model Using DEA and Tobit with DMU Dummies

Tsutsui, Miki - Tone, Kaoru

Session 14 A Methodological Aspects in Nonparametric Analysis
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DEA efficiency scores are calculated based on deviation from the efficient frontier and such scores may reflect the impact of uncontrollable factors such as business environments among DMUs, and also statistical noise such as data error. It is also essential to eliminate uncontrollable effects for Decision Making Units (DMUs) from DEA scores and evaluate gpure h efficiency. This study employs a multi-stage data adjustment model using DEA and Tobit regression with dummies in order to separate pure managerial inefficiency and obtain adjusted DEA efficiency indices. Furthermore, we also attempt to separate time shift effect from the DEA scores as an environmental variable in the multi-stage data adjustment model in addition to the other external effects. Fried et al (1999) proposed a multi-stage approach to obtain a pure managerial efficiency score. In their model, slacks of each input or output are measured by DEA in the 1st stage, and then they are used as dependent variables in the regression model in the 2nd stage. Independent variables are external environmental variables that are uncontrollable by management of DMUs. Then, in the 3rd stage, the actual data are adjusted by the coefficients and the error term estimated in the previous stage. In the final stage, the DEA model is rerun using the adjusted data. Through this multi-stage approach, we can obtain the adjusted efficiency score, which can be regarded as a measure of gpure h managerial efficiency. In Fried et al. (2002), Stochastic Frontier Analysis (SFA) was used as a regression model in the 2nd stage, in which the dependent variable (slack) can be decomposed into three components; environmental effect, statistical error, and managerial efficiency terms. In our study, we employ the Tobit model for the 2nd regression stage instead of SFA to obtain unbiased and consistent parameter estimates. Furthermore, we incorporate dummy variables for all DMUs in the Tobit model to capture the fixed effect of DMUs, which plays a similar role to the efficiency term of the SFA model. Thus, this approach can also decompose slacks into environmental effect, statistical noise and managerial efficiency terms expressed by dummy variables in the same manner as SFA. In addition, we further employ time dummy (or a time trend) variables to the Tobit regression model as independent variables in order to evaluate the time shift effects. In the case we measure frontier shift effect using DEA model (Fare, Grosskopf and Roos 1996), it must include environmental effects as well as technical efficiency score. If we separate uncontrollable effects from an efficiency score and time shift effect, we must conduct the multi-stage data adjustment model twice. In contrast, our model is convenient to separate uncontrollable factors and time shift effects simultaneously in the data adjustment model.

Incorporating both the Undesirable Output and the Uncontrollable Variables in DEA: The Performance of Chinese Coal-fired Power Plants

Yang, Hongliang - Pollitt, Michael

Session 14 B Eco-Efficiency
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Building A - Second Floor - Room A201 J. MONNET

There are two potential difficulties in doing an objective evaluation of the performance of ecision-making units (DMUs). The first difficulty is how to treat undesirable outputs jointly produced with the desirable outputs. Traditional literature only values the desirable and simply ignores the undesirable. However, ignorance of the undesirable is equal to saying that they have no value in the final evaluation and this may give rise to misleading results. Therefore, it is necessary to credit DMUs for their provision of desirable outputs and penalize them for their provision of undesirable outputs. The second difficulty is how to treat uncontrollable variables, which often reflect the impact of the operating environment. Generally, management can decide on some controllable factors internal to the production activities, while the impact of the operating environment is out of the control of management. Traditional studies, which constructed research models using the controllable factors only, in fact implicitly assume that all inefficiency of DMUs is caused by the bad management. Since the impact of the uncontrollable variables is not filtered out, the evaluation of those DMUs in the adverse operating environment will be underestimated. However, given difficulties in both model construction and data availability, there are very few published studies simultaneously considering both problems. This article attempts to solve the above issue by setting up six DEA-based performance evaluation models based on a large research sample of Chinese coal-fired power plants including one, two, three and four stage approaches to environmental variables. To the authors` knowledge, no other empirical studies have used all of these models in a single paper. The finding of this paper not only contributes for the performance measurement methodology, but also has policy implications for the Chinese coal-fired power sector.

Electric Utilities, Environmental Externalities and Cost Measured Productivity Growth

Prior, Diego - Granderson, Gerald

Session 14 B Eco-Efficiency
Friday, June 29, 2007 16:00 - 17:30
Building A - Second Floor - Room A201 J. MONNET

The use of coal to produce electric power (good output) can lead to sulfur dioxide (SO2) and nitrogen oxide (NOX) emissions, which contribute to the production of acid rain. Title IV of the 1990 Clean Air Act (CAA) called for permanent reductions in SO2 emissions, with 110 power plants of electric utilities having to reduce their emissions to levels relative to their fuel use in the 1985 to 1987 time period. Reducing the emissions can be achieved through (i) producing less electric power (using less coal) (ii) installing equipment to lower SO2 emissions, or (iii) using a different input mix or technology to produce electric power. Using each method could affect total factor productivity (TFP) growth, and/or the contributions of efficiency change, technical change, and other factors, in TFP growth. Firms having to reduce SO2 emissions may try to enact policies that lead to the development of a new technology that produces electric power more efficiently and less costly, with fewer emissions. A question to ask is whether compliance with Title IV of the CAA affected the measurement and decomposition of TFP growth. This paper uses the Malmquist Cost Productivity (MCP) Index developed by Ball, Färe, Grosskopf, and Zaim (2004) to measure and decompose (into various components) TFP growth for U.S. electric utilities when accounting for the production of good (electric power) and bad (emissions) outputs. The data sample is a panel of 34 U.S. investor-owned electric utilities from 1992 to 2000, of which some electric utilities are impacted by Title IV (having to reduce SO2 emissions). We measure and decompose TFP growth for utilities that were and were not impacted by Title IV, to analyze what affect compliance with Title IV had on the measurement and decomposition of productivity growth. A measure of investments in air pollution control facilities is utilized to analyze how installing equipment or using cleaner fuels to reduce SO2 emissions impacted productivity growth. The Malmquist Cost Productivity Index can also be used to measure productivity growth and its decomposition when not accounting for (a) production of the bad output (emissions), or (b) the installation of equipment or using cleaner fuels. Not accounting for the use of cleaner fuels, installation of equipment, or production of the bad output, can lead to inaccurate estimates of both productivity growth, and the decomposition of productivity growth into its various components.

Production-Theoretical Underpinnings of Eco-Efficiency: Marrying Diverse Methodological Approaches

Lauwers, Ludwig - Meul, Marijke - Van Meensel, Jef - Van Passel, Steven

Session 14 B Eco-Efficiency
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In the search for an operational and integrated economic-ecological performance measure, a wide variety of methods has been developed. The most straightforward branch results from the operationalisation of the eco-efficiency concept that searches for optimising an economic outcome over the ecological impact. The second branch implies environmentally adjusted productive efficiency methods. These are production and efficiency analysis methods, in which environmental impacts are incorporated. Each branch has its merits, but also fundamental shortcomings. A straightforward approach would be bringing the best of both worlds together. Some examples already exist of coaxing between both methodological approaches. These examples are Tyteca (1996, 1997), Callens and Tyteca (1997), Kuosmanen and Kortelainen (2005) and Kortelainen (2007). They, however, quantify eco-efficiency with methods idiosyncratic to productive efficiency methods rather than exploring the production-theoretical underpinnings of activities, which jointly lead to good and bad outputs. This paper examines how productive efficiency methods can help to quantify eco-efficiency. Moreover, it will be shown that using the production-theoretical underpinnings of activity analysis will enrich the conventional eco-efficiency ratio-indicators. Compared to the above mentioned work, this paper aims at a surplus value through combining analytical soundness of productive efficiency methods with the easiness to communicate of eco-efficiency concepts. Moreover, incorporating the production-theoretical fundaments may open ports to a more proactive and normative analysis of eco-efficiency and its drivers. Section 1 discusses the two branches, beginning with the basic underlying ideas and concepts, then looking to the operationalisation, and finally questioning how the approaches reciprocally enrich the concept of the other. The basic idea behind efficiency and productivity analysis (EPA) is that efficiency is a relative performance, not a ratio concept. The way that environmental issues enter EPA is overviewed in short. Next, the basic idea behind and the quantification of eco-efficiency is given. Finally, it is shown how production efficiency ideas entered the eco-efficiency concept. Here, the question arises whether the move from ratio to frontier concept followed the same reasoning as has been done before in EPA. From this overview, section 2 draws a SWOT analysis of the two approaches. The following aspects are discussed: -easiness to handle and to communicate; -the underlying assumptions; -social-value outcomes of economic activities, which are primarily private-economically driven; -descriptive versus normative use; -can the signals of necessary environmental improvements be caught up by individual decision-makers?; -how do they account for port-folio effects of individual decisions? Although it seems not straightforward to develop a framework that combines the best of both worlds, section 3 gives some research cases as starting points for further methodological development. The first research illustration compares frontier methods with the sustainable value method as developed by Figge and Hahn (2004,2005). The second case analyses the economic-environmental trade-offs in more detail. The basic idea is that joint production in goods and bads is not separable. The third research case treats the incorporation of the materials balance information as an operational description of joint production. Finally, in the fourth research case, some preliminary ideas are discussed how to interpret individual firms efficiency performance in situations where those firms can be seen as complementary at an aggregation level. Finally, section 4 concludes: fundamental production-theoretic underpinnings lead to a progeny of approaches that brings new dimensions to eco-efficiency measurement.

Eco-Efficiency as a New Principle for the Allowance Allocation Mechanism in Emission Trading

Luptacik, Mikulas

Session 14 B Eco-Efficiency
Friday, June 29, 2007 16:00 - 17:30
Building A - Second Floor - Room A201 J. MONNET

The first important step in the emission trading is the initial allocation of emission certificates. The question is whether the certificates are distributed for free among the participants of the trading program or whether the government gives the emission rights away in an auction, where the traders have to pay for the allowance. In the free allocation are principally two approaches to determine the amount of certificates allocated to each plant. One is called “grandfathering” and the other is named “update”. The basic difference is that the grandfathering mechanism uses historic emission information of the different plants to calculate the allocation, whereas in the update method current and future data form the basis for the certificate distribution. In the paper we propose an alternative initial allocation of the emission certificates based on the eco-efficiency of the firms. The eco-efficiency is defined such that the goods and services (or desirable outputs) should be produced with less energy and resources (or inputs) and with less waste and emissions (or undesirable outputs). Because of the different units in which the desirable and undesirable outputs are measured, data envelopment analysis (DEA) for eco-efficiency measurement is used. DEA models – as developed by KORHONEN- LUPTÁCIK (2004) – taking into account the inputs, the pollutants and the desirable outputs simultaneously indicate the potential reduction of the emissions and thereupon provide a decision support for an incentive based allocation mechanism. The amount of free allocated certificates to the plants is based on their eco-efficiency scores. The approach will be illustrated by using data that are available from public sources:26 plants of the Finnish paper industry and 35 plants of the French cement industry.

A DEA Model as a Generalized Human Development Index

Estellita Lins, Marcos - Moreira da Silva, Angela Cristina - Carvalho Pereira, Bárbara

Session 14 C Socio-Economic and Environmental Performances
Friday, June 29, 2007 16:00 - 17:30
Building A - First Floor - Room A103 M. CROZIER

Assessing social development requires integrating several dimensions of human development as, for example, health, education and the ability to achieve a decent standard of living. One of the most accepted methodologies is the Human Development Report, an independent report produced by a team of select scholars, development practitioners and members of the Human Development Report Office of UNDP. The method applies fixed weights assigned to the selected dimensions: life expectancy at birth, adult literacy rate and school enrollment, and GDP per capita in purchasing power parity (PPP) U.S. dollars. The weights are arbitrarily chosen and measure the importance given to each dimension of development. In this manuscript we propose to incorporate the decision maker's uncertainty about the precise values of the weights. This is done using a weight restricted DEA program, where the expert's judgment is included through a range instead of a fixed value. Unlike the HDI, it is not necessary to provide an a priori normalization of data. Our most attractive result is to show the geometrical meaning when substituting a range for each fixed weight value. Three-dimensional DEA frontiers help understanding that assuming a fixed weight corresponds to restrict the efficient frontier to a unique efficient point. Thus the HDI can be considered as a specific case for a weight restricted DEA model when the allowed range collapses into a point. Case studies illustrate this methodological approach. Further emphasis is given to health aspects of efficiency, extending the original HDI framework.

Ranking Corporations Based On Their Social and Environmental Performance

Constantin, Belu

Session 14 C Socio-Economic and Environmental Performances
Friday, June 29, 2007 16:00 - 17:30
Building A - First Floor - Room A103 M. CROZIER

In this study we perform a ranking of corporations based on their social and environmental (i.e. sustainable) achievements in relation to their financial results. For this purpose we use a "Data Envelopment Analysis" model, with financial performance indicators as inputs and sustainability grades as outputs. The financial performance indicators chosen are the ones that have been most commonly used in the financial literature. Our approach treats the financial variables as exogenous. Consequently, an output-oriented DEA model is used. The sustainability scores for different dimension are provided by a specialized screening company, and we have marks for a broad range of sustainable practices. DEA establishes a best practice frontier, against which firms can be clustered and ranked in accordance with their social & environmental success. DEA allows that multiple social and environmental variables/dimensions be given an objectively endogenous importance in the construction of the composite performance index. We can compute a performance score for each company and we compute average scores for each industry. An industry level analysis is conducted by computing industry-specific frontiers as well as a pooled frontier. Striking results are found in the across industries comparison i.e. financial and services sectors appear as less effective in sustainability measures than the manufacturing and heavy industry. The study can be useful for mutual funds with the desire to construct socially responsible portfolios (i.e. portfolios that include socially responsible companies), allowing the selection of best socially and environmentally performers in a fair manner.

Doing Bad to Do Better? Slack Patterns, Financial Performance and the Link to Corporate Social Responsibility

Asmild, Mette - Chapple, Wendy - Hougaard, Jens Leth

Session 14 C Socio-Economic and Environmental Performances
Friday, June 29, 2007 16:00 - 17:30
Building A - First Floor - Room A103 M. CROZIER

Within the management literature, there has been a raging debate surrounding the relationship between Corporate Social Responsibility (CSR) and financial or economic performance. So far, the jury is still out and the theoretical and empirical findings are mixed. As a result the relationship between corporate social performance and economic performance is still unclear after 20 years of research. This paper explores whether slack patterns can shed new light on the linkage between economic and social performance. Within the technical efficiency paradigm, we explore whether CSR is in fact a rational explanation of the presence of certain slack patterns. More specifically we investigate how slack in one period might generate future efficiency and financial gains in subsequent time periods. This paper takes the first steps in investigating an inter-temporal relationship between slacks and both social and financial performance. Hence, what might show as inefficiency in static models, might actually be investments in future efficiency. These various efficiency gains could be due to future technology changes (innovation), shaping future market expectations (demand side) or by shaping the regulatory environment (raising rivals costs).

Productivity And Downsizing: Who Gets Fired? Evidence from One Consumer-Goods Industry in Russia

Rinaldi, Gustavo

Session 14 D Human Resources, Regulation, Incentives and Productivity

Friday, June 29, 2007 16:00 - 17:30

Building A - First Floor - Room A121 M.E. PORTER

Does employee productivity explain why during a period of crisis firms fired relatively more blue-collar than white-collar workers? Are redundancies targeted towards the least productive workers? Was firms' behaviour profit maximising? These questions are investigated in the extreme circumstances of the footwear industry in Russia in the period 1994-2000. Firms in this industry underwent a major upheaval in these years. Part of their response was to downsize the blue-collar workforce more severely than the white-collars. Was this because (a) white collar employees had higher marginal productivity or (b) because the technical rate of substitution of white collar labour with blue collar labour was greater than the factor price ratio of these two inputs? If it turns out that the marginal productivity of white collar employees was the higher, we could conclude that they were embodying more human capital (Becker, 1962); if they were no more productive than blue collars, this could mean that they had been privileged during downsizing for some institutional reasons, e.g. a prior commitment towards higher-ranking staff (Lazear, 1979; Lazear and Rosen, 1981). If it turns out that the technical rate of substitution of white collar labour with blue collar labour was greater than their factor price ratio, this would suggest that the firms' downsizing policies were consistent with profit-maximising precepts. Russian footwear is a suitable industry for investigation because there are many units, which use a standard technology, and with relatively little political interference. The paper uses a Cobb Douglas production function with ordinary least squares, two-step least squares and stochastic frontier analysis, both in a panel and in a cross-section setting. Results show that white collar employees were not only more productive than blue collar employees but also the technical rate of substitution of white collar labour with blue collar labour was greater than the factor price ratio of these two inputs. This suggests that even in a turbulent period and with a Soviet heritage, the firms behaved as profit-maximising agents. Institutional factors may also have operated, but they do not need to be invoked in explaining the data.

Secure Relative Performance Pay

Nielsen, Kurt

Session 14 D Human Resources, Regulation, Incentives and Productivity

Friday, June 29, 2007 16:00 - 17:30
Building A - First Floor - Room A121 M.E. PORTER

In this paper we present a relative performance scheme that aligns the motivation of e.g. the owner and the manager of a firm. Each of the participating firms receive a benchmark determined by (DEA based) directional distance functions, where the strategy (in operational terms) defines the direction and the best performing peers define the benchmark. With verifiable performance data the prime concerns are the more traditional on e.g. balancing motivation and risk sharing. In most cases verifiable performance data are rare. Therefore, the crux is to design a system that motivate truth-telling. To motivate truth-telling we discuss three issues. First, that the participants within the firm have proper incentives to tell the truth. Second, that the firms between have proper incentives to tell the truth. Finally we discuss how to model the required trusted third party. Assuming that the evaluation is based on data that is verifiable within the firm by the owner as well as the manager, the first issue is ensured by conflicting interest in pretending higher/lower performance. If a possible incorrect performance can be identified by competing firms the system may facilitate a signalling game. Two things are required to avoid any signalling: a) the benchmark may not reveal peer performances and b) it must be costly to report untruthful performance data. To solve these two issues the reported benchmark is based on multiple inputs and outputs where at least one of them is verifiable. Assuming convexity any single benchmark may support an infinite number of hyperplans. Therefore, a single benchmark reveals little if any information about peer performances. However, since the benchmark is determined a long a direction provided by the evaluated firm any misreported performance along this line will result in the same benchmark. Though, since at least one variable is verifiable, costless misreporting is not possible, given that the evaluated firm aspire for a better performance on the verifiable variable. The system relies heavily on central coordination by a trusted third party. Paying a third party (e.g. a consultancy house) to truthfully handle the data is not only expensive but also prone to human mistakes. However, the discipline of distributed cryptography provides a theoretical solution by the so-called secure multiparty computation. We show that this approach is computational feasible for the suggested relative performance scheme.

Application of Efficiency Measurement in the Analysis of Entrepreneurial Processes

Tajnikar, Maks - Pusnik, Ksenja

Session 14 D Human Resources, Regulation, Incentives and Productivity

Friday, June 29, 2007 16:00 - 17:30

Building A - First Floor - Room A121 M.E. PORTER

The paper will present the original application of efficiency measurement using data envelopment analysis (DEA) in the analysis of entrepreneurial processes. Namely, authors of the paper argue, first, that the efficiency of the impact of determinants of entrepreneurial processes on early-stage entrepreneurship varies widely across countries, and second, efficiency measurement of entrepreneurial processes using DEA enable more in-depth analysis of the differences in entrepreneurship across countries and has, therefore, useful implications for economic policy in the field of entrepreneurship. In investigating efficiency measurement of entrepreneurial processes authors follow somewhat stylised findings of Davidsson's (2004) that, according to the entrepreneurship determinants, entrepreneurial activity originate in three waves. The first wave is composed of ability, need and opportunity for entrepreneurship, which are objective in a particular economy and could not be changed rapidly. This wave is then transformed into second wave, which are perceptual determinants, composed of perceptive ability, perceptive need, and perceptive opportunity for entrepreneurship. All three components of the wave of perceptual determinants are then transformed into the third wave of entrepreneurial motivation, which later results in entrepreneurial activity. Like the transformation of the wave of objective determinants to the wave of perceptual determinants, the transformation to this third wave takes place in different economies in different ways. This is what leads to the concept of the "efficiency" of transformation of one of the waves of determinants to another. Authors hypothesise that the efficiency of transformation of objective early-stage entrepreneurship determinants to perceptive determinants, as well as the efficiency of transformation of perceptive determinants into entrepreneurial motivation and entrepreneurial activity can be measured by DEA (e.g., Zhu, 2003). Therefore, DEA is employed both to measure the "technical efficiency" of these transformations by using constant returns to scale input-oriented DEA models, and to identify countries that can serve as benchmarks for other countries seeking entrepreneurship improvements. The analysis will be conducted on the sample of selected countries participating in the Global Entrepreneurship Monitor (GEM) research in 2004. National countries data will be obtained from international data sources such as the World Bank, the International Monetary Fund, the United Nations and Eurostat, as well as the GEM data set. Selection of observed countries will depend on the availability of data.

Price Cap Regulation with Imperfect Information

Lay, Helen - Weeks, Melvyn

Session 14 D Human Resources, Regulation, Incentives and Productivity

Friday, June 29, 2007 16:00 - 17:30

Building A - First Floor - Room A121 M.E. PORTER

Despite the recent increase in the use of comparative efficiency analysis by economic regulators in a large number of countries, there still exists a considerable gap between the manner in which policy-driven comparative efficiency analysis is undertaken, and the type of analysis promoted by academic experts. In the case of the English and Welsh water and sewerage industry the gap between best practice and the approach used by the regulator is particularly acute. In this paper we consider two questions. First, in estimating firm-specific efficiency levels across a range of di¤erent model specifications, we examine whether the regulators relatively simple approach produces inference, both in terms of individual efficiency estimates, and ultimately prices, that are at odds with those produced by relatively sophisticated techniques. In addition we consider whether conditional on a given model, it is possible to identify a distribution of both firm-specific efficiencies and rankings with precision. The motivation for this analysis is prompted by the manner in which prices are set by the regulator. Although a set of firm-specific efficiencies are estimated, in recognition of a number of dimensions of uncertainty inherent in the estimation process, firms are grouped into a number of categories based upon the distance from the benchmark firm. Firms which are allocated to the same category then receive the same price cap. Our analysis will therefore determine to what extent it is possible to discriminate across firms based upon a given distribution of efficiencies, and as a result the type of inference that can be undertaken. Given both the small sample size and the need to determine the degree of precision with which both efficiency estimates and rank distributions of efficiencies are estimated, we adopt a Bayesian approach to inference.

Comparison of Two Alternative Store Formats using a Malmquist-Type Index

Vaz, Clara - Camanho, Ana

Session 14 E Marketing Performance
Friday, June 29, 2007 16:00 - 17:30
Building A - First Floor - Room A120 E. MALINVAUD

This paper explores the differences in performance between two groups of retailing stores that operate with different formats. The study uses a Malmquist-type index to distinguish internal inefficiencies from those associated with the group (or format) characteristics. A fundamental characteristic of the new index is to compare groups in a static setting. The study described in this paper combines the use of the Malmquist index with statistical tests. The Malmquist-type index is decomposed into sub-indexes for comparing the efficiency spread between groups and the productivity differences between the best-practice frontiers of the groups. The hypothesis tests are used to verify if the differences between groups captured by the Malmquist-type index and its components are statistically significant. There are several methods based on DEA for comparing the performance of two groups, such as the program efficiency method and the comparison of efficiency distributions using statistical hypothesis tests. The method used in this paper is compared with the existing approaches to highlight its strengths and weaknesses. The applicability of the method is illustrated with a case study that compares the performance of heavy bazaar stores (that sell electrical appliances and consumer electronics) with different formats (megastores versus superstores). The study showed that the overall performance of megastores is better due to the effect of a more productive frontier. However, the efficiency spread is larger in megastores than in superstores meaning that there is scope for efficiency improvements.

Total Factor Productivity and the Role of Location & Ownership: Evidence from the UK Retail Sector

Anon Higon, Dolores

Session 14 E Marketing Performance
Friday, June 29, 2007 16:00 - 17:30
Building A - First Floor - Room A120 E. MALINVAUD

A considerable amount of research effort and policy attention has recently been directed towards the identification of the major determinants of productivity growth in UK retailing (McKinsey, 1998; O'Mahony and de Boer, 2002; Van Ark et al, 2003). In contrast, several comparative studies at an aggregate level have shown a labour productivity gap of UK retailing when compared with other countries, notably the US, Germany and France (O'Mahony and de Boer, 2002). Inevitably, one of the key questions that one may ask in this context is what is the role of Foreign Direct Investment (FDI) in shaping up the productivity performance of the retail sector. The importance of multinationals and FDI as fertilizers for productivity growth has been extensively discussed in the context of manufacturing (Caves, 1984; Dunning, 1993; Blomström and Kokko, 1998), however, little work has yet been undertaken on this direction for the service sector and specifically for retailing. This study aims to fill this gap and contribute to the understanding of the effects that foreign ownership and multinationality may entail for UK retailing. Our contribution is twofold: First, we compare foreign MNEs with other domestic MNEs and non-multinationals in the retail sector; furthermore we distinguish the later according to their regional presence. To do so we use a rich micro data drawn from the UK Annual Responses Database (ARD) and the UK Annual Foreign Direct Investment (AFDI) register. Merging the ARD and AFDI we construct a well informed dataset that provides us with information at the reporting-unit level on several measures of productivity performance, production inputs (including intermediate inputs), distributive services, geographical location of firms and country of origin for the period 1997-2003. We then proceed with the performance assessment of the domestic (UK) versus foreign-owned MNE retailers. To assess a broader range of firm attributes, we examine five different performance indicators, namely firm size, labour productivity, Total Factor Productivity (TFP), average wage and capital intensities. Special attention is paid to the measurement of TFP in retailing (Haskel and Khawaja, 2003). A further contribution of the present study is that we allow for different effects of multinationality on TFP at different quantiles of the productivity distribution. While ordinary least squares (OLS) regression estimates the mean of the dependent variable conditional on the covariates, we use the quantile regression estimator to estimate the effect of the covariates on different quantiles of the productivity distribution. This allows us to take better account of the large and persistent heterogeneity in productivity dynamics across establishments. Preliminary empirical results highlight the performance heterogeneity that tends to characterize firms of different country ownership and regional presence in our sample. The key preliminar findings are: • MNEs pay on average higher salaries when compared with their domestic counterparts. However, when differences in the origin of foreign ownership are accounted for, foreign (non-UK) MNEs outperform domestic multinationals. Those results may reflect differences in the recruitment policies of foreign versus UK MNEs, with the first investing heavier on skills and human capital than the second. • When controlling for age and size, all MNEs in our sample appear to hire more intensively than domestic non-MNE retailers. More specifically, UK MNEs hire more employees than foreign MNEs in both full time and part time contracts. • MNEs come up to be more productive than domestic non-MNEs, independently of the productivity measure used. When controlling for country of origin, UK multinational retailers are as productive as US MNEs in terms of labour productivity and TFP, whereas Rest-of-the-World (RoW) MNEs are not found to be significantly more productive than local non-MNE firms, except in terms of labour productivity. In addition, those non-MNE UK firms with plants located in different regions are significantly more productive than single plant retailers and multi-plant retailers located in a single region. • The quantile regression reveals that the coefficient of the ownership and location variables varies considerable as we move among the selected quantile of the productivity conditional distribution. In particular, the relative superior performance of UK_MNEs is evident when we concentrate our attention on establishment that are at the lower quantiles. Yet, as we move to upper quantiles, the estimated effect of foreign ownership on TFP becomes significantly positive, suggesting that ownership may play a significant positive role as firms attain higher productivity levels.

Profit Efficiency in Social Labor Services

Blank, Jos - Koot, Patrick

Session 15 A Parametric Frontier Applications
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A101 J.M KEYNES

In this paper we analyze profits and losses of Dutch Social Labor services. Social labor services provide sheltered work and wage subsidies for people with a mental or physical disability. In this paper we focus on environmental variables (including regulation), the allocation of resources and services provided and management performance. With micro level data of Social labor services firms through the years 2003-2005 we estimate a shadow profit function (Generalized Leontieff type). From the estimates we conclude that the composition of the population (age and severity of disability) affect profit efficiency. The paper also stresses the tension between social policies and economic rationality. The results also show that the socially preferred detachments based on wage subsidies are in general less profitable than sheltered work.

What Does the Distribution of Efficiency Look Like? A Nonparametric Deconvolution Approach

Parmeter, Christopher - Horrace, William

Session 15 A Parametric Frontier Applications
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Building A - First Floor - Room A101 J.M KEYNES

Stochastic frontier analysis is a unique tool that allows a deep understanding of inefficiency in producer theory. Unfortunately, the methods used are commonly criticized for what is believed to be arbitrary assumptions on the data generating process behind the behavior of firms and the realizations of inefficiency gleaned from them. The methods are further debilitated by the fact that these assumptions are inherently untestable, tying researchers hands when they are asked to justify the use of a particular distribution. This paper takes a step in cutting the chains that bound researchers using the stochastic frontier methodology by modifying commonly used deconvolution techniques from the statistics literature. These methods are adjusted to account for the bounded support and unknown mean of the distribution of (in)efficiency. Bandwidth selection and boundary correction methods are also discussed to provide a parsimonious overview of the deconvolution problem from a stochastic frontier approach.

Foreign Capital, Human Capital and Efficiency: A Stochastic Frontier Analysis for Developing Countries

Mastromarco, Camilla - Ghosh, Sucharita

Session 15 A Parametric Frontier Applications
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A101 J.M KEYNES

In this paper we use stochastic frontier analysis to study which of the three channels of technology diffusion, foreign direct investment (FDI), imports of machinery and equipment or research and development (R&D) expenditures affects the total factor productivity of developing countries. We also analyze whether a developing country's openness to technology diffusion is affected by their existing levels of human capital. We find that FDI, imported capital goods and imported R&D are all important channels for improving efficiency, as is human capital accumulation. However, the positive effect of FDI, imported capital goods and imported R&D depends crucially on the level of accumulated human capital. In addition, we find that in the process of technology diffusion the impact of human capital is more important for FDI than it is for imported capital and imported R&D.

Productivity Differentials or Different Production Technologies?

Bos, Jaap - Economidou, Claire - Koetter, Michael - Kolari, James W.

Session 15 A Parametric Frontier Applications
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A101 J.M KEYNES

We seek to contribute to the empirical growth literature by, first, acknowledging that economies might employ their resources inefficiently and, second, explicitly account for the fact that countries may employ different production technologies at different times. We propose a panel production frontier with latent class structure where capital and labor elasticities are allowed to differ across groups of countries. Membership in these groups are estimated rather than determined ex ante. Based on 73 countries over the period 1970-2000, we identify three groups. While changes in inefficiency are small, efficiency levels differ considerably across groups. In line with expectations, especially Sub-Saharan Africa exhibits the highest levels of persistent inefficiency. Hence, policies that aim to support growth in less developed regions should focus on the efficient use of existing technologies rather than fostering capital accumulation or technical advances alone. Overall, scale effects (input growth) provide the major impetus for total factor productivity growth in all groups of countries.

Research Efficiency in Public Centers: The Case of the Spanish Food Technology Program

Zofio Prieto, Jose Luis - Zabala Iturriagagoitia, Jon Mikel - Jiménez Sáez, Fernando

Session 15 B Public Sector Contributions to Productivity
Saturday, June 29, 2007 09:00 - 10:30
Building A - Second Floor - Room A201 J. MONNET

We rely on efficiency analysis to evaluate the Spanish R&D public policy based on financial incentives, and investigate to what extent this instrument has been able to promote a multidimensional research output mix, contributing therefore to the articulation of a successful Spanish Food Innovation System. That way, we assess the research efficiency within the Spanish Food Technology Program by evaluating the ability of individual research units to produce multiple scientific outputs consisting of patents, international journal articles, patents, PhD.s, trained personnel and private sector contracts, while competing among themselves for their input endowments: full time equivalent staff and public financial funds. In this sense we assess whether this policy has contributed to the creation, strengthening and promotion of units whose activities present a balanced and comprehensive production of complementary research outputs: training, science and technology results, and socio-economic collaboration with the private sector. We model the research production technology by way of the generalized distance function recently introduced by Chavas and Cox (1999), which allows for simultaneous and equiproportional output increases and inputs reductions. From an applied perspective, research efficiency is calculated by way of non-parametric programming Data Envelopment Analysis. Characterizing the alternative ways in which the different research units have been participating in the Spanish Food Technology Program, and hence their role within the innovation system, we conclude that R&D policy efforts have not succeeded in achieving a multidimensional research output due to lack of incentives – mainly lack of a sustained budget that would enable the consolidation of emerging research units. Furthermore, we observe that the majority of research units channel their research efforts toward achieving science-technology results related to publications and submitted patents, instead of increasing socio-economic results that would help strength the articulation and efficiency of the innovation system. Besides, we identify different types of research groups, namely consolidated, specialized, mixed, emerging and “shooting stars” among those efficient units that define the production frontier.

Testing for Substitutability between Factors of Production with an Application to University Administration

Ferrari, Alessandra - Casu, Barbara - Thanassoulis, Emmanuel - Despic, Ozren

Session 15 B Public Sector Contributions to Productivity
Saturday, June 29, 2007 09:00 - 10:30
Building A - Second Floor - Room A201 J. MONNET

This study addresses the issue of inputs substitutability, namely when two inputs are both necessary for production but their levels may be independent or in fixed proportion. This question arose when assessing cost efficiency in UK university administration, where the two main inputs are only available in staff and non-staff categories. The paper demonstrates the problems arising from imposing zero substitutability and illustrates the tests to establish whether the presence or absence of substitutability is more plausible. Finally, the paper also demonstrates the policy implications of the alternative assumptions on the results of the cost efficiency analysis.

Productivity, Spillovers and Human Capital

Sena, Vania

Session 15 B Public Sector Contributions to Productivity

Saturday, June 29, 2007 09:00 - 10:30
Building A - Second Floor - Room A201 J. MONNET

This papers measures the extent to which British establishments, having access to a more qualified workforce at a regional level, can benefit more from R&D spillovers than establishments located in areas with less qualified workforce, after controlling for the firms' stock of R&D, skills of the workforce and other characteristics. To this purpose we have estimated a production function on a panel of firms (establishments) drawn from the Annual Business Inquiry (ABI) over the period 1997-2002 where both measures of knowledge spillovers (measured at different levels of geographical disaggregation) and regional density of human capital (computed using information from the Labour Force Survey) - and their interactions - appear among the factors that can affect firms' productivity. Geographical density of human capital is measured as the industry-specific average educational attainment in a region. The main results are consistent with our expectations that the regional density of the stock of human capital available to a firm will condition its capability of absorbing knowledge spillovers.

Co-plot: A Useful Tool to Detect Outliers in DEA

Mahlberg, Bernhard - Raveh, Adi

Session 15 C Innovative DEA Applications
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A103 M. CROZIER

The main goal of this research is to compare and contrast two methodologies that exist within the multi-criteria decision making field. After presenting Data Envelopment Analysis (DEA) and the Multi-Dimensional Scaling approach (Co-plot), the two techniques are evaluated and compared against data on Program Follow Through (PFT) reported by Charnes et al. (1981). It would seem that cross-fertilization of these two methodologies sheds additional light on the definition of DEA efficiency and grouping in Co-plot, it may also be useful to apply both approaches in the future. Comparison shows that Co-plot may be useful prior to a DEA in order to identify outliers that require additional scrutiny. Furthermore, there is a clear connection between DEA efficient units and the results of a Co-plot analysis using variable ratios; consequently Co-plot could be useful as a graphical tool helping to interpret the results of a DEA.

Analyzing the Structure of Inefficiency

Asmild, Mette - Bogetoft, Peter - Hougaard, Jens Leth

Session 15 C Innovative DEA Applications
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A103 M. CROZIER

When models of efficiency measurement are applied to empirical data sets, there are often good reasons to question the estimated levels of efficiency. Naturally the applied model itself may be misspecified, but even with a fairly good representation of the DMU's activities there may still be many reasons for seemingly irrational and inefficient behaviour by individual DMU's. Following the notion of rational inefficiency introduced in Bogetoft & Hougaard (2003) we develop a more detailed, yet simple, agency model in order to further analyze and understand the structure and composition of input slacks amongst the DMU's. The theoretical model are applied to a comprehensive data set on Canadian bank branches and by using panel data we are furthermore able to investigate the development over time in the slack structure of each DMU.

The Effect of Age on the Performance of Professional Golfers

Fried, Harold - Tauer, Loren

Session 15 C Innovative DEA Applications
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A103 M. CROZIER

The relationship between age and performance on the PGA tour is complex. Beyond some point, athletic prowess declines, but at the same time, the increase in experience is a compensating factor. This suggests an inverted U shaped relationship between age and performance that could vary across golfers and be confounded by the late and dramatic successes of golfers such as Corey Pavin and Jack Nicholas. The objective of this paper is to reveal the relationship between age and performance in general and at the level of the individual golfer. As Corey and Jack demonstrate, it is critical to adopt a technique that is robust to the impact of outliers. The dataset consists of golfers on the PGA tour for the years, 2004 – 06. Earnings per event is the measure of performance. Explanatory variables include the generally accepted measures of athletic golfing ability: driving distance, percent of drives in fairway, percent of greens hit in regulation, sand saves, and average putts per hole (fewer is better). All variables are measured as annual averages over the PGA season. A frontier technique is used to identify best-practice golfers for given levels of athletic golfing ability. Inefficiency can be interpreted to measure the ability to perform under pressure. Golfers with similar levels of golfing ability can have dramatically different earnings per event. The inefficient golfer attains a seasonal average ability measure as a result of doing well, perhaps, on Thursday, Friday, possibly Saturday and folding to the pressure on Sunday – missing the big pay check that goes to the tournament winner. The efficient golfer attains the same seasonal average ability measure as a result of putting four excellent rounds together over the course of a tournament, handling the pressure of competing at the top of the leaderboard on Sunday and winning the big paycheck. We use the Daraio-Simar (JPA, 2005, “Introducing Environmental Variables in Nonparametric Frontier Models: A Probabilistic Approach) methodology that utilizes order-m frontiers, which embeds the standard DEA methodology into a probabilistic production framework and mitigates the influence of outliers such as Tiger Woods. Age is treated as an environmental (exogenous) variable. Efficiency scores are calculated with and without age. The impact of age is based upon a ratio of these scores. This approach enables us to identify the influence of age on golf performance for the individual golfer and in general. The global conclusions on age are based upon non-parametric regression, which captures the nonlinear complexity of age on performance. It is also possible to obtain individual measures of the impact of age on performance

What Can we Learn from the Application of Frontier Analysis to Sporting Performance

Simpson, Gary

Session 15 C Innovative DEA Applications
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A103 M. CROZIER

Applications of the Data Envelopments Analysis and Stochastic Frontier Analysis to assessing the performance of individuals and teams in sporting events are reviewed. A number of problems are identified and illustrated with simple examples from the sports of Tennis and Soccer. The difficulties relate to the stochastic nature of outcome measures of sporting performance and highlight the need to carefully construct performance measures and to consider the homogeneity of variance of the efficiency. We conclude by encouraging the consideration of these issues in more conventional applications of Frontier Analysis.

IT Productivity and Productivity Paradox: A Semiparametric Smooth Coefficient Estimation

Chen, Jong-Rong - Huang, Cliff - Liu, Ting-Kun

Session 15 D IT and Productivity
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A121 M.E. PORTER

This paper explores the issue of whether information technology (IT) investment brings about the Solow productivity paradox. This paper considers, aside from the general specification of the Cobb-Douglas production function, the impact of augmented labor productivity through IT by applying semiparametric smooth coefficient estimation on the idea that the impact on the total factor productivity (TFP) may not be neutral. The rising trend of the wage rate in the high-tech industries, the so-called ¡§skill-biased technological change¡¨ phenomenon, provides empirical evidence of the non-neutral impact of IT on labor productivity. This is also indicated by the huge increase in the share of personnel spending across sectors and industries for the years from 2000 to 2004, according to the Directorate General of Budget, Accounting and Statistics (DGBAS) Therefore, a generalized semiparametric production function is used to appraise the impact of IT on TFP in general and on labor productivity in particular. Employing the manufacturing firm-level data of Taiwan in 1991, the empirical results show that IT investment provides a significant contribution to productivity and the observed production in the Taiwanese manufacturing firms is shown to be increasing return to scale. Besides, IT has a significant spillover impact on the labor productivity, particularly for larger and more IT deepening firms. That is, they also demonstrate that the ¡§share¡¨ of IT in production is not constant and that IT has a non-neutral impact on the productivity of labor. We also find that when IT reaches a certain threshold, it starts to have a spillover impact on the productivity of labor. In fact, the spillover impact ¡§takes over¡¨ the direct impact of IT on output. The direct impact of IT on output decreases when the spillover impact on the productivity of labor increases. This result could explain some studies¡¦ finding that IT has a productivity paradox. It could also be the reason that most of them neglect the non-neutral or spillover effects from IT on the productivity of labor or other inputs.

Does IT-Outsourcing Increase Firm Success? A Firm-level Investigation for Germany

Ohnemus, Joerg

Session 15 D IT and Productivity
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A121 M.E. PORTER

Outsourcing, especially Information Technology (IT) outsourcing was widely discussed during the last years. The focus thereby was mainly on the negative effects for the local labor market through the expected loss of high qualified jobs by the outsourcing of firms' IT-activities to foreign countries.One aspect often forgotten in this lively discussion is the possible positive impacts of IT-outsourcing for the subsequent firm performance. In most companies IT-activities don't belong to their core competencies. Furthermore, external IT-service providers are able to provide the same service at better quality and lower costs. As a consequence, it would be reasonable to assume, that for firms which source out their IT-tasks, one could observe an increased future performance. The aim of this paper is to analyze the effects of IT-outsourcing at the firm-level using a comprehensive and representative dataset of German firms with five and more employees collected in 2000 and 2004 by the Centre for European Economic Research (ZEW). The focus thereby lies on the effects of IT-outsourcing on labor productivity and firms labor force growth as measures of firm success. To explore productivity effects an endogenous switching regression model as in Bertschek and Kaiser (2004), together with an production function approach is employed. The decision to outsource IT-services defines two labor productivity regimes. The first regime includes firms which decided to source out IT-services, the second regime covers those firms without IT-outsourcing. The endogenous switching regression models allows, in contrast to standard regression techniques, a more flexible effect of IT-outsourcing on labor productivity, as it permits IT-outsourcing to change the entire set of partial productivity elasticities. The growth rate of the firms'; labor force is examined by an instrumental variable approach, accounting for the potential endogeneity of IT-outsourcing on the firms'; growth rate. The results for the labor productivity analysis show, that multifactor productivity is significantly higher for firms which are active in IT-outsourcing compared to their counterparts without IT-outsourcing. Furthermore, the specification of an endogenous switching model is confirmed by the estimation results. For the firms'; labor force growth rate between 2000 and 2004, there is only a weakly significant positive contribution of IT-outsourcing observable. Although we can';t see a highly significant positive contribution, this result at least counters the broad belief, that IT-outsourcing automatically kills jobs in the medium term.

InnovaTion, InvesTment and ImiTation: How Information and Communication Technology Affected European Productivity Performance

Los, Bart - Timmer, Marcel

Session 15 D IT and Productivity
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A121 M.E. PORTER

In many studies of recent economic growth performances with an international comparative perspective, capital inputs have been disaggregated. It is often argued that information and communication technology (ICT) has characteristics of a general purpose technology (see David, 1990; Brynjolfsson & Hitt, 2000), which justifies treatments of ICT capital goods distinct from non-ICT capital goods. Traditional growth accounting studies that apply this distinction find total factor productivity growth in market services in the United States, but not in Europe (see Jorgenson, Ho & Stiroh, 2005; Timmer & Van Ark, 2005). According to Aghion & Howitt (2006), the productivity slowdown in Europe is a consequence of exhaustion of imitations in 'old' technologies, while it is lagging in the application of new ICT-based innovations developed in the US. This argument can be put into the perspective of the "appropriate technology" growth theory proposed by Basu & Weil (1998). In their theory, the extent to which innovations by leaders will be beneficial to followers is dependent on the degree to which the technologies operated by leaders and followers is alike. In the Basu & Weil framework, Europe's mediocre performance in imitation would thus be due to insufficient investment in ICT capital. Another explanation could be that the opportunities for imitation of successful US innovation is present, but that Europe lacks the absorptive capacity to actually turn these potential 'spillovers' into productivity gains. Such an explanation is more in line with arguments put forward by Nelson & Pack (1999). In this paper, we propose a new decomposition method that allows for a division of labor productivity into the effects of actual assimilation of potential spillovers and the growth of potential spillovers. The growth of potential spillovers can be due to both technology upgrading (by investing in ICT-intensive technology) and innovation by world leaders. Hence, labor productivity performances of EU countries can be compared in terms of the Basu & Weil arguments and Nelson & Pack's. The approach is an adapted version of Los & Timmer (2005) and requires the estimation of a global productivity frontier. This will be done by means of Data Envelopment Analysis techniques, with labour, ICT capital and non-ICT capital as inputs. We will study productivity trends (1990-2004) in two broad sectors, manufacturing and market services. For these sectors, we will answer the following questions: "How many years are European countries lagging the US in terms of ICT adoption?", "How well are European countries able to turn potential spillovers from US innovations into productivity gains?", and "To what extent can regulation and the supply of skilled labor explain differences in abilities to benefit from potential spillovers?". The data used for this analysis are taken from the recently launched EUKLEMS database. The countries included in the analysis are the EU-15 (minus Luxembourg and Ireland) and the US.

Portfolio Selection with Higher-Order L-Moments: A Robust Non-Parametric Mean-Variance-Skewness-Kurtosis Efficient Frontier

Jurczenko, Emmanuel - Maillet, Bertrand - Merlin, Paul - Yanou, Ghislain

Session 15 E Portfolio Performance
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A120 E. MALINVAUD

This paper proposes a robust non-parametric portfolio selection criterion for the static asset allocation problem in a higher-order L-moments space. Using the shortage function approach by Luenberger (1995), we generalize in this article the multimoment optimization approaches of Briec et al. (2004 and 2007) and Jurczenko et al. (2006), in the four L-moments space to deal with the poor sample properties and determinacy problems of the traditional moments. After a theoretical presentation of the univariate L-moments and of their multivariate extensions (see Hosking, 1989, and Serfling and Xiao, 2007), we derive a four-dimensional representation of the primal non-convex mean-L-variance-L-skewness-L-kurtosis weakly and non-dominated efficient portfolio sets, using an universe of 162 European stocks. We also investigate on our sample, the relative performances of some specific efficient portfolios such as the global minimum variance, the global maximum L-skewness and global mininimum kurtosis portfolios.

Geometric Representation of the Mean-Variance-Skewness Portfolio Frontier: A Shortage Function Approach

Kerstens, Kristiaan - Van de Woestyne, Ignace - Mounir, Amine

Session 15 E Portfolio Performance
Saturday, June 29, 2007 09:00 - 10:30
Building A - First Floor - Room A120 E. MALINVAUD

The literature suggests that the portfolio efficiency based on the mean-variance-skewness is more desirable than the one based on the mean-variance efficiency. Furthermore, a plethora of researches attempted to develop the MVS efficiency through a non parametric efficiency analysis tool . However the visual method presenting the results of those performances especially in three dimension spaces is difficult due to added the skewness. Based on the shortage function, introduced recently in the portfolio management as a measure of efficiency, this paper presents the first geometric representation of the MVS portfolio frontier.

Efficiency Consultation in Engineering: Is it Worth the Investment?

Lay, Helen (Indepen Consulting) -
Walden, John B. (NOAA/NEFSC) -
Johnson, Andrew (Texas A&M University) -
Triantis, Kostas (Virginia Tech)

Session 15 F Round Table
Saturday, June 29, 2007 09:00 - 10:30
Building B - Second Floor - Room B253

Engineering is concerned with the design of products, services, processes, or in general with the design of systems. These design activities follow well documented engineering life-cycle management processes. Within these design processes performance evaluation plays a fundamental role of assessing conformance to requirements. In the last twenty years plus years, there has been limited research that documents the use of efficiency analysis in engineering design and consulting. One can attribute this to a number of issues that include but are not limited to: 1) The definition of what constitutes a reasonable unit of analysis; 2) The specification of what are defined as reasonable input, output, environmental, infrastructure, etc. variables. How do the underlying technologies and knowledge processes support the definition of these variables? 3) Data and information issues given that information systems are not typically designed to facilitate performance analyses; 4) The linkage to system design decision making is ambiguous and the mapping between the modeling world and the "real world" is not obvious; 5) The definition of effective experiments in the context of the application of efficiency models; What can these experiments tell us about the existing production theory? 6) What is model validity and robustness? How do we know that our models are useful? How do we assess impact of the application? In this same vein, how do we provide feedback for recurring model formulations? This roundtable discusses some of these and additional issues beginning with the 1999 NSF workshop of engineering applications of efficiency analysis where a formal attempt to bridge the efficiency analysis paradigm to classical engineering disciplines was attempted.

Incorporating the Price of Quality into Benchmarking UK Electricity Distribution

Yu, William - Jamasb, Tooraj - Pollitt, Michael

Session 16 A Public Utilities & Regulation (YR)
Saturday, June 29, 2007 11:00 - 12:30
Building A - First Floor - Room A101 J.M KEYNES

Efficiency analysis and benchmarking of electricity distribution networks in regulation is generally limited to technical efficiency measures and important and non-tradable aspects of the operation of networks such as quality of service and energy losses are not part of the analysis. A regulatory concern is that companies may achieve cost saving and technical efficiency at the expense of allocative efficiency. This is partly due to the fact that valuation of these factors and their inclusion in models is difficult. This paper presents a method and model to measure and incorporate service quality and energy losses and analysis of allocation efficiency that allows us to obtain a more holistic picture of the firms¡¦ performance with a view to overall economic efficiency. We calculate technical and allocative efficiency of the 14 electricity distribution networks in the U.K between 1990/91 and 2003/04 using Data Envelopment Analysis technique. We find that both of these efficiency measures have improved during the first (1990/91-1994/95) and second (1995/96-1999/00) distribution price control reviews and exhibited a slight decline during the third (2000/01-2004/05) review period. We find relatively low allocative efficiency indicating that firms are not adopting a correct mix of inputs given the price of outputs. In other words, there is a mismatch in allocating resources among expenditures, service quality, and energy loss reduction. The results also imply that the utilities are not sufficiently incentivised to achieve a socially optimal bundle under the current incentive scheme.

Predicting Efficiency Differentials for Operators under Multiple Regulators

Lorenz, Mathias - Agrell, Per

Session 16 A Public Utilities & Regulation (YR)
Saturday, June 29, 2007 11:00 - 12:30
Building A - First Floor - Room A101 J.M KEYNES

Several of the largest infrastructure operators in the energy sector are international firms subject to multiple national network regulations. A game-theoretic argument supports the hypothesis that these internationally consolidated infrastructure operators behave more strategically under complementary regulatory regimes in neighbouring countries than their national competitors. We validate this hypothesis with Swedish and Norwegian panel data for regulated electricity distribution system operators (DSO) for the years from 2000 to 2004. A non-parametric frontier model using aggregated and disaggregated DMU for the international operators is proposed following the work in NEMESYS (2005). We investigate how the industry's efficiency is affected by the presence of consolidated distribution operators; we compare efficiency scores and catch-up behaviour over time with respect to ownership. The results provide complementary information to the ongoing discussion on the effectiveness of high-powered regulation in the presence of heterogenous firm-level objectives and ownership structures, as well as recent studies on horizontal mergers and acquisitions among Scandiavian DSOs. From a policy viewpoint, the study can be seen as a support for the harmonization of infrastructure regulation in zones with high mobility of labour and capital.

Spatial-Temporal Dimensions of Efficiency Among Electric Cooperatives in the Philippines

Lavado, Rouselle - Barrios, Erniel

Session 16 A Public Utilities & Regulation (YR)
Saturday, June 29, 2007 11:00 - 12:30
Building A - First Floor - Room A101 J.M KEYNES

The efficiency of 119 electric cooperatives in the Philippines from 1990-2002 is analyzed using a stochastic frontier model augmented with spatial-temporal terms, addressing the underestimation of technical efficiency usually encountered among maximum-likelihood based methods. The model is also robust to the choice of environmental variables that will be included in the inefficiency equation provided that the spatial distance measure substantially captures the efficiency-enhancing factors. The average of estimated technical efficiency is 0.86. The growth in technical efficiency of 1-2% per year is explained by the slow adjustment process in the operation of the cooperatives lacking the medium to feedback production outcomes in the previous year to their operation cycle in the following year. Medium-sized cooperatives need to organize for strategic competitive advantage and to facilitate attainment of production efficiency.

Efficiency and Effectiveness in Water Distribution: A Challenge for African Companies

Tarsim, Achraf - Estache, Antonio - Perelman, Sergio – Saal, David

Session 16 A Public Utilities & Regulation (YR)
Saturday, June 29, 2007 11:00 - 12:30
Building A - First Floor - Room A101 J.M KEYNES

Water distribution in Africa is an important target of the Millennium Development Goals (MDGs) (World Bank, 2004). International development agencies and national authorities are therefore pressuring water utilities to improve their effectiveness by serving a greater proportion of the population, providing higher per capita volumes of water, and improving both water and service quality. This objective implies an efficiency challenge for water utilities in most African countries. Different factors influence efficiency in water distribution: These include access to and quality of water sources, geography, weather conditions, customer density, network characteristics such as age and quality and, last but not least, institutional settings. From an international perspective, African water utilities face probably the worst conditions in several of these dimensions, as illustrated by their high network losses, as well as the relatively poor institutional environment in which they operate. The purpose of our research is to estimate the performance of 51 African water distribution companies in 2001 with data available from the Water Utility Partnership's SPBNET website. The methodology used is a parametric stochastic output distance function, which allows a multi-output multi-input setting, and is also appropriate given the desire to maximize water service availability and quality given available inputs. The technology is assumed to be translog with two outputs: legitimate water consumption and population served; and three inputs: employees, other operational costs and water losses. Moreover, we further control for other exogenous factors that may influence input requirements. Thus, our model takes into account two dimensions that, particularly for less developed countries, should be important: population served and water network losses. Our preliminary results show that both population served and water network losses matter. On the output side, this suggests that given limited inputs, African utilities must choose between serving a greater proportion of the population or increasing per capita water consumption for those already served. Similarly, on the input side, there is the potential to substitute water losses for operational costs (staff costs and others). Moreover, as expected, it appears that companies' efficiency scores must be adjusted to take into account specific exogenous characteristics, such as outsourcing of key activities, and the type of technology used to collect water.

Regional Dimension of the Impact of Foreign Direct Investment on the Host Economy: A Case of Ukraine

Kravtsova, Victoria

Session 16 B Macro Economic and Environmental Issues (YR)
Saturday, June 29, 2007 11:00 - 12:30
Building A - Second Floor - Room A201 J. MONNET

This paper contributes to the methodology of evaluating the impact of FDI on the host country by taking into account the impact of FDI on the regional level. The methodology also accounts for both impact on the technical and efficiency change of domestic firms. The empirical analysis of the economic development with regard to FDI in Ukraine suggests that foreign presence has positive impact on the efficiency change of domestic firms in the Eastern regions of Ukraine, but has a negative effect on the technical change of the firms. At the same time there is a positive spillover effect on the firms operating in the Western regions of Ukraine in terms of technical change. Different impact of foreign presence on the performance of firms in two parts of Ukraine might reflect deep institutional divergence of the West and the East.

Efficiency and Export Activities of Vietnamese Small and Medium Enterprises: Does Export Matter?

Nguyen Dinh, Chuc - Simpson, Gary - Thanassoulis, Emmanuel - Nguyen Ngoc, Anh

Session 16 B Macro Economic and Environmental Issues (YR)
Saturday, June 29, 2007 11:00 - 12:30
Building A - Second Floor - Room A201 J. MONNET

This paper analyses the efficiency of small and medium enterprises (SMEs) and considers their export activities. Particularly, it examines the effect of exporting activities on efficiency of Vietnamese small and medium enterprises, the effect of attending export sector on both technical efficiency and allocative efficiency of SMEs is analysed. Technical and allocative efficiency scores of SMEs in different sectors of the developing economy of Vietnam are estimated using Data Envelopment Analysis (DEA). Technical and allocative efficiency scores and the statistical analysis followed are based on data obtained from the Small and Medium Enterprises Survey and the Enterprise Consensus Survey in Vietnam. The investigation clarifies that whether the best enterprises in term of technical and allocative efficiency are those who do export or not.

The Impact of ICT-use on Efficiency and Productivity

Bin, Wang - Hailin, Liao

Session 16 B Macro Economic and Environmental Issues (YR)
Saturday, June 29, 2007 11:00 - 12:30
Building A - Second Floor - Room A201 J. MONNET

The role of information and communication technology (ICT) on productivity growth and therefore growth differentials among economies has attracted a great deal of attention in the economic literature given the evidence of a strong pace of investment in highly productive ICT equipment associated with the sharp decline in its relative prices since the 1990s. In literature, growth accounting involves a statistical decomposition of growth in labor productivity into contributions from capital deepening and multifactor productivity (MFP) growth, and two links between ICT and labour productivity growth are possible: increased capital deepening through ICT investment and gains in MFP associated with ICT-use and ICT-producing. While most of these factors (increase in capital deepening by both ICT-capital and non ICT-capital, and MFP gain due to ICT-producing) were widely accepted, the contribution that ICT-use made to MFP growth is still controversial. For example, if considering the interesting case of Australia with both high level ICT-use and MFP growth, there is no way of determining from the aggregate growth accounting whether, or to what extent, use of ICT is associated with the acceleration in MFP growth (Gretton, et al. 2003). This paper investigates the relationship between the use of ICT and MFP with an aim to compare the technical efficiency change (TEC) of the relevant ICT-using sectors in both Australia and the U.S., by arguing that the MFP gains partially from ICT-use sectors due to a positive contribution in TEC while ICT-producing improves MFP mainly through technology progress (TP). The application of Bayesian (parametric) stochastic production frontiers to a comprehensive industry-level data set provides us with empirical evidence that ICT-using sector has a significantly positive effect on technical efficiency, and hence, contributes to the overall productivity growth.

Estimation of Environmental Efficiencies and Shadow Prices of Pollutants: Stochastic Frontier Analysis Approach

Salnykov, Mykhaylo

Session 16 B Macro Economic and Environmental Issues (YR)
Saturday, June 29, 2007 11:00 - 12:30
Building A - Second Floor - Room A201 J. MONNET

Recently the topic of measuring efficiencies of technologies when some outputs are undesirable became increasingly popular in the field of productivity analysis. To analyze those technologies the researchers traditionally used output oriented directional distance function (ODDF) that credits production of desirable outputs and debits production of undesirable outputs. Depending on the purposes of the research the studies used either parametric (usually Translog) specification of ODDF or nonparametric Data Envelopment Analysis (DEA) approach. It was unusual, however, for the studies in the field to use the increasingly popular tools based on the Stochastic Frontier Analysis (SFA). We attempt to fill the existing gap by applying SFA technique to analyzing multi-output technologies with some outputs being undesirable in order to estimate environmental efficiencies of the decision making units (DMUs) and shadow prices of various pollutants (CO2, SO2 and NOx). We use macro level cross sectional data for 97 countries with GDP being the desirable output and air pollutants being undesirable outputs. Shadow prices of pollution assess short run perspectives of increase in pollution when GDP is increased and may serve as a reference value for environmental taxes and prices for international emission trade and can be interpreted as marginal abatement cost of pollution; efficiency represents a long term perspective of countries to increase GDP and decrease pollution simultaneously. Our results indicate that countries value pollutants proportionally to their impact on human health (i.e. hazardous pollutants have the highest shadow prices). We find that in both rich and poor countries can be fully environmentally efficient, while most of the countries in transition (CITs) are inefficient. Our findings imply that under emission trade agreements CITs will generally be permit sellers. By selling permits they will hamper their future ability of economic growth, thus some restrictions (which we propose) must be made to limit this effect for CITs. Our estimates show that currently global wealth and pollution are allocated inefficiently. We draw three illustration how our estimates can be used in public policy.

Cost and Revenue Efficiency in the German Life Insurance Industry: Direct versus Agent-based Insurers

Trigo Gamarra, Lucinda - Growitsch, Christian

Session 16 C Financial Sector (YR)
Saturday, June 29, 2007 11:00 - 12:30
Building A - First Floor - Room A103 M. CROZIER

In most insurance markets, independent agents, dependent agents, and the direct sale of insurance products via phone or the internet coexist as distribution channels. Although direct sale is known to be the least cost-intensive channel of distribution, insurance products continue to be distributed via all three ways. On the German insurance market, dependent agents are the predominantly used channel of distribution. But as one result of the liberalisation of the German insurance market in 1994, direct insurance companies have gained importance on the German market, although agent-based distribution is still the dominant sales channel for insurance products in the German market. Thus, this paper analyzes the question why the less costly direct distribution has not gained more significance on the market until today. Economic theory provides varying explanations for the coexistence of different distribution systems, among them the market imperfections and the product quality hypotheses. The product quality hypothesis states that the two systems of agent-based distribution on the one hand, and direct sale on the other hand may be able to coexist because they differ in the services they offer and the clientele they attract. As a result, the higher costs of the agency system are compensated by a higher level of service quality compared to the direct distribution of insurance. According to the market imperfections hypothesis the direct distribution on the one hand, and the agency-based distribution system on the other hand do not differ in the quality they offer to the customer. According to the market imperfections hypothesis, the more cost-intensive agent-based distribution channel continues to exist only due to prevailing information asymmetries on the market. Methodologically, both hypotheses can be tested by analysing the cost and profit efficiency of the examined insurance companies. For it, insurance companies are separated into a group of direct insurers, and a second group mainly using agency-based distribution. Regarding the cost efficiency levels, it can be supposed that direct insurers show higher efficiency scores as they do not deploy cost-intensive agents to distribute their products. However, only by including revenues into the analysis, it is possible to consider the profit efficiency levels besides the costs. Measuring profit efficiency levels allows for the possibility that agency-based firms show additional costs compared to direct insurers, but at the same time provide superior service for which they are compensated by higher revenues. Assuming a higher cost efficiency of direct insurance companies, similar profit efficiency levels of agency-based firms and direct insurers would indicate that agent-based insurers are compensated by higher revenues for their services. In that case, the product quality hypothesis could not be rejected. A converse result would argue for the market imperfections hypothesis holding true. Data Envelopment Analysis is employed to estimate company specific efficiency scores. The output is proxied by the incurred benefits net of reinsurance in a given year to proxy the risk-bearing function. The intermediation function is proxied by the output variable of expenses for refunds of premiums. The expenses for refunds of premiums are a special characteristic of the German insurance system. They represent the part of the investment income, which benefits the policyholders besides the incurred benefits. The revenues of an insurance firm, which are needed to calculate the profit efficiency, are represented by the earned premiums net of reinsurance and the net investment income of the insurance firm. Concerning the inputs, administration and acquisition expenses are used to model the inputs of labour force, business services, and materials used in the production of the insurance products. Equity capital proxies the input for insurers' risk-bearing and risk-pooling function. To estimate efficiency, financial data was obtained from periodically published insurance industry reports and insurers' income statements for the years 1997-2005. The data set includes information about approx. 110 German life insurance companies for each year, approx. 10 companies being direct insurers, and 90 firms mainly distributing their products through agents. Our results indicate that agency-based insurers show on average lower cost efficiency levels compared to direct insurers, as could be expected. But these efficiency differences are compensated when calculating profit efficiency, where agency-based and direct insurers do not show significant differences. Thus, agency-based insurers are compensated with higher revenues for their superior services. This would result in a separating equilibrium which makes it able for agency-based and direct insurance companies to coexist. Summarizing, we find evidence, that the product quality hypothesis holds true on the German life insurance market.

Parametric Estimation of Merger Related Efficiency Gains

Gourlay, Adrian - Ravishankar, Geetha - Weyman-Jones, Thomas

Session 16 C Financial Sector (YR)
Saturday, June 29, 2007 11:00 - 12:30
Building A - First Floor - Room A103 M. CROZIER

This paper offers an insight into the effectiveness of economic policy reforms in the Indian Banking System by examining the efficiency benefits of mergers among Scheduled Commercial Banks (SCBs) in India over the post-reform period 1991-92 to 2004-05. The analysis is performed in two stages. In the first, the potential for efficiency gains is determined a priori to the merger using hedonic outputs constructed from the outputs of the parent entities. In the second stage, the degree to which these potential gains, if any, were realised is measured by combining the estimate of the Technical Efficiency (TE) of the bank with an analysis of its productivity change. The Malmquist Index of Productivity (MIP) lends itself readily to this analysis providing the added advantage of encompassing a decomposition of the productivity change to its component technical change and technical efficiency change. Thus estimating this change in productivity, particularly between the pre merger year and the first post merger year, would indicate (a) if there was any merger related productivity benefit (b) the degree to which potential technical efficiency was realised and (c) the degree to which the technical efficiency of the bank changed and its direction of change. Both stages employ Stochastic Input Requirement Functions to measure the merged bank's efficiency. We also provide a metric for judging the success or failure of a merger. To-date there have been relatively few studies focusing on the mergers and acquisitions scenario in India and even fewer focusing on the efficiency benefits of mergers involving SCBs. This paper addresses this current weakness in the literature.

State-Space Models, Technological Change and Initial Conditions

Severgnini, Battista

Session 16 D Methodological Advances in Efficiency & Productivity (YR)
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Building A - First Floor - Room A121 M.E. PORTER

The State-Space models provide an accurate and innovative method for estimating the rate and the biases of the technological change. The implementation of this methodology requires initial conditions which are often not possible to determine through the traditional econometric techniques and can confound the productivity estimates, especially when the inputs are affected by measurement errors. Applying the Kalman Filter to artificial data, we propose a computation of the initial condition for productivity exploiting some properties of the Malmquist index. Moreover, we compare our results in the Bayesian framework using Gibbs-sampling and provide more robust results. The empirical application is to Danish industries data.

Stochastic Frontier Model with Discrete Valued Dependent Variables

Fe-Rodriguez, Eduardo

Session 16 D Methodological Advances in Efficiency & Productivity (YR)
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Building A - First Floor - Room A121 M.E. PORTER

Stochastic Frontier Models (SFM) are the main statistical tool for the study of efficient production (see Aigner,Lovell and Schmidt, 1977, or Greene, 1990). The economic background of the model does not limit the utility of the model for other academic fields and, thus, areas like epidemiology can benefit from the SFM. In these other areas it is frequent to find problems related to the idea of a frontier, but where the random variable of interest has a discrete probability distribution function. To give an example, consider an study about the determinants of mortality in a population (for instance, different geographical areas within a country). It is appropriate to expect, at a given period in time, an minimal number of deaths, which will depend on a number of structural factors associated to all the areas. These could be the proportion of elderly people at the area, deprivation levels, or other measurable socio-economic variables. However, the actual number of deaths at each geography will depart from this optimal number of due to two different shocks. Firstly, the area might be subject to natural disasters or unexpected events which might cause unusually high numbers of deaths. Thus, the minimum number of deaths will vary randomly across geographies. On the other hand, a given area might be subject to idiosyncratic albeit unobservable effects (associated to its natural environment, population characteristics, crime rates, housing conditions and so on), which might lead to higher mortality than optimal. These effects can be seen as Technical Hazards -in the same way that technical inefficiency was defined in economic studies. In the type of situations we are describing, traditional SFM are not appropriate because they are built on the assumption that the random variable of interest has a continuous probability distribution function. At best, this will lead to inefficient estimation of the parameters in the model and ultimately to misleading inferences. In this article we make use of Copula Theory in order to develop a new Discrete Stochastic Frontier Model. Our method not only accommodates discrete frontiers, but also does not require to impose any restriction on the structure dependence of the technical inefficiency with the pure statistical error. In order to accurately measure the degree of association among these, we advocate the use of recent results by Denuit and Lamber (2005).

EWEPA X

LIST OF PARTICIPANTS

TENTH EUROPEAN WORKSHOP ON EFFICIENCY AND PRODUCTIVITY ANALYSIS

Lille, June 27-30, 2007

Efficiency and Productivity Analysis: Retrospect and Prospect

Organised by
GAPEM
P. Agrell, K. Kerstens, P. Vanden Eeckaut

Hosted by
IÉSEG School of Management
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