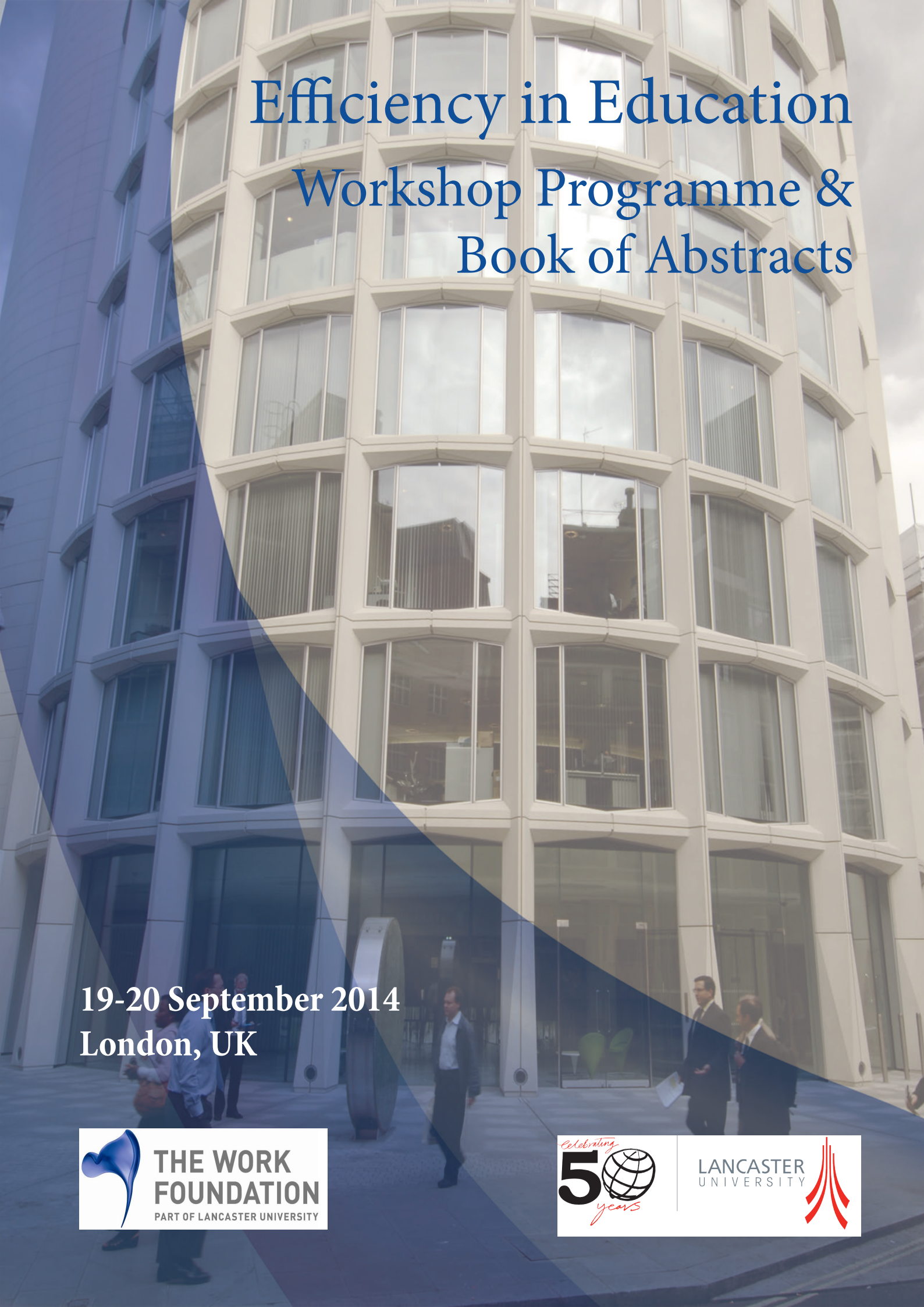

Efficiency in Education

Workshop Programme & Book of Abstracts

19-20 September 2014
London, UK

THE WORK FOUNDATION
PART OF LANCASTER UNIVERSITY

Celebrating 50 years
LANCASTER UNIVERSITY

It is a pleasure to welcome you to Lancaster University's Work Foundation for this conference on Efficiency in Education.

The Work Foundation is a London based think-tank that serves as Lancaster University's base in the capital. It transforms people's experience of work and the labour market through high quality applied research that empowers individuals and influences public policies and organisational practices.

The research agenda of the Work Foundation is wide ranging, covering labour market disadvantage, human resource management, health and wellbeing in the workplace, and demographic issues. Of particular interest in the context of this conference is our work on productivity and on skills.

The origins of the Work Foundation go back to 1918. It has had several name changes over the years, but acquired its current name in 2002, when the Industrial Society sold its training arm to Capita, leaving the Work Foundation as a think-tank focused on delivering research and policy advice to government and business. It became part of Lancaster University in 2010.

Lancaster University Management School has a long tradition of work in the area of efficiency. Its Operational Research department (now Management Science) was the first university department of its kind in the UK, and – alongside the rest of the university – celebrates its 50th anniversary this year. Indeed this conference forms part of the anniversary celebrations. Lancaster's work specifically on the economics of education has been at the forefront of work in this area for the last quarter of a century.

This conference promises to be a landmark event in the analysis of efficiency in education. We hope you will find it fruitful.

The Organising Committee, Efficiency in Education Workshop:

Geraint Johnes, Lancaster University Management School
Jill Johnes, Lancaster University Management School
Mike Tsionas, Lancaster University Management School
Emmanuel Thanassoulis, Aston Business School
Giannis Karagiannis, University of Macedonia

Friday 19 September 2014

08.30 – 09.30

Registration

09.30 – 09.45

Welcome Talk

Geraint Johnes

Director of The Work Foundation

Garnett Room

09.45 – 10.15

Invited Speaker

Emmanuel Thanassoulis

Aston University, UK

Assessing Research Productivity in Terms of Endogeneity or Exogeneity of Academic Salaries

Co-authors:
D. Despotis, D. Sotiros, Y. Smirlis

Garnett Room

Hyde Room

10.15 - 11.15

Session 1a

CHAIR: Roberto Zotti

- *The Impact of the Financial Crisis on the Efficiency of Italian Universities*

  Mattia Cattaneo, **Davide Donina,** Michele Meoli, Stefano Paleari, Davide Scotti

- *Regional Growth and Human Capital in Italy Using a Spatial Approach: Is There a Quality Effect of University Efficiency?*

  Cristian Barra, **Roberto Zotti**

Garnett Room

Session 1b

CHAIR: Tommaso Agasisti

- *Efficiency in Education Achievements: A Regional Disparities Analysis*

  Giuseppe Coco, **Raffaele Lagravinese**, Christian A. Mongeau Ospina

- *Using OECD-Pisa Data for Estimating the Efficiency of Secondary Schools in an International Perspective: Preliminary Results*

  Tommaso Agasisti, Pablo Zoido

11.15 – 11.45

Coffee Break

11.45 - 12.45

Session 2a

CHAIR: Chandra Shah

Hyde Room

- *Productivity Pay-offs from Academic Mobility: Should I Stay or Should I Go?*

  Ana Fernández-Zubieta, Aldo Geuna, **Cornelia Lawson**

- *Incentives for Relocating to Regional Australia: Estimates Using a Choice Experiment*

  Aaron Nicholas, **Chandra Shah**

Session 2b

CHAIR: Gabriela Sicilia

Garnett Room

- *Measuring School Demand in the Presence of Spatial Dependence: A Conditional Approach*

  Laura López-Torres, Diego Prior

- *Dealing with the Endogeneity Issue in the Estimation of Educational Efficiency Using Nonparametric Techniques*

  Daniel Santín, **Gabriela Sicilia**

12.45 – 13.30

Lunch Break

13.30 – 14.00

Invited Speaker

Maria Conceição A. Silva Portela

Centro de Estudos em Gestão e Economia da Católica Porto

Efficiency and Value Added in Secondary Education: The case of Portugal

14.00 - 15.30

Session 3a

CHAIR: José F. Maripani

Hyde Room

- *Efficiency Measurement of Turkish Public Universities with Data Envelopment Analysis*

  Taptuk Emre Erkoç

- *How Efficient Are Our Universities? A Stochastic Frontier Analysis of English and Welsh Universities*

  James Carroll, Adrian Gourlay, Anthony Glass, Thomas Weyman-Jones

- *Technical Efficiency and Total Factor Productivity Growth in Chilean Higher Education*

  José F. Maripani, Víctor H. Moreira López, Boris E. Bravo-Ureta

Session 3b

CHAIR: Daniel Santín

Garnett Room

- *Assessing European Primary School Performance Through a Conditional Nonparametric Model*

  José Manuel Cordero, Daniel Santín, Rosa Simancas

- *Student Learning Assessment: A Non-Compensative Robust Composite Measure in Italy*

  Francesco Vidoli

- *The Teacher Effect: An Efficiency Analysis from a Natural Experiment in Spanish Primary Schools*

  Daniel Santín, Gabriela Sicilia

Garnett Room

15.30 – 16.00

Coffee Break

16.00 – 17.00

Keynote Speaker

Kristof De Witte

Katholieke Universiteit Leuven

Efficiency in Education. A Review of Literature and a Way Forward

18.30 – 20.30

Reception at the House of Lords

Saturday 20 September 2014

09.15 - 09.45

Coffee

09.45 – 10.15

Invited Speaker

Jill Johnes

Lancaster University, UK

University Mergers in England: Effects on Efficiency

Co-author:
Mike Tsionas

Garnett Room

Hyde Room

10.15 - 11.15

Session 4a

CHAIR: Cecilio Mar-Molinero

- *Evaluating Impact of Mexican Higher Education Policy on State Universities Using Direct and Indirect Technology.*

  Herberto Rodríguez-Regordosa, Pablo Arocena-Garro, Emili Grifell-Tatjé

- *Exploring the Efficiency of Mexican Universities: Integrating DEA and MDS*

  Tommaso Agasisti, **Cecilio Mar-Molinero,** Marti Sagarra

Session 4b

CHAIR: María-Jesús Mancebón

Garnett Room

- *Efficiency of Upper Secondary Schools in Finland: Evaluating Persistent and Non-Persistent Differences in Value Added*

  Mika Kortelainen, Heikki Pursiainen, Jenni Pääkkönen

- *Financial Literacy, Maths Performance and Private Publicly Subsidised Schools in Spain*

  María-Jesús Mancebón, **Domingo Pérez Ximénez de Embún**

11.15 – 11.45

Coffee Break

11.45 - 12.45

Session 5a

CHAIR: Ann Veiderpass

Hyde Room

- *An Evaluation and Explanation of Higher Education Institutions' Inefficiency in Europe and in the U.S. with Application of Two Stage Semi-Parametric DEA*

  Joanna Wolszczak-Derlacz

- *Evaluating the Performance of Higher Education Institutions in Europe: A Non-Parametric Efficiency Analysis of 944 Institutions*

  Ann Veiderpass, Maureen McKelvey

Session 5b

CHAIR: John McCormack

Garnett Room

- *The Long Term Effects of Early Educational Selection – a Quasi-Natural Policy Experiment from Hungary*

  Klára Gurzó, **Dániel Horn**

- *Who are Department Heads?*

  John McCormack

12.45 – 13.30

Lunch Break

13.30 – 14.00

Invited Speaker

Giannis Karagiannis

University of Macedonia, Greece

Assessing Research Productivity at Faculty and Department Level: The Case of Greek Departments of Economics

Co-author:
Georgia Paschalidou

14.00 - 15.30

Session 6

CHAIR: Finn Forsund

- *Nonparametric Estimation of Adequacy in Education*

  John Ruggiero, Shae Brennan, Carla Haelermans

- *Efficiency of Australian Technical and Further Education Institutes*

  Peter Fieger, Renato A. Villano, Ray W. Cooksey

- *Productivity of Norwegian Institutions of Higher Education*

  Dag Fjeld Edvardsen, **Finn R. Førsund**, Sverre A. C. Kittelsen

15.30 – 16.00

Coffee Break

Assessing Research Productivity in Terms of Endogeneity or Exogeneity of Academic Salaries

Emmanuel Thanassoulis, D. Despotis, D. Sotiros, Y. Smirlis

This talk begins with two recent methodological development for comparing units or groups of units in costs terms when input prices are available. The first method treats input prices as endogenous, at least in part, and assesses units on the potential for cost savings through better productivity in technical terms on the one hand, and securing better input prices on the other. The second method takes input prices as exogenous and focuses on comparing Groups of units both in technical and cost terms without recourse to metafrontiers. The presentation will illustrate how these methods can be used to compare academics within their Departments and Departments within academic institutions, treating time devoted to research and qualifications on recruitment of an academic as inputs, and research output in post as the key deliverable. The method assuming endogenous prices will identify potential savings through salary adjustments and/or higher research productivity over time by academics. The method assuming exogenous prices will focus on comparing academic Departments and decompose cost differences into those attributable to salary differences and those attributable to more productive use of time for research.

The Impact of the Financial Crisis on the Efficiency of Italian Universities

Mattia Cattaneo, **Davide Donina,** Michele Meoli, Stefano Paleari, Davide Scotti

Recent financial crisis has significantly affected the public sources to universities and diverging funding policies can be identified among European countries. In Southern European countries in particular, public funding for higher education systems have been significantly reduced (EUA 2013, 2014) and universities have to make the best use of their resources, as well as attracting additional funding, i.e. by increasing tuition fees revenue (Rossi 2010; Donina et al. 2014), in order to make their activity sustainable. The way universities manage their resources is indeed a crucial issue to ensure the pursuit of their mission and long-term survivability. Therefore universities are paying more and more attention to the link between inputs and outputs and to find new solutions to produce the required outputs given the smaller amount of resources. Efficiency is thus one of the most important topic in the agenda of universities (Bonaccorsi and Daraio 2007). The Italian higher education system, as an example of a Southern European countries which is facing the severe cut of governmental funding in the last years (Donina et al. 2014), represents a valid setting to investigate such an issue. Indeed this paper aims to investigate in the Italian context whether university efficiency has changed since the beginning of the financial crisis by implementing a DEA-based analysis on the population of Italian universities active during the period 2002-2012. In order to perform the analysis, we focus simultaneously on the three university missions to pinpoint the overall change in efficiency. We expect to identify different patterns among institutions in the dynamics of efficiency over time, because of different capabilities and behaviours by universities to manage the challenges of austerity.

Regional Growth and Human Capital in Italy Using a Spatial Approach: Is There a Quality Effect of University Efficiency?

Cristian Barra, **Roberto Zotti**

In this paper, we explore whether tertiary education institutions contribute, through the development of human capital and skills, to the regional economic growth. The main part of the studies on the contribution of universities to regional development is on technology transfer and most of them have underlined the importance of the higher education institutions' (HEIs) activities for the industry sector. We, instead, want to focus the attention on the other side of the coin, which is less explored so far, such as the teaching mission of the universities which might lead to important and strong regional effects. The idea is to emphasize a wider set of aspects concerning higher education institutions rather than research activities, on the extent that the amount of highly-skilled human capital is a good predictor of economic development and that HEIs might strongly contribute to increase the local human capital. Moreover, highly skilled and well educated individuals are one of the main outputs of universities and at the same time are considered as the ultimate drive of economic development. Indeed, among the several channels through which the HEI's activities might contribute to sustain regional economies, this paper focuses specifically on the university contribution to the development of regional human capital and skills; local human capital levels might increase through the production of highly skilled graduates and consequently of highly educated workforce. Thus, using the population of 72 Italian universities and 686 working local systems (groups of municipalities) over the 2003-2007 time span, an important contribution of the paper is to investigate whether the efficiency level of HEI's, calculated using a non-parametric approach, affects regional development in Italy, under the assumption that the presence of an efficient university in a specific area might positive influence its growth. Specifically, the analysis is performed in two stages: firstly, we use Data Envelopment Analysis (DEA) to calculate an index of efficiency for each university and secondly, a parametric approach

is used to evaluate the relationship between teaching efficiency and regional growth. We hopefully contribute to the existing research shedding further light on the effects that universities might have on raising the ratio of local income per capita including the spatial interaction and spatial structure into our analysis, using both a Spatial Error Model and a Spatial Autoregressive Model. Therefore, our main goal is, relying on a spatial approach, to see whether the closer an area is to an efficient university the higher is the effect of the level of efficiency of the university on the economic development of that area (measured by value added per worker). Finally, as robustness, we specifically take into account that, as already pointed out before, the underlying driver of economic development is highly skilled and educated people; in other words, in order to measure the effectiveness of the HEI's activities we use a proxy of both the quality and the quantity of the teaching such as the number of graduates weighted by their degree classification.

Efficiency in Education Achievements: A Regional Disparities Analysis

Giuseppe Coco, **Raffaele Lagravinese**, Christian A. Mongeau Ospina

Objectives: The purpose of this study is to measure the efficiency in education achievements in Italy and Spain from a regional perspective by applying a conditional nonparametric model. Data: We used the sample of Italian and Spanish pupils from the Organization for Economic Co-operation and Development's Programme for International Student Assessment (OECD PISA 2012) data set. Methods: The study reviews the existing literature on performance measurement and proposes models on these grounds. More specifically we estimate students' performance and the influence of background characteristics and school variables computing a conditional efficiency approach with a tailored mixed kernel function and a data-driven bandwidth selection. Results: The results are presented at the aggregate level for each country (Italy and Spain) and then divided by the single regions. The results of our application show that several family- and student-specific characteristics have a statistically significant effect on the educational efficiency in both countries. Moreover, the characteristics of schools and especially the geographical areas in which they are located will affect the performance of the students. The findings suggest the need of public policies to reduce regional disparities.

Using OECD-Pisa Data for Estimating the Efficiency of Secondary Schools in an International Perspective: Preliminary Results

Tommaso Agasisti, Pablo Zoido

In this paper, we use OECD-PISA2012 database for estimating the efficiency of secondary schools, through a bootstrap DEA (Data Envelopment Analysis) approach. Data refer to around 18,000 schools in 60 countries. The educational production process (EPP) is modeled by considering resources and students' characteristics as inputs, and test scores in Pisa tests as outputs. After having estimated the efficiency scores for each school, we estimate statistical correlations between these scores and groups of schools' processes, organizational characteristics and institutions, etc. (second-stage regressions). In addition, we estimate the relationships between efficiency scores and non-academic results, as well as with equity. For these purposes, we use (i) the scores of the ability tests, developed in Pisa2012 for complementing achievement test scores and (ii) some measures of test scores' dispersion within schools and/or the proportion of students who obtained particularly low scores. While there is a significant number of studies about the efficiency of secondary schools in many countries (especially US, European countries, Australia – see Worthington, 2001 and Johnes, 2004 for early reviews), the literature about the comparison of schools' efficiencies across countries is in its infancy (for studies about school-level data, see Southerland et al., 2009; for a discussion about cross-country comparisons of educational public spending efficiency, Afonso & St.Aubyn, 2006) The possibility of realizing a study about the efficiency of schools in a crosscountry comparison allows discussing the extent to which schools' performances are more heterogeneous within or between countries; this way it is also possible to check whether are there institutional differences between educational systems that correlate with higher/lower (average) levels of schools' efficiency. In addition, it is possible to investigate which are those school-level factors that are associated with efficiency in the various schools, in different countries or groups of them. The paper innovates the existent literature in a number of ways. First, we propose a methodology for conducting efficiency analyses with Pisa data; and this is important because although Pisa has been used for efficiency studies (Agasisti, 2013; Mancebon et al., 2012), actually it is not designed specifically for this objective. As already pointed out, it is among the first studies that estimate schools' efficiency in a cross-country setting. Second, we define a framework (and an empirical work) to analyze efficiency not only looking at the performance side (achievement), as usually done in studies that use Pisa data, but also considering the amount and type of resources invested by schools to produce those results. Third, the results for the emerging countries are particularly interesting because, while previous studies were conducted about developed western countries, there is still a lack of research about schools' results in these countries.

Productivity Pay-offs from Academic Mobility: Should I Stay or Should I Go?

Ana Fernández-Zubieta, Aldo Geuna, **Cornelia Lawson**

This article analyses the impact of interorganizational mobility on researchers' scientific productivity. We develop a theoretical framework based on the job-matching approach and the idea that research productivity is driven by the availability of capital equipment (and human capital) for research, and peer effects. The empirical analysis studies the careers of a sample of 171 UK academic researchers, spanning 1957 to 2005. On the basis of a unique ranking of UK institutions that we were able to construct for the period 1982 to 2005, we develop an econometric analysis of the impact of job changes on post mobility performance over three-years, and the overall effect of mobility. We find no evidence that mobility per se increases academic performance. Only mobility to 'better' departments has a positive weakly significant impact, while downward mobility reduces researchers' productivity (in quantity and quality). Job mobility is always associated with a short-term decrease in performance arguably or most likely due to associated adjustment costs.

Incentives for Relocating to Regional Australia: Estimates Using a Choice Experiment

Aaron Nicholas, **Chandra Shah**

Inter-regional migration plays an important role in regional labour markets; for instance, by moving labour from a region with high unemployment to a region where there are unfilled vacancies. The study uses a discrete choice experiment to investigate the willingness to move for work of a sample of individuals from New South Wales and South Australia, states which have had pockets of relatively high unemployment, to Karratha (Western Australia) and Emerald (Queensland), two regional centres with relatively high demand for labour in 2012. The aim is to understand how individual and job characteristics are related to the willingness to move. The study is unique, in that it estimates the monetary value of the incentives required for individuals to accept job offers in a region different from that in which they currently live. This paper reports on one of three topics that comprise a three-year program of work: 'Geographical dimensions of social inclusion and VET in Australia'. Key messages: Some groups are more prepared to move than others. In particular, individuals who are looking for work (both employed and unemployed) indicate a strong willingness to relocate for work. Individuals are more willing to move for jobs that: are ongoing or longer-term rather than fixedterm; provide training; or involve a fly-in/fly-out contract rather than permanent relocation. Some groups require wage incentives to accept a job in a regional location but others require no such incentives. The size of the incentive depends on individual characteristics as well as on the job conditions being offered; for example, the preference for fly-in/fly-out and training provision in the job contract reduces the size of any wage incentive that needs to be offered. This study suggests that policies promoting geographical labour mobility are more likely to succeed if job offers include upskilling and reskilling opportunities and contracts that are not short-term. Addressing the demand-side factors, such as matching job seekers' skills and experience to employer requirements, can also improve labour mobility.

Measuring School Demand in the Presence of Spatial Dependence: A Conditional Approach

Laura López-Torres, Diego Prior

Improving educational quality is an important public policy goal. However, its success requires identifying factors associated with student achievement. At the core of these proposals lies the principle that increased public school quality can make school system more efficient, resulting in correspondingly stronger performance by students. Nevertheless, the public educational system is not devoid of competition which arises, among other factors, through the efficiency of management and the geographical location of schools. Moreover, families in Spain appear to choose a school on the grounds of location. In this environment, the objective of this paper is to analyze whether geographical space has an impact on the relationship between the level of technical quality of public schools (measured by the efficiency score) and the school demand index. To do this, an empirical application is performed on a sample of 1,695 public schools in the region of Catalonia (Spain). This application shows the effects of spatial autocorrelation on the estimation of the parameters and how these problems are addressed through spatial econometrics models. The results confirm that space has a moderating effect on the relationship between efficiency and school demand, although only in urban municipalities.

Dealing with the Endogeneity Issue in the Estimation of Educational Efficiency Using Nonparametric Techniques

Daniel Santín, **Gabriela Sicilia**

One of the most important current concerns in economics of education, namely, the presence of endogeneity in the production process has received little attention in the frontier literature and is frequently overlooked when practitioners apply frontier techniques. This issue is particularly relevant in school choice problems where the presence of endogeneity is frequently observed (Schlotter et al. 2011). Although some recent research have dealt with this problem in the estimation of technical efficiency with parametric frontier techniques, in nonparametric literature is still an unknown and incipient issue. In principle, it might seem that DEA should not be influenced by this problem, since it constructs a boundary around feasible combinations of educational inputs and outputs without assuming a parametric functional form (Orme and Smith 1996). However, if we apply insights from Kuosmanen and Johnson (2010) and interpret the DEA model as a constrained variant of the convex nonparametric least squares regression (Kuosmanen 2008), we can derive straightforward that the same problems of bias caused by the presence of endogeneity explained above can also arise within this approach. In a recent work Cordero, Santín and Sicilia (2013) found that DEA estimates could be severely impaired under the presence of a significant positive endogeneity, that is, when at least one input in the production process is positive correlated with the true efficiency. In this research, using synthetic data generated in a Monte Carlo experiment, we propose a simple statistical criterion which allows practitioners to identify the presence of an endogenous input in an empirical application. In addition, we propose a potential solution to deal with this problem in order to improve DEA estimations: to use an 'instrumental input'. Finally, we perform an empirical application for secondary schools in Uruguay in order to illustrate our theoretical findings.

Efficiency and Value Added in Secondary Education: The case of Portugal

Maria Conceição A. Silva Portela

School effectiveness is often assessed through value-added studies that take into account students' achievement on entry of a certain schooling period and compare it with achievement on exit from the same period. This comparison is a means to assess the extent to which the school has added value to the students it received. In Portugal we have been using value added analysis in AVES program since 2005 (AVES is run by a private institution and is administered only to participating schools – over 40 schools in 2014). Historical data from the application of this program over a long period of time reveals some interesting conclusions regarding the way Portuguese schools add value to their students. In particular the behaviour of schools differs depending on the cycle of studies, and it also varies depending on the type of students (high ability or low ability on entry). In parallel with AVES program, there is also a benchmarking website BESP, where exam results are every year uploaded and translated into a graphical interface for consultation by schools and the general public. Within BESP schools can perform aggregate performance assessments in real time based on a user-specified set of variables. BESP is available since 2009 and an analysis of some of its features will also be undertaken. We conclude, detailing on the main difficulties faced by schools on the use of evaluation programs, whose main aim is to foster their continuous improvement but not always succeed in this purpose.

Efficiency Measurement of Turkish Public Universities with Data Envelopment Analysis

Taptuk Emre Erkoç

The purpose of this paper is to estimate technical and cost efficiencies of 53 public HEIs in Turkey by the means of non-parametric technique named as Data Envelopment Analysis (DEA). In doing so, overall efficiencies of HEIs are computed on the basis of certain production and cost models motivated by different sets of input/output. The results of those models, firstly, have shown that public HEIs in Turkey are performing in unsatisfactory levels although some of them are doing fairly well. Besides after employing bootstrapping procedures, results indicated that efficiency scores are significantly diverging between best and worst performing DMUs. Secondly, even though there is not any systemic improvement during this five-year time span, overall efficiencies of public HEIs in Turkey had gone up at the course of last two years. Thirdly, the share of full-time academic staff in the whole faculty and having medical school are founded as the determinants of inefficiencies among HEIs regarding to the estimates of Tobit regression analysis. Consequently, even though those findings might be suffering from a number of methodological problems, they would be used as the departure points both for academic and policymaking interests.

How Efficient Are Our Universities? A Stochastic Frontier Analysis of English and Welsh Universities

James Carroll, Adrian Gourlay, Anthony Glass, Thomas Weyman-Jones

There is a paucity of efficiency studies on the Higher Education Sector in Britain. Only a small subset of those utilise Stochastic Frontier Analysis (Izadi et al, 2002; Stevens, 2005). This paper bolsters the existing UK Higher Education Stochastic Frontier Analysis literature through application of the conditional heteroscedasticity approaches to modelling environmental variables suggested by Coelli et al (1999). Our database consists of 142 Higher Education Institutions within England and Wales from 2004 to 2009. Application of the Net and Gross efficiency concepts allows the paper to distinguish between factors which affect the level of frontier cost faced by an Institution, from those which only impact on efficiency. The analysis shows that institutions with higher proportions of female students, non-EU Students, and STEM students suffer from lower efficiency. Conversely higher levels of Female Staff, membership to the Russell Group, and offering a Law Programme are associated with greater efficiency of Institution. Additionally, we provide evidence against the efficiency impact of geographical location and changing fee regime before reporting overall efficiency scores. The disparity in efficiency between all institutions will enable Institutional managers to identify key examples of best practice within the Sector, allow managers to separate increased levels of cost from increased inefficiency, and will suggest potential future areas of regulation and legislation to policy makers. Furthermore, this paper contributes a newly derived measure for Research Output. This extends measures of Research Output currently used and improves the precision of the estimated frontier enabling future benchmarking analysis to be more robust. Key Words: Higher Education; Technical efficiency; Operating environment; Stochastic frontiers

Technical Efficiency and Total Factor Productivity Growth in Chilean Higher Education

José F. Maripani, Víctor H. Moreira López, Boris E. Bravo-Ureta

This paper adds to the literature on both Technical Efficiency (TE) measurement and Total Factor Productivity Growth (TFPG) decomposition for Higher Education Institutions (HEIs) in Chile. Input-oriented stochastic distance functions (ISDF) are used to measure technical efficiency (TE) and Total Factor Productivity Growth (TFPG) for 25 Chilean universities all of which are members of the Council of Rectors. The data is a balanced panel of 275 observations over 11 years (2002 to 2012). The results for the TL model show that, at the geometric mean (GM) of the data, undergraduate enrollment is the dominant output while academic staff is clearly the most important input. In addition, the analysis reveals that the average level of TE for all universities and years is 96.70%, with a range from 86.9% to 99.6%. TE is found to improve over time. TFPG was decomposed into TE change (TEC), technological change (TC) and scale efficiency change (SEC). These results reveal that over the 11 years analyzed (2002 to 2012), TFPG for all universities combined decreased at an average annual rate of 0.0062%. A decomposition of this average annual figure indicates that TC and SEC contributed positively to growth, an average of 0.098% and 0.103%, respectively, while TEC has been regressive at a negative 0.104% average rate per year. A review of the results makes it possible to derive a few policy implications. The presence of economies of scale indicates that considerable productivity gains could be attained by a consolidation of institutions and such gains would be higher for the smaller institutions. Considering that TEC is negative, policies should be focused on providing incentives and an appropriate environment to induce and enable less efficient universities to catch up with those that are closer to the frontier and thus are examples of best practice.

Assessing European Primary School Performance Through a Conditional Nonparametric Model

José Manuel Cordero, Daniel Santín, Rosa Simancas

This paper presents a fully nonparametric framework to assess the efficiency of European primary schools using data about 21 countries participating in PIRLS and TIMSS 2011. This study represents an unusual initiative, since most of the empirical research in this field is restricted to evaluations at regional or national level and focused on secondary education.
We use a technique inspired by the Free Disposal Hull (FDH) and the application of partial order-m models. Likewise, we adapt the metafrontier framework to compare the technical efficiency of units operating in heterogeneous contexts, in our case represented by different educational systems, thus we can detect whether inefficiency can be attributed to schools or specific institutional factors in each country.
Moreover, we apply an extension of the conditional model which allows us to account for the specific operational environment where production units are operating. This model is based on recent developments in nonparametric econometrics and its main advantage is that it allows us to deal with both continuous and discrete background variables.
Our results suggest that several environmental variables have a statistically significant effect on school performance such as

their students´ socioeconomic background or their location. Actually, when those factors are taken into account in the estimation of efficiency using a conditional model, the ranking of countries varies significantly.

Student Learning Assessment: A Non-Compensative Robust Composite Measure in Italy

Francesco Vidoli

The aim of the present research is to obtain a composite measure of learning assessment for the elementary school students from the Italian national student assessment annual survey, year 2011. This measure would be part of an extensive project, started in 2014 in Italy, that aims to assess the schools' value added with the purpose to estimate the specific contribution of each school into the knowledge development of the elementary school students and, subsequently, analyse the educational models used in schools with higher value added. From an applied point of view, we suggest an original weighting method based on the integration of robust BoD by a directional distance function with the aim of proposing a comprehensive approach to construct robust and non-compensatory composite indicators.

The Teacher Effect: An Efficiency Analysis from a Natural Experiment in Spanish Primary Schools

Daniel Santín, Gabriela Sicilia

The aim of this research is to detect the main drivers of Spanish primary schools efficiency dealing with the self-selection problem in education. It is well-known that school choice often leads to the endogeneity problem in estimations because most motivated parents self-select in best schools. In this case a serious problem arises for measuring efficiency because it is impossible to disentangle managerial school efficiency computed with DEA from having the most motivated students at the school, a variable that is not observed. To overcome this problem we propose a natural experiment framework in which we compare the efficiency of classrooms inside the same school where students were randomly assigned to classes. Doing this, efficiency differences between classes inside the same school are due to a fix effect composed by the teacher and the tasks he/she develops at class. After this, we perform a second stage regression model where the dependent variable is the positive difference in efficiency between the two groups belonging to the same school across schools. To explain this difference we analyze variables related with teacher and average family characteristics. To do this, we use the 'General Evaluation of Spanish Education' database from the Spanish Ministry of Education that is collected to study primary education (4th grade). Results show that when two groups within the same primary school are compared, in 30% (10%) of them the teacher and teaching methods explain five to ten (more than ten) efficiency points. Regarding the drivers of efficiency gaps, our findings suggest two important results. Firstly, the higher the attendance to early education gap, the higher the efficiency gap. Secondly, when teachers devote most of class time to explain contains the efficiency gap reduces in favor of the group in which teacher assigns more time to other tasks.

Efficiency in Education. A Review of Literature and a Way Forward

Kristof De Witte

This paper summarizes various debates in the economics of education literature, and translates them to the OR literature. It starts from answering the normative question: should one pursue efficiency in education; or does the search for efficiency comes at the cost of lower education outcomes? We show that efficiency and equity in education can go hand in hand, so does efficiency and effectiveness in education. If we agree that educational efficiency is important, the paper continues by outlining the various contextual variables which have been argued to correlate with education efficiency. We do so on three different levels: efficiency at the micro/student level, at the meso/school level and at the macro/system level. Combining insights from those various strands of literature will provide new insights in how to foster efficiency. For each of those levels, we will summarize the underlying data and its quality, as well as the applied methodologies (e.g. FDH, DEA, order-m, SFA, conditional efficiency, Stoned, metafrontier). A second part of the paper is more methodological as it uses recent insights from the standard economic/econometrics literature to formulate a research agenda on educational efficiency. It is structured along the current difficulties to measure educational efficiency. The difficulties include (1) lack of causal estimations, (2) unobserved heterogeneity, (3) inappropriate input and output variables due to structural differences between schools, (3) simplistic conceptual models, and (4) poor identification strategies. For each issue, the paper provides some ways to circumvent the problem or gives heading to further research lines.

University Mergers in England: Effects on Efficiency

Jill Johnes, Mike Tsionas

As governments must adopt austerity measures, pressure is placed upon sectors in receipt of public funding. The higher education sector in England is one such sector which is facing cuts. One possible response is for institutions to merge in an effort to reap efficiency gains through economies of scale and scope. Little is known, however, of the precise efficiency benefits from merging. Recent research based on a panel of data of English universities from 1996/97 to 2008/09 suggests that mean efficiency is higher for merging institutions compared to pre- and non-merging institutions (Johnes 2013), but these results are based on a static analysis which fails to take into account the potentially dynamic relationship between inefficiency and merger activity. In this paper we develop a dynamic model of inefficiency and merger the estimation of which relies on Bayesian techniques organized around the use of Markov chain Monte Carlo (MCMC). We are able to quantify the determinants of inefficiency and mergers and assess whether mergers have contributed to efficiency in the period following the union. An application of this method to data on English universities from 1996/97 to 2008/09 which encompasses 25 mergers suggests that typically merger delivers efficiency gains; this varies by merger, however, and not all merging institutions can expect an increase in efficiency.

Evaluating Impact of Mexican Higher Education Policy on State Universities Using Direct and Indirect Technology.

Herberto Rodríguez-Regordosa, Pablo Arocena-Garro, Emili Grifell-Tatjé

The source of funding for higher education systems drives many activities of institutions, institution's administrators and staff. In the systems that receive strong public funding, the government allocates funds using different approaches: incremental budgeting, activity-based formula models, performance based outcome models and efficiency-based models (Sexton, Comunale, & Gara, 2012). Public pressures and the competition for resources for several public needs have been growing firmly and are relevant for higher education policy. Governments have been forced to provide better accountability, to improve efficiency and to optimize taxpayer-generated money (Liefner, 2003) (Rabovsky, 2012). Mexico has not been the exception; pressures are growing as its democracy advances, as a plural political system emerges and as the middle class rises. Followed by a deep public funding crisis during the eighties, a new reform was implemented in Mexico during the nineties that allowed the government to have a greater influence in public institutions by quality assessment and accountability programs, and by implementing incentives using performance-based models for public funding. (ANUIES, 2005). During the years that followed the reform, the Mexican higher education system experienced several and important transformations in almost every angle: in its organization, size, distribution and performance. Policy makers are asking themselves if the institutions are using their resources productively. Public higher education institutions have characteristics that make it difficult to measure performance: they are non-profit making, sometimes there is an absence of output and input prices and there is no consensus on the right combination of inputs and outputs that has to be used (Johnes, 2006). Using 20 years of data of the Mexican State Universities (that account for 30% of the Mexican higher education enrolment), and in the context of the Mexican higher education reform the aim of this work is to provide evidence to analyze if public policies have been able to influence institutions' performance. We use an approach that combines direct and indirect (cost constrained) technologies, we compute distance functions using Data Envelopment Analysis (DEA) and build and later deconstruct Malmquist indexes to obtain a measure of efficiency that captures the optimality of decisions to select the right mix of inputs that seek to maximize outputs subject to a budget constraint; we think this measure can explain institution's behavior over time and can be interpreted as a response to public policy change.

Exploring the Efficiency of Mexican Universities: Integrating DEA and MDS

Tommaso Agasisti, **Cecilio Mar-Molinero,** Marti Sagarra

We analyse the data for a sample of 55 Mexican universities over a six-year period (2007-2012). We use two approaches: Data Envelopment Analysis (DEA) and Multidimensional Scaling (MDS). Both methods rely on multiple comparisons in order to reveal the characteristics of the data. DEA asks if the resources currently used by a Unit Of Assessment (UOA) would be better employed in another UOA whilst MDS asks up to what point two UOAs have similar structure. It is clear that if two UOA are similarly organised and use resources to produce outputs in an equally efficient way, they would also have similar structure of data, and this will be revealed by the MDS analysis. This is what we find in the study. The study is innovative in the sense that we deal with panel data. The data used is in the form of ratios. The use of ratios in multivariate analysis is well established. The assumption is that UOA with similar ratio structure, as revealed by means of MDS, will also have similar levels of efficiency. Thus, DEA and MDS can be combined to reveal

different aspects of the data. The DEA model includes the number of full-time equivalent (FTE) academic staff and the number of enrolled students (divided by Licentiate and Masters) as inputs, and the number of academic publications and graduates (by discipline) as outputs. Although the use of the two approaches is quite common in the literature (see Johnes, 2004 for a review about DEA; and Pounder, 1999 for MDS), their joint utilization is new in the HE context. The main research questions can be summarized as follows:
a) How efficient are the Mexican universities? And how efficiency evolved over time (2007-2012)?
b) Is it possible to identify homogenous groups (i.e. clusters) of Mexican universities based on their observable and structural characteristics, by using quantitative multidimensional scaling techniques? Which are the main dimensions that affect such classification?
c) How are the identified groups characterized, in terms of efficiency - is efficiency's differential wider within or between groups? And why? Is efficiency evolution over time within and between groups?
The study is also inserted in the recent stream of the literature that explores the evolution of universities' efficiency over time (see Johnes, 2008 for England, and Garcia-Aracil, 2013 for Spain).

Efficiency of Upper Secondary Schools in Finland: Evaluating Persistent and Non-Persistent Differences in Value Added

Mika Kortelainen, Heikki Pursiainen, Jenni Pääkkönen

We analyze differences in school efficiency or value added using a comprehensive panel data set covering all upper secondary school graduates in Finland during the years 2002-2013. School efficiency is defined as the impact of a school on standardized matriculation exam results controlling for quality of student intake. Using the value added modeling approach recently proposed by Chetty, Friedman and Rockoff (forthcoming, American Economic Review) we measure both cross-sectional differences in school efficiency and the persistence of these differences over time. We also control for the uncertainty inherent in assessing the efficiency of smaller schools with a relatively low number of graduates. We use each pupil's comprehensive school grades to control for pupil quality. Also, comprehensive school fixed effects are used to control for differences in comprehensive school grading as well as unobserved socioeconomic factors. The method is potentially sensitive to bias induced by school selection. To assess the potential bias we partially match our student sample to a spatial database by home address and use various variables to assess bias. We find no evidence of significant bias for our preferred model. Our first result is that there are relatively large cross-sectional differences in school efficiency even after controlling for student intake quality. The difference between the top schools and bottom schools each year measured in average matriculation score points is around one grade point in a scale of 1 to 7. However, large differences are observed only between the very top and bottom institutions. For most schools school efficiency estimates are much closer to each other: the interquartile range each year is only about a fifth of a grade average point. Our second result indicates that there is persistence over time in school efficiency, but it is far from complete. This implies that the ranking of the majority of schools is highly unstable over time, making any yearly league tables dubious. There is more persistence in the very top and bottom institutions, which are roughly the same during the whole period under consideration.

Financial Literacy, Maths Performance and Private Publicly Subsidised Schools in Spain

María-Jesús Mancebón, **Domingo Pérez Ximénez de Embún**

In this paper we inquire into the determinants of financial literacy of 15 years old Spanish students. Its main aim is to evaluate the impact of school type (public versus private publicly subsidized schools) in the financial performance of students. Two hypotheses are submitted to consideration: that mathematical competencies are the main determinant of financial capabilities, and that school type (public versus private publicly financed) influences financial competencies through its influence on maths scores. The peculiarities of the data supplied by PISA 2012, the potential cross effects between maths and financial literacy and the endogeneity of one of the main predictors in our study (type of school) are the main restrictions to our empirical strategy, which is composed by two steps. The first one is involved in the application of a propensity score matching analysis which is intended to balance the composition of pupils belonging to public and private publicly subsidized schools. This analysis allows us to deal with the selection bias threatening the internal validity of our estimations. The second step of the analysis consists of the estimation of a simultaneous multilevel regression model which allows us to take into account the potential simultaneity of the determination of mathematical and financial competencies of students and the hierarchical structure of the data supplied by PISA 2012. Our results allow us to conclude that financial literacy is mediated by mathematics abilities of individuals, and that the raw differences between financial and mathematical competencies of students coming from public and private publicly financed schools vanish when fine statistical controls are applied to the data. These results lead us to conclude some implications that can be useful in the design of educational policies directed to promote the financial culture of population.

An Evaluation and Explanation of Higher Education Institutions' Inefficiency in Europe and in the U.S. with Application of Two Stage Semi-Parametric DEA

Joanna Wolszczak-Derlacz

Data envelopment analysis (DEA) is used in this study to evaluate the relative efficiency of more than 500 higher education institutions from ten European countries and the U.S. for the period between 2000 and 2010. Efficiency scores are determined using different input-output sets (inputs: revenues, academic staff, students, administration staff, outputs: number of publications, graduates, PhD awarded) and assumption considering frontier: global frontiers (all HEIs pooled together), European versus US frontier (European countries pooled together) and country specific frontier (each country has its own frontier). We also investigate what external factors e.g. institutional setting, composition of academic staff, location etc. affect the degree of HEIs' inefficiency (two-stage DEA analysis following bootstrap procedure proposed by Simar and Wilson, 2007). Finally, the changes in total factor productivity are assessed on the bases of Malmquist index and are decomposed into pure efficiency change and frontier shift. Our research is motivated by the fact that most previous studies have considered one, or a limited number of countries, mainly due to the fact that micro data on HEIs (at the level of individual institutions) are not easily obtainable and comparable across countries and time periods. To the best of our knowledge this is one of the first attempt of cross-country analysis that considers many years and the first paper that analysis efficiency differentials between European and US higher education institutions together with the role of different external determinants (both between and within country perspective). We do not limit ourselves to evaluation of DEA scores but conduct the second step in which we quantitatively asses the direction and magnitude of the impact of their potential determinants. The results of this part indicate: (a) higher efficiency of universities with bigger proportion of revenues obtained from competitive resources (competitive resources defined as those received through the process of open competitions e.g. research grants from research agencies); (b) the number of different departments is associated positively with units' efficiency - indicating the presence of the economy of scope and/or economies of scale; (c) there is evidence that higher number of professors among academic staff improve the efficiency; (d) neither the year of foundation of given institution nor its location (expressed by the GDP per capita of the region where the university is located) have robust statistically significant impact on the efficiency of units.

Evaluating the Performance of Higher Education Institutions in Europe: A Non-Parametric Efficiency Analysis of 944 Institutions

Ann Veiderpass, Maureen McKelvey

Although a long tradition exists of studying the economics of education, performance comparisons of different kinds have traditionally been difficult to undertake. An important impediment has been the lack of comparable data. Tertiary education is no exception and data availability has proven to be problematic in several respects. Thus, early studies focused on traditional universities although higher education institutions (HEIs) represent a diverse group of organizations providing education. Apart from the difficulty of including different types of education providers, the field has also faced the problem of country comparison. At best, researchers have been able to access data within one country or a handful of countries. To a large extent, this study remedies the shortcomings of earlier studies. The study suggests evaluating HEI performance in a production theory context, applying the well-known Data Envelopment Analysis method to a cross section of 944 HEIs in 17 European countries. The DEA approach is particularly suitable in this context where little is known about production technologies and economic behaviour of the HEIs. Our country comparison is based on a large database, developed by the EUMIDA consortium. The consortium developed a census about basic indicators of HEI inputs and outputs. Experts from each country gathered data from national statistics offices, ministries and specific universities and then harmonized the appropriate data according to the agreed upon definitions of indicators. The data collection includes all HEIs which grant postgraduate and graduate education. Hence, the EUMIDA database offers unique microdata about decision-making units in the higher education sector across Europe. On average, provision of education is found to be most efficient in the Slovak Republic followed by Belgium and Latvia, while Denmark and Norway display the lowest efficiency. The study also indicates a positive relation between high efficiency and research intensity.

The Long Term Effects of Early Educational Selection – a Quasi-Natural Policy Experiment from Hungary

Klára Gurzó, **Dániel Horn**

Using a unique institutional change this paper provides causal estimates on the long-term effects of early educational selection. During the post-socialist transition the structure of the Hungarian education system changed gradually as new early-selective tracks were established. These elite academic tracks are cream-skimming the best students at ages 10 and 12 - as opposed to the typical age of first selection at age 14 - in order to provide better education and thus better employment chances for the selected. Utilizing the spatial and time variance in the establishment of these early-selective tracks we provide difference-in-difference estimates on the effect of these tracks on probability of unemployment and other outcomes. Using the 2011 Hungarian Census data we estimate time and settlement fixed-effect and event-study models. The paper contributes to the literature in two ways. Firstly, contrary to previous policy evaluations on the effect of de-tracking school reforms we identify the effect from a re-tracking policy, which made the Hungarian school system more selective. Secondly, the establishment of the early-selective tracks did not overlap with other large-scale educational policy changes, which allows for an accurate identification of the effects of early educational tracking. Our results show, contrary to expectations, that early selection has no effect on the unemployment chances, wages or on tertiary participation probabilities of young adults. The effects are not only insignificant but are precisely estimated zeros.

Who are Department Heads?

John McCormack

There have been a number of studies on the management and leadership of Higher Education organizations in the UK in recent years, but this has almost exclusively focused on the senior and executive levels of leadership; Vice Chancellors and Pro Vice Chancellors. Heads of Department (H.O.D.) are responsible for the operations of the two core activities at the heart of the university; Research and Teaching, and yet there is very little empirical work investigating who they are, what they do and how this role is perceived as a component of an academic career. Traditionally, the H.O.D. role has been a collegiate position in a department where relatively senior member of staff steps in to the role for a predetermined period of time and then returns to their previous activities. Recent research seems to indicate that professional managers are becoming increasingly popular, but the extent to which this is true in practice and the relative effectiveness of the professional manager is still largely anecdotal. This research is based on a series of semi structured interviews, from over 250 heads of department in research active across the United Kingdom regarding their operational role, professional autonomy, qualification, selection criterion, and their views on how being an H.O.D. fits in to their longer term professional goals (McCormack, et al, 2014). This information is then matched against scores in three different dimensions of operational practices; Monitoring, Incentives and Targets. This tool was adapted from the Management Matters survey tool developed by Nick Bloom and John Van Reenan (2008) which has been used in a number of different industrial sectors and has been useful in identifying management effectiveness.

Assessing Research Productivity at Faculty and Department Level: The Case of Greek Departments of Economics

Giannis Karagiannis, Georgia Paschalidou

In this paper we consider five variants of the Benefit of the Doubt (BoD) model, which is a radial single constant input DEA model, to assess research productivity at both the faculty and the department level in Greek Departments of Economics during the period 2000-2010. Performance is evaluated on the basis of three research outputs, namely number of journal publications, their quality standards, and the number of citations. Once research productivity is estimated at the faculty member, the results are aggregated in a theoretically consistent way to obtain research performance at the department level. The results from the conventional BoD model are then compared and contrasted, in terms of ranking and aggregate (department) efficiency, with those obtained using common weights, imposing weights restrictions reflecting stakeholders (i.e., dean, rector, etc) preferences, evaluating cross efficiencies, and conducting VEA (value envelopment analysis).

Nonparametric Estimation of Adequacy in Education

John Ruggiero, Shae Brennan, Carla Haelermans

Adequacy is defined in education as a minimum set of outcome standards. Previous research attempts to estimate the cost of meeting the minimum standards but did so assuming schools face the same resource prices. In this paper, we extend the existing model to estimate of the minimum cost of meeting the predefined standards nonparametrically given differential environmental conditions and resource prices. We apply this model to analyze Dutch schools.

Efficiency of Australian Technical and Further Education Institutes

Peter Fieger, Renato A. Villano, Ray W. Cooksey

Technical and Further Education (TAFE) institutes provide for the majority of Australian government funded courses in vocational education and also provide a stepping stone into degree level programmes at university. In recent history, budgetary constraints on the public purse have led Australian State and Federal governments to focus increasingly on the efficiency of educational institutions, including TAFE Institutes. Efficiency measurement of TAFE institutes is also of interest also to tax payers, other stakeholders and the institutions themselves. In this study we used institutional financial, educational, demographic and environmental data and employed stochastic frontier analysis to develop two distinct efficiency measures. The first measure examines institutional efficiency in the transformation of financial resources into teaching loads. The second model evaluates efficiency in the transformation of institutional resources into a post study employment outcomes. In both models we found significant inefficiencies in the Australian TAFE system, along with notable economies of scale effects in the first model. We then assessed the possible relationship between both types of efficiency. While there was no direct linear relationship, a distinct pattern was detectable. K-means cluster analysis was used to establish groupings of similar institutes and subsequent canonical discriminant analysis to develop a typology of these clusters. We conclude that, based on the measures developed in this study, there are inefficiencies in the Australian TAFE system for which an underlying typology exists.

Productivity of Norwegian Institutions of Higher Education

Dag Fjeld Edvardsen, **Finn R. Førsund**, Sverre A. C. Kittelsen

Statistics Norway has recently set up a database for several different types of public production within the central government domain. Using this database covering 2004-2012 the productivity development of institutions in the sector of higher education of Norway, i.e. universities and regional colleges, are studied. The methodological approach is based on a non-parametric modelling of the production possibilities using the observations to span the production possibility set as done within the DEA approach. To calculate productivity development we use the Malmquist productivity index approach. We have a panel of 38 units for the time period 2004-2012. As resource variable we use labour measured in man-years in the basic model and labour split into faculty and administration in the more detailed model. The service outputs are based on student exams expressed as student points (the norm is that a student takes exams giving her 30 points per semester of half a year length) split on short education (3 years or less) and longer education (more than 3 years), and based on publications weighed into publication points based on two categories of publications based on a quality classification done by a central higher education board. For policy purposes it is important to show the uncertainty associated with our estimates of productivity. We have therefore applied a bootstrap approach yielding confidence intervals for all estimates. The main results including confidence intervals are shown by tailor-made figures developed in the project.

Call for Papers – Journal of the Operational Research Society

Special Issue on

Efficiency in Education

Aims and Scope

Education provides a particularly interesting context for efficiency evaluation because its institutions are, in general, not-for-profit, prices for inputs or outputs are not always meaningful and so conventional measures of performance are inappropriate. Moreover, they are at least partly publicly funded, leading to public interest in obtaining value for money.

The OR discipline has a long history of developing and applying methods for measuring education efficiency including multilevel modelling, data envelopment analysis, and stochastic frontier analysis. Public funding cuts, following the global financial crisis, have made it essential to develop methods and approaches for accurately measuring efficiency in all education sectors, so as to achieve the greatest output and quality for the funding available. A collection of work in this field is therefore particularly timely.

This special issue of JORS is devoted to publishing state-of-the-art research on issues related to efficiency and productivity in education. Papers can be theoretical or empirical, can relate to any level of education or aspect of efficiency such as economic or educational value added, and can have a national or international focus.

Potential research topics include, but are not limited to, the following:

- Effects on efficiency of merging education institutions
- Efficiency and effectiveness of administration of education institutions
- Productivity change over time of universities in teaching and research output and its relationship with periodic assessments of research/teaching quality at national levels
- Efficiency and productivity and its relationship with type of institution or public/private status;
- Influence of the economic crisis on the management and outcomes of education institutions
- International comparisons between countries on cost efficiency, or value added of educational institutions
- Studies on the stability and consistency of the performance of education institutions over time
- Adoption of new methods to efficiency measurement in the education field

Manuscript Preparation and Submission

The closing date for submissions will be 31 January 2015. Papers should be submitted electronically via the Journal of the Operational Research Society's online submission system at http://jors.msubmit.net/ following the journal's instructions to authors at http://www.palgrave-journals.com/jors/author_instructions.html. Please indicate that your submission is to the Special Issue "Efficiency in Education" (by selecting this option at the appropriate place). All papers submitted to the special issue will be peer reviewed in accordance with the standard processes of the Journal.

Papers presented at the Efficiency in Education Workshop to be held at The Work Foundation, London, 19th to 20th September 2014 may be submitted.

Guest Editors

Jill Johnes, Lancaster University Management School, UK
Maria C. S. Portela, Universidade Católica Portuguesa, Porto, Portugal
Emmanuel Thanassoulis, Aston Business School, Aston University, Birmingham, UK

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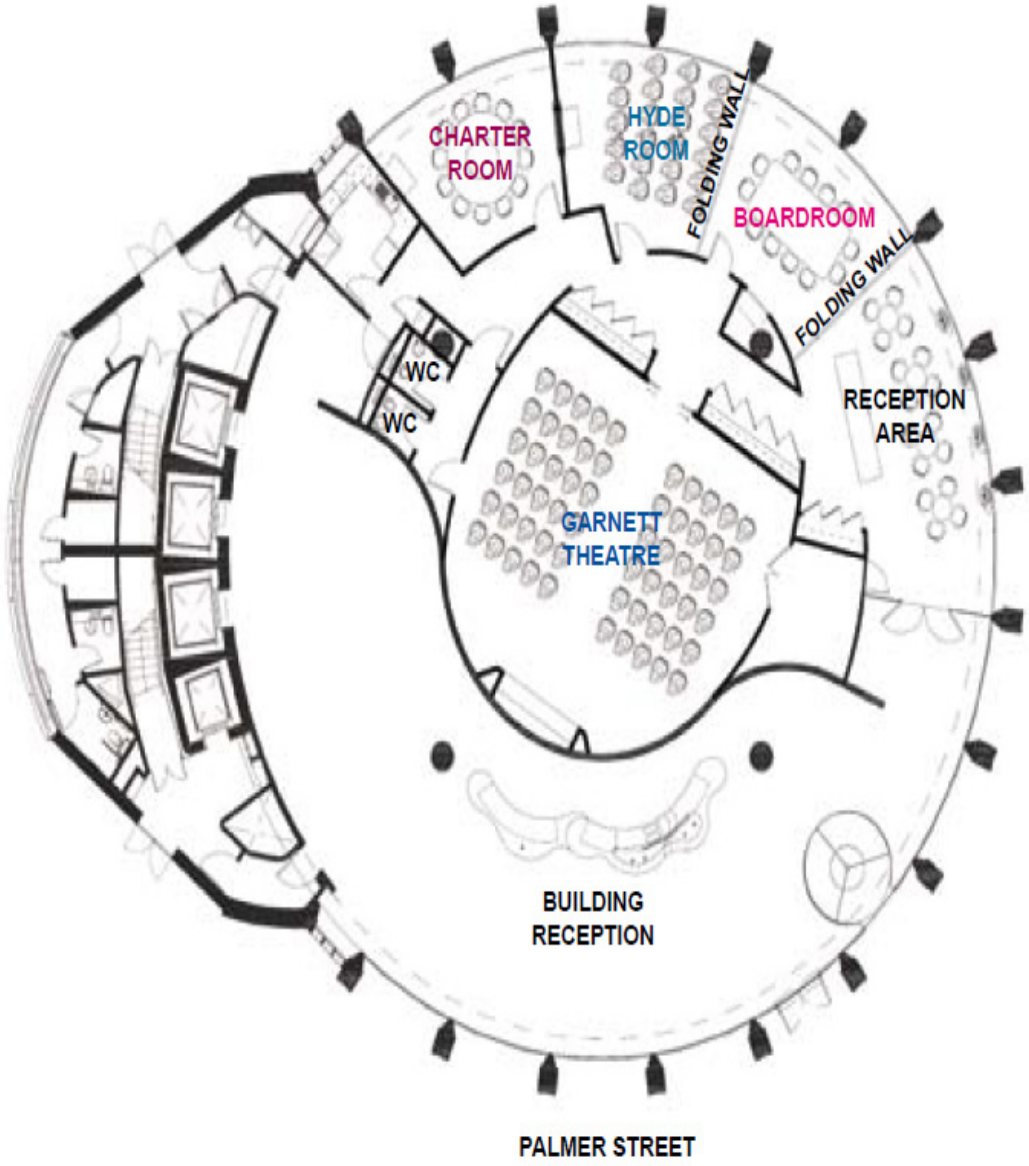

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Efficiency in Education

Information for the House of Lords Reception

Which entrance is used?

The entrance to the Attlee Room is the **Black Rod's Garden Entrance**.

What time should guests arrive?

Guests should arrive **no earlier than 15 minutes before 18.30**.

What do guests need to bring with them?

All guests **must have their invitation** (which will be included in the Workshop bags handed out at registration) in their hand when arriving at their entrance point together with **a form of photographic identification** (photo ID). This is a mandatory security requirement. Airport style security checks are in place.

Is parking available at the House of Lords?

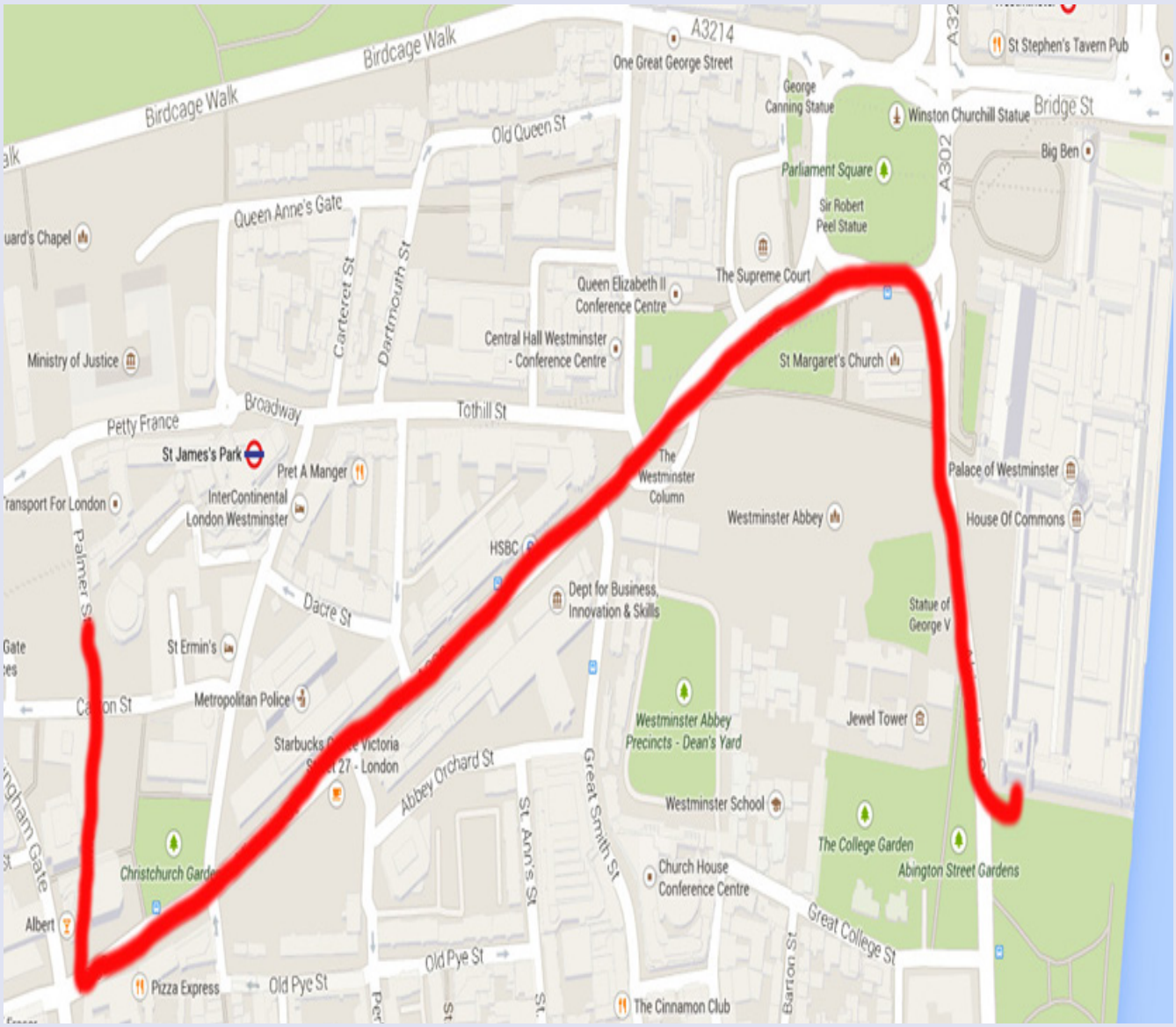
Parking is not available for guests. Parking is only permitted for Blue Badge/disabled permit holders by prior arrangement.

Is there a dress code?

No there is no official dress code; however it is advised that guests avoid wearing jeans and trainers.

Efficiency in Education

Map to The House of Lords Reception



Wi-Fi Instructions for The Work Foundation

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