



Book of Abstracts

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Book of Abstracts

Esquema de sesiones

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JUEVES, 3 DE SEPTIEMBRE

10:00–12:00 | Sesión: APLICACIONES REGIONALES**Ineficiencia productiva en perspectiva regional: evidencia empírica para Cuba mediante fronteras estocásticas***Ana Laura Imbernó Díaz (U. de Oviedo / U. de La Habana); José Baños-Pino (U. de Oviedo)***Resumen**

América Latina se ha caracterizado históricamente por marcadas disparidades económicas y heterogeneidades estructurales que se reflejan en diferencias persistentes en productividad y eficiencia técnica. Estas brechas condicionan no solo el crecimiento de largo plazo, sino también la efectividad de la política fiscal, al determinar el tamaño del producto potencial, la capacidad recaudatoria y el margen para aplicar políticas de estabilización sin generar presiones inflacionarias o desequilibrios externos. En este contexto, el análisis de la eficiencia productiva constituye un instrumento clave para el diseño de políticas orientadas a la sostenibilidad fiscal. Dentro del panorama regional, Cuba constituye un caso particular debido a su trayectoria institucional y a las características de su modelo económico centralizado, que la distinguen de las economías de mercado predominantes en América Latina. Las persistentes restricciones externas, la elevada dependencia de importaciones estratégicas y los shocks recientes, como la pandemia y la contracción del turismo internacional, han intensificado las tensiones macroeconómicas del país, poniendo de relieve la necesidad de mejorar la eficiencia productiva como condición para estabilizar la economía. La presente investigación analiza el desempeño relativo de Cuba mediante la estimación de modelos de frontera estocástica aplicados a un panel de países latinoamericanos para el período 1985–2023. Este enfoque permite obtener medidas de eficiencia técnica comparables internacionalmente, distinguiendo entre ineficiencia y perturbaciones aleatorias. En una primera etapa se estima una frontera estocástica estándar para derivar niveles de eficiencia relativa por país. En una segunda etapa se implementa un modelo con clases latentes que segmenta endógenamente a las economías según sus estructuras productivas, capturando la heterogeneidad tecnológica regional y evaluando si Cuba conforma un régimen productivo diferenciado. Los resultados obtenidos aportan evidencia sobre la posición relativa de Cuba en términos de eficiencia técnica dentro de América Latina y sobre la magnitud de su brecha respecto a la frontera regional. Desde una perspectiva fiscal y macroeconómica, estos hallazgos permiten inferir el potencial de mejora productiva existente y sus implicaciones para el crecimiento sostenible, la estabilidad de precios y la programación presupuestaria. En particular, la estimación de las tasas de ineficiencia proporciona un marco empírico para analizar cómo la asignación del gasto público, la inversión en capital físico y humano y las reformas estructurales pueden contribuir a acercar la economía a su frontera productiva.

Measuring Technical Efficiency in European Regions: A Random Forest-Adaptive Constrained Enveloping Splines Approach*José Manuel Cordero; Víctor Javier España; Cristina Polo (U. de Extremadura)***Resumen**

The analysis of regional efficiency and productivity has attracted growing attention in recent years and has become an increasingly important line of research within regional economics. Within this literature, the two approaches most frequently employed, Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA), are subject to several well documented limitations. Among the most relevant are their sensitivity to outliers, the risk of overfitting in high dimensional settings, and the imposition of restrictive assumptions on the underlying production technology. In response to these challenges, this paper applies Random Forest-Adaptive Constrained Enveloping Splines (RF-ACES), a novel ensemble methodology that combines machine learning techniques with shape constrained nonparametric frontier estimation. RF-ACES provides a flexible and robust framework that helps overcome many of the limitations associated with conventional frontier methods. RF-ACES builds upon the Adaptive Constrained Enveloping Splines (ACES) framework, which extends Multivariate Adaptive Regression Splines (MARS) to production frontier estimation while imposing monotonicity and concavity constraints consistent with microeconomic production theory. The ensemble extension

incorporates random input subsampling and bootstrap aggregation, following the Random Forest paradigm, across multiple ACES base learners trained on resampled datasets. The resulting aggregated estimator reduces variance and improves out-of-sample generalization relative to single-model frontiers, while preserving key properties of the estimated technology, including free disposability and convexity. In addition, RF-ACES provides internal variable importance measures that enable a systematic and data driven identification of the most influential inputs, a feature largely absent from traditional nonparametric frontier approaches. The empirical application draws on the ARDECO database and focuses on a sample of European NUTS-2 regions. Gross Value Added (GVA, in constant 2015 EUR) is used as the output, while employment (in thousands of persons) and physical capital stock (in constant 2015 EUR) serve as inputs, following the standard specification in the regional production function literature. RF-ACES efficiency scores are benchmarked against those obtained from DEA and ACES in order to evaluate the potential robustness gains associated with the ensemble approach. The proposed framework is expected to provide additional insights into the measurement of regional technical efficiency and the relative importance of production inputs, contributing to the development of more flexible and robust methodologies for regional efficiency analysis.

Determinants of Efficiency in Regional Innovation Systems: A Bayesian Framework

Joan Crespo Cepas (U. de València); *David Conesa* (U. de València); *Zaira García-Tórtola* (U. Jaume I); *Emili Tortosa-Ausina* (U. Jaume I)

Resumen

Innovation activity is inherently shaped by interactions and knowledge flows among firms, institutions, and other actors, and can therefore be understood as a collective learning process embedded within geographically bounded (but open) systems. From this perspective, this paper examines the innovative performance of European NUTS2 regions over the period 2015–2020, conceptualizing these territories as Regional Innovation Systems (RIS). The study pursues two main objectives. First, it develops a comparative assessment of regional innovative performance by constructing a ranking of European regions. Second, it investigates the determinants underlying observed performance differentials across regions. To this end, we employ a single-stage empirical strategy based on stochastic frontier analysis within a Bayesian framework, allowing for the simultaneous estimation of efficiency levels and their drivers. The empirical analysis relies on a novel and comprehensive dataset that integrates information from multiple sources, including Eurostat, the Regional Innovation Scoreboard, and OECD REGPAT. Particular attention is devoted to the role of local institutional conditions and spatial interdependencies, capturing the extent to which regional performance is influenced by both internal characteristics and external knowledge spillovers. The results are expected to contribute to the literature on regional innovation and efficiency by providing new evidence on the functioning of RIS and the factors shaping their performance. The paper concludes by discussing policy implications aimed at enhancing innovation capacity across European regions.

Género y ecoeficiencia en la agricultura española: evidencia microeconómica mediante un modelo super-SBM DEA

M.^a Pilar Rodríguez Fernández; *Cristina Hidalgo González*; *David Pérez Neira* (U. de León)

Resumen

La incorporación de la perspectiva de género al análisis de la ecoeficiencia agraria sigue siendo muy limitada, pese a su relevancia para comprender la sostenibilidad del sector. Este trabajo examina las diferencias de género en la ecoeficiencia de la agricultura española a partir de un modelo no paramétrico de super-eficiencia SBM-DEA, no orientado, con rendimientos variables a escala y consideración explícita de outputs no deseables. El análisis utiliza un panel balanceado de 8.975 observaciones correspondientes a 1.795 explotaciones para el período 2018–2022, construido a partir de microdatos armonizados de la Red Contable Agraria Nacional (RECAN). Como output deseable se considera la producción total agraria y, como output no deseable, las emisiones de gases de efecto invernadero, estimadas a partir de la estructura productiva y del consumo energético de cada explotación. La contribución del estudio es doble. En primer lugar, aporta evidencia empírica a nivel microeconómico sobre la ecoeficiencia de la agricultura española desde una perspectiva de género,

un ámbito todavía escasamente explorado. En segundo lugar, permite identificar no solo diferencias en los niveles medios de eficiencia, sino también en los patrones de ajuste necesarios para que las explotaciones alcancen la frontera eficiente. Los resultados muestran que las explotaciones con titularidad femenina presentan, de manera sistemática, niveles medios de eficiencia superiores a los de las explotaciones gestionadas por hombres, así como una trayectoria más estable durante el período analizado. Esta ventaja relativa se observa también en varias comunidades autónomas y orientaciones técnico-económicas, aunque con notable heterogeneidad territorial. Además, las proyecciones DEA indican que las explotaciones femeninas requieren, en general, menores ajustes en consumos intermedios y capital para situarse en la frontera eficiente. En conjunto, la evidencia sugiere que el género no constituye un atributo marginal, sino una dimensión estructural para explicar la ecoeficiencia agraria, con implicaciones directas para las políticas de modernización, sostenibilidad e igualdad en el sector.

10:00–12:00 | Sesión: INNOVACIÓN Y DIGITALIZACIÓN (Sesión español/inglés)

Utility Effectiveness, Composite Indicators and 'Benefit of the Doubt' Models: How Important Are Preferences When Evaluating the Performance of Innovation Systems?

José Luis Zofío (U. Autónoma de Madrid / Erasmus University Rotterdam); Juan Aparicio (U. Miguel Hernández); *Javier Barbero* (U. Autónoma de Madrid); Jon Mikel Zabala-Iturriagoitia (Deusto Business School, University of Deusto)

Resumen

This study introduces a methodology that embeds 'Benefit of the Doubt' evaluations of performance of innovation systems, based on objective measures of technical effectiveness—that compare the values of a set of indicators across countries—into the literature of composite indicators, which rank countries relying on utility functions and whose aggregating structure and weights are subjectively chosen by the decision makers. Considering the general case of the constant elasticity of substitution utility function, whose power mean formulation nests popular specifications such as the weighted (linear) arithmetic mean, weighted geometric (Cobb-Douglas) mean, and fixed-proportions (Leontief), we define the concept of utility effectiveness of an alternative as the ratio of its observed utility to the maximum utility observed across countries. We show that the utility loss resulting from an ineffective performance can be consistently decomposed into two mutually exclusive factors: first, grounded in the objective criterion of Pareto-dominance, the mentioned technical effectiveness is represented by a technical (radial) measure depending only on quantities, which gauges the distance to the utility frontier; second, a measure of allocative effectiveness, determining the additional utility loss resulting from an unbalanced composition of indicators given the subjective preferences of the decision maker. Using data from the European Innovation Scoreboard, our results show high levels of utility ineffectiveness in Southern and Eastern European countries. On average, these countries' performance is half of the maximum utility reached by the best performing innovation systems. Objective technical ineffectiveness generally dominates over subjective allocative ineffectiveness (except for the fixed proportion specification), showing that the practical impact of choosing one utility specification over another, although sizable, is limited and that main performance deficits are often not substitutability or compensatory issues, but real shortfalls in indicator levels, while preference-driven differences tend to be second-order and comparatively robust.

Eficiencia y uso óptimo de la cirugía robótica en cáncer colorrectal: análisis coste-efectividad y oportunidades de mejora organizativa en un hospital público

David Vivas Consuelo; *Carla Ortega Fernández* (CIEGS-UPV)

Resumen

Introducción. La incorporación de tecnologías sanitarias de alto coste, como la cirugía robótica, plantea importantes retos para la eficiencia y la sostenibilidad de los hospitales públicos. En el cáncer colorrectal, donde la cirugía mínimamente invasiva es el tratamiento estándar, resulta clave evaluar si la adopción de la cirugía robótica aporta valor suficiente en términos de resultados y uso de recursos.

Objetivo. Analizar la eficiencia de la cirugía robótica frente a la laparoscopia en un hospital público, evaluando su coste-efectividad e identificando oportunidades de optimización organizativa y de gestión mediante técnicas avanzadas de análisis de datos.

Metodología. Se realizó un análisis coste-efectividad desde la perspectiva hospitalaria, considerando costes directos asociados a la tecnología, al proceso quirúrgico, a la estancia hospitalaria y a las complicaciones. La efectividad se evaluó mediante un indicador multicriterio que integra eventos adversos y resultados quirúrgicos relevantes. Además, se aplicaron modelos predictivos para identificar perfiles de pacientes con mayor probabilidad de beneficiarse de la cirugía robótica y técnicas de minería de procesos para analizar el circuito asistencial real, detectar variabilidades y evaluar la adecuación del uso del robot.

Resultados. La cirugía robótica presentó mayores costes incrementales (+4.817,51 €) sin mejoras relevantes en la efectividad clínica (+0,0160 u.a.), resultando en un ICER de 264.083,30 €/u.a., por encima del umbral de eficiencia considerado. El análisis predictivo permitió identificar subgrupos de pacientes con mayor beneficio potencial, mientras que la minería de procesos evidenció diferencias en el consumo de recursos y en la organización del proceso asistencial entre técnicas.

Conclusiones. Desde una perspectiva de gestión, la cirugía robótica no resulta eficiente en su uso actual. Sin embargo, la mejora en los criterios de indicación y la reorganización de los procesos asistenciales podrían incrementar su eficiencia y contribuir a un uso más racional de tecnologías de alto coste en el sistema sanitario público.

Size Thresholds and the Adoption of Advanced Digital Technologies: Evidence from Spanish Manufacturing Firms

Inmaculada Álvarez (U. Autónoma de Madrid); Luis Orea (U. de Oviedo); Christopher F. Parmeter (U. of Miami); Desiderio Romero-Jordán (U. Rey Juan Carlos)

Resumen

This paper investigates why some firms adopt advanced digital technologies while others do not. We model adoption decisions as an ordered outcome governed by profitability cutoffs, which allows us to infer adoption constraints without fully specifying demand or cost functions. We contribute to the literature by adapting the threshold-based framework of Bresnahan and Reiss (1991) to the analysis of technology adoption. Our size thresholds measure the firm size required to adopt a technology, intensify its use, or adopt multiple technologies. This concept is highly versatile, as it summarizes the net profitability of adoption by jointly accounting for its drivers and barriers, while also allowing us to examine a wide range of firm adoption decisions within a common framework. Using panel data on Spanish manufacturing firms over the period 2017–2022, we find that the average size threshold is three to four times larger than the size of a representative firm. We also document substantial heterogeneity across firms, industries, and technologies. Firm characteristics play an important role in technology adoption, mainly through their effect on fixed adoption costs. Finally, our results point to meaningful cost-based state dependence, although this effect gradually weakens over time.

The Impact of Economic Complexity on Carbon Productivity Focusing on the Role of International R&D Spillovers

Ghazal Shahpari; Maria Chiara D'Errico; Paolo Polinori (University of Perugia)

Resumen

This study examines the impact of economic complexity on carbon productivity across 47 countries, including 34 European and 13 Middle Eastern nations, over the period 2000–2019. Utilizing a two-stage analytical framework, we first estimate Total Factor Carbon Productivity (TFCP) through the Global Malmquist-Luenberger Index (GMLI) within a Data Envelopment Analysis (DEA) framework, accounting for both desirable (GDP) and undesirable (CO₂ emissions) outputs. In the second stage, the dynamics of TFCP is explained using a composite sets of explanatory variables which includes economic complexity and variables capturing the degree of technological advancements proxied by domestic R&D stock and foreign R&D spillovers. In this regards, the sample divided to two groups; the ten countries with the highest technological advancement, while the rest of the countries are treated as

followers. To ensure the empirical rigor of the analysis, a comprehensive sets of diagnostic tests is applied, including separability, returns to scale, and stationarity tests.

Our empirical results reveal that economic complexity exerts a positive and significant effect on carbon productivity. This suggests that countries with more sophisticated and diversified productive structures are better positioned to internalize cleaner technologies and optimize resource allocation. Furthermore, the findings shows that both domestic and foreign R&D stock are vital drivers of carbon productivity, particularly in non-leader economies.

These findings offer critical policy insights underscoring the pivotal role of stringent environmental regulations and call for targeted policy interventions that foster economic complexity and intensified R&D, to catalyze sustainable technological innovation and long-term decarbonization.

12:30–14:30 | Sesión: INNOVACIONES METODOLÓGICAS EN MÉTODOS PARAMÉTRICOS Y SEMIPARAMÉTRICOS

Contabilidad mental y decisiones de gasto turístico: una perspectiva de eficiencia

José Baños-Pino (U. de Oviedo); Beatriz Tovar (U. de Las Palmas de Gran Canaria)

Resumen

Este trabajo integra la teoría de la contabilidad mental con el análisis de fronteras estocásticas para examinar el comportamiento de gasto de los pasajeros de cruceros en los destinos que visita. Modelizamos a los viajeros como individuos que asignan su gasto discrecional entre el consumo a bordo y el consumo en las escalas una vez que han tomado ex ante la decisión de realizar un crucero. Los presupuestos mentales internos pueden distorsionar los precios percibidos y generar desviaciones sistemáticas respecto al nivel óptimo de gasto. Estas distorsiones implican una pérdida de utilidad y una forma de ineficiencia en el consumo que puede cuantificarse mediante un enfoque de frontera estocástica. Se demuestra que la eficiencia del consumo depende de dos factores clave: la relevancia psicológica que los individuos asignan a la contabilidad mental y el grado de sustituibilidad entre el consumo a bordo y el consumo en las escalas. Una aplicación empírica proporciona evidencia favorable al marco analítico propuesto.

Funciones de producción con frontera estocástica cuando hay un límite superior que no se puede rebasar

Julio del Corral; María Jesús Ruiz-Fuensanta (U. de Castilla-La Mancha)

Resumen

Una de las formas más habituales de estimar una función de producción es a través de los modelos de frontera estocástica. Los modelos de frontera estocástica presentan varias ventajas frente a alternativas como el DEA, pero, no están exentos de posibles problemas. Uno de ellos se refiere a que si el nivel de output no puede sobrepasar de cierto nivel mediante un modelo de frontera estocástica no se puede imponer que se sobrepase de ese nivel. Ejemplos de este problema se dan de forma habitual en Economía del Deporte, donde la puntuación esperada que marca la función de producción no debería sobrepasar la máxima puntuación posible en una liga. Así, si el número de puntos máximo con pleno de victorias es de 114, los puntos esperados que marca la función de producción no deberían superar estos 114, pues si lo hicieran la función de producción no delimitaría lo máximo que se puede producir dada una determinada cantidad de inputs, sino que mostraría una cifra por encima de dicho límite. Este mismo problema aparece también en Economía Ambiental y de la Energía cuando el output viene dado por índices normalizados con un tope superior fijo, como el Environmental Performance Index (EPI), cuyo valor máximo es 100 por construcción, de modo que la frontera estimada no debería predecir valores superiores a dicho umbral. Asimismo, este problema se presenta en algunas funciones de producción en las que el output refleja la posición en un ranking. Una posible solución es realizar sobremuestreo mediante la replicación artificial de las observaciones problemáticas, pudiendo asignar diferentes factores de multiplicación (3×, 4×, 20×, etc.). Este trabajo analiza su efectividad con datos reales y establece recomendaciones para su aplicación.

A Machine-Learning-Enhanced Approach to Measure the Effects of Public Funding on R&D Expenditure

Darío Blanco Fernández (U. de Oviedo); *Desiderio Romero-Jordán* (U. Rey Juan Carlos); *Inmaculada Álvarez* (U. Autónoma de Madrid); *Luis Orea* (U. de Oviedo)

Resumen

This study aims to assess the impact of public R&D funding on the R&D expenditure of Spanish manufacturing firms, using data from the ESEE survey for 2012–2023, coinciding with the Next Generation EU recovery package. Prior research has extensively examined the effects of public funding on business R&D, increasingly relying on policy evaluation tools such as regression discontinuity designs and difference-in-differences. Our contribution is twofold. First, we focus on the most recent public R&D funding received by Spanish firms, which likely differs in nature from earlier programs. Second, we contribute methodologically to this field by implementing a machine-learning-enhanced synthetic control framework, which is more suitable than traditional quasi-experimental approaches, as it allows us to capture complex relationships among variables in the so-called treatment equation. We then estimate treatment effects at the firm, year, and aggregate levels. This method mitigates misspecification biases often found in this literature. Our data supports the proposed methodology as we find remarkable nonlinearities in our treatment equation. Overall, our empirical exercise shows how these new funds have been channeled, as our findings indicate that public R&D funding significantly increases external R&D expenditure but does not affect internal R&D investment. This suggests that subsidies primarily finance additional outsourced research rather than expanding firms' internal R&D capabilities.

Where Does Gender Belong? A Monte Carlo Assessment of Specification Bias in Wage Frontiers

Antonio Álvarez; *David Boto García* (U. de Oviedo)

Resumen

The gender wage gap can be analyzed using stochastic frontiers. The wage frontier represents the maximum potential earnings an individual can achieve given their productive traits. The literature has followed two estimation paths: separate frontiers for men and women, and pooled models. In pooled models, researchers must decide where to include the gender dummy: in the frontier, in the inefficiency component, or in both. This paper investigates the sensitivity of wage gap estimates to these three modeling strategies. The choice of where to place the gender dummy carries profound implications. Including it in the deterministic part of the frontier assumes a difference in the "potential" wage. If the dummy is significant, it implies that even if a woman is efficient, her maximum possible wage is lower than a man's. Including it in u suggests an attainment gap. Here, women and men share the same potential frontier, but women face higher hurdles in reaching it, perhaps due to household responsibilities or Glass Ceiling effects that show up as inefficiency. We use Monte Carlo simulations to evaluate the robustness of these three specifications. In empirical analysis, the "true" state of the labor market is unknown, making it impossible to determine which model is most accurate. By simulating a synthetic population where the true parameters of the wage frontier and the distribution of inefficiency are pre-defined, we can measure the performance of each modeling approach.

12:30–14:30 | Sesión: INNOVACIONES METODOLÓGICAS EN MÉTODOS NO PARAMÉTRICOS

Theoretical Framework of the Loss-Function-Based Score of Technical Efficiency under Variable Returns to Scale

Juan José Díaz-Hernández; *David-José Cova-Alonso*; *Eduardo Martínez-Budría* (Instituto Universitario de Desarrollo Regional, U. de La Laguna)

Resumen

This paper develops a framework for measuring technical efficiency under variable returns to scale and a procedure for estimating it by means of Data Envelopment Analysis (DEA). The approach

distinguishes between two conceptually different elements that are often conflated in the DEA literature: the efficiency measure, which identifies the efficient reference, and the efficiency score, which evaluates inefficiency relative to that reference. The efficiency measure proposed here is an aggregated productivity distance function that maps each inefficient activity into a frontier point that is technically efficient and productivity-maximising within the set of admissible improvements. The efficiency score is derived from Debreu's loss function, interpreted as the opportunity cost of not operating with an optimal output-input relationship. This loss function is obtained from the linear approximation of the transformation function at the efficient reference, which yields the shadow prices required to aggregate inputs and outputs consistently. The theoretical framework is implemented empirically through a DEA-BCC procedure with radial and non-radial adjustments, together with a supporting-hyperplane representation of the estimated technology. This allows the productivity distance, the loss function, and the efficiency score to be estimated in a manner that preserves the main properties of the theoretical model. The result is an internally coherent approach that links projection, valuation, and efficiency measurement within a unified structure.

Introducing Environmental Variables Z in Efficiency Analysis Trees

Alejandro Astor Valentín (Center of Operations Research, U. Miguel Hernández); *Juan Aparicio* (Center of Operations Research, U. Miguel Hernández); *José Luis Zofío* (U. Autónoma de Madrid / Erasmus University Rotterdam); *Javier Barbero* (U. Autónoma de Madrid)

Resumen

This paper proposes a new methodology for estimating production frontiers when environmental variables are considered. The proposed method is structured in a two-stage architecture. First, standard Classification Trees are employed to partition the data sample space into homogeneous clusters based on so-called contextual, non-discretionary, or environmental variables (Z). To ensure the feasibility and stability of local estimations, the algorithm incorporates a minimum cluster size constraint based on an empirical rule from Data Envelopment Analysis (DEA) that considers the number of inputs and outputs of the problem. This segmentation ensures that Decision Making Units (DMUs) are compared solely within similar operational environments, mitigating the bias caused by external factors. Second, the Efficiency Analysis Trees (EAT) methodology is applied locally within each cluster to estimate the production frontier and the output-oriented technical efficiency. The algorithm's architecture implements various pruning criteria based on a trade-off between computational complexity and absolute error. To evaluate the performance of this proposal, a simulation experiment is developed under different data generation processes and sample sizes, contrasting its performance with reference methods such as Conditional DEA and StoNEZD, employing standard accuracy and correlation metrics. Finally, an illustrative example is presented to demonstrate the practical applicability of the proposed methodology, highlighting its interpretability.

Educational Poverty Measurement through Basic Competencies: A Multidimensional FGT-BoD Approach

Claudio Thieme (U. Diego Portales, Chile); *Emili Tortosa-Ausina* (U. Jaume I); *Víctor Giménez* (U. Autónoma de Barcelona); *Diego Prior* (U. Autónoma de Barcelona)

Resumen

La expansión global de la cobertura escolar no se ha traducido en aprendizajes efectivos: más de la mitad de los niños en países de ingresos bajos y medios no alcanza competencias básicas. Las métricas tradicionales de desigualdad educativa —coeficiente de variación, desviación estándar, índice de Gini— tratan toda dispersión como igualmente problemática, sin distinguir entre diversidad legítima y privación inaceptable de capacidades fundamentales. Este estudio propone un marco metodológico que operacionaliza dicha distinción integrando dos enfoques complementarios. En una primera etapa, se adaptan los índices Foster-Greer-Thorbecke (FGT) al contexto educativo para capturar la incidencia, profundidad y severidad de la pobreza de aprendizaje en matemáticas, lectura y ciencias, utilizando el Nivel 2 de PISA como umbral de competencia básica. En una segunda etapa, los nueve indicadores resultantes se agregan mediante un modelo Benefit-of-the-Doubt centralizado con restricciones de aseguramiento derivadas de consulta experta, generando un índice compuesto de pobreza educativa multidimensional comparable internacionalmente. Aplicando esta metodología a datos de PISA 2022 para 80 países (17.759 escuelas), los resultados revelan un marcado gradiente continental —desde

África (media 0,52) hasta Oceanía (0,13)— y demuestran que matemáticas concentra los mayores déficits de incidencia. La validación empírica confirma que el índice propuesto presenta correlaciones sustancialmente más fuertes con indicadores de desarrollo humano (IDH: $r=-0,83$), innovación ($r=-0,78$) y crecimiento económico que las medidas tradicionales de dispersión, cuyas correlaciones con estas mismas variables resultan débiles o no significativas. El marco ofrece herramientas concretas para focalizar políticas en los estudiantes más vulnerables, priorizando la eliminación de privaciones absolutas sobre la mera compresión de la distribución.

Standard Efficiency and the Decomposition of the Standard Total Factor Productivity Index

Daniel Santín (U. Complutense de Madrid)

Resumen

The Standard Total Factor Productivity index (STFPI) introduced by Aparicio and Santín (2026) is the ratio of an output aggregator function to an input aggregator function while the Standard Total Factor Productivity Change index (STFPCI) is defined as the ratio of two STFPI in two different periods. Moreover, the STFPCI can be decomposed into efficiency change, global technical change (GTC) and local technical change (LTC). The aim of this paper is three-fold. First, this research demonstrates that it is possible to extend the STFPI using traditional efficiency measures obtained through Data Envelopment Analysis. Second, the new productivity measures can be used to benchmark decision making units (DMUs) through the concept of Standard Efficiency, defined as the ratio of the STFPI to the maximum observed STFPI using the available technology. Third, the LTC component in the STFPCI can be further decomposed using the new productivity measures into three terms; a non-radial technical change for accounting the impact of slacks, a mix-efficiency change for analyzing how the distance with respect to the most productive DMU change and the relative technical change of the most productive DMU that relates the change in the maximum observed STFPI in both periods is relation to the GTC. The new decomposition enhances our understanding of the economic drivers for benchmarking DMUs over time.

16:00–18:00 | Sesión: ENERGÍA Y SOSTENIBILIDAD

Sesión patrocinada por el Proyecto PID2024-156813OB-I00 (Generación del Conocimiento. Agencia Estatal de Investigación).

Environmental Performance Gaps in European Regions: Eco-innovation or Catching-up?

Andrés J. Picazo-Tadeo; Celia Melguizo; Jesús Peiró-Palomino (U. de València)

Resumen

This research examines the long-term trends and regional heterogeneity of environmental performance in greenhouse gas emissions in the European Union's industrial sector. Using Luenberger indicators, performance changes are decomposed into environmental technical change resulting from eco-innovation, and eco-efficiency change or catching-up. Environmental performance improved modestly over 1995–2024, driven entirely by technological progress, while eco-efficiency declined on average. Performance stagnated until 2009 and improved markedly thereafter due to technological progress, whereas catching-up turned negative from 2018 onwards. Regions with larger industrial sectors experienced faster performance growth due to stronger technological change. Clear geographical disparities emerged, with positive trends concentrated in Northern and Western Europe and persistent underperformance in Central–Eastern regions. These findings underscore the need for policies that enhance eco-efficiency and promote convergence toward best practices, alongside place-based interventions targeting lagging regions, particularly in Central–Eastern and Southern Europe.

Beyond Traditional ESG Ratings: A Robust Benefit-of-the-Doubt Analysis of the European Energy Sector

Roberto Gómez-Calvet; M. Ángeles Casabó-Ortí (U. Europea de Valencia)

Resumen

The aim of this paper is to propose a robust methodological approach for evaluating Environmental, Social, and Governance (ESG) scores in the European energy sector. In this work we address common criticisms of traditional ESG scoring methods by applying a Data Envelopment Analysis technique known as the Benefit of the Doubt (BoD) approach, which eliminates the need for arbitrary weighting schemes and normalization processes in composite indicators. This approach also mitigates the influence of outliers. Key findings reveal that BoD generally yields more optimistic ESG scores than Refinitiv's proprietary ratings, with particular improvement opportunities identified in the Oil & Gas Transportation Services, Oil & Gas Exploration and Production, and Renewable Energy Equipment & Services sectors. The ternary analysis of E-S-G component scores shows balanced equilibrium across dimensions but with less dispersion in BoD-derived values compared to Refinitiv scores. Notably, the study identifies a positive correlation between firm size (measured by total assets) and ESG performance across both measurement approaches. This research contributes to the ongoing discussion about objective ESG assessment methodologies and provides insights into performance patterns within the European energy sector.

Measuring Global GHG-GDP Efficiency: An Enhanced Hyperbolic Distance Function Approach

Roberto Balado-Naves; José Baños-Pino; Ana Rodríguez-Álvarez (U. de Oviedo)

Resumen

The present study contributes to the limited body of research examining the long-term economic and environmental performance of countries. We extend the standard neoclassical growth model by incorporating the generation of undesirable outputs, using an enhanced hyperbolic distance function to represent the economy. This approach improves upon previous models by explicitly accounting for greenhouse gas (GHG) emissions without imposing parametric assumptions on the relationship between aggregate production and pollution. We show that long-term growth rates and convergence dynamics depend not only on conventional growth determinants but also on changes in efficiency relative to the production possibility frontier and on per capita GHG emission growth. To test these relationships, we estimate growth rates and convergence speeds for a panel of 156 countries over the period 1995–2022. The empirical analysis relies on stochastic frontier methods and includes standard control variables such as private and public savings rates, population growth, human capital, and the share of renewable energy consumption. Our findings indicate that average efficiency has improved over time and that higher efficiency levels are associated with faster economic growth. Moreover, accounting for both the distance to the frontier and the growth of per capita GHG emissions leads to higher estimated speeds of convergence toward the steady state.

The Influence of Environmentally Friendly Vehicles on Air Pollution

Darío Blanco Fernández; M.^a José Pérez Villadóniga; Ana Rodríguez-Álvarez; David Roibás (U. de Oviedo)

Resumen

Air pollution negatively affects the environment, human health and imposes substantial economic costs through productivity losses. The transport sector accounts for nearly one quarter of the EU's GHG emissions, with road transport responsible for approximately three quarters of these emissions. To reduce traffic-related air pollution, several actions have been taken in the EU to replace the most polluting vehicles by non-polluting ones, such as fiscal incentives. To assess the impact of vehicle substitution on air pollution in Spain, we propose the use of a hyperbolic distance function, in which vehicles and fuel serve as inputs to produce traffic (vehicle-km) alongside nondesirable outputs (air pollutants). We assess the impact of environmentally friendly vehicles (based on the Spanish "environmental labels") on reducing pollution. We include meteorological variables and industrial GDP to control for their influence on pollution. Since factors such as weather conditions or vehicle type may

affect desirable and undesirable outputs differently, we use the model in Perez-Mendez et al. (2019) to take this into account. We use a panel dataset, where the Communities are the cross-sectional units. The period of analysis starts in 2016, when the “environmental labels” were introduced, and extends to include the most recent data available.

16:00–18:00 | Sesión: TRANSPORTE, INFRAESTRUCTURAS Y TURISMO

Eco-eficiencia en sistemas portuarios: evidencia empírica para España mediante un modelo WRDDM no orientado con emisiones de CO₂

Andrea Rodríguez; Lourdes Trujillo (U. de Las Palmas de Gran Canaria)

Resumen

La Eco-eficiencia se ha consolidado como un eje central en la economía portuaria, especialmente en un contexto en el que las exigencias de descarbonización condicionan crecientemente las decisiones operativas. A pesar del notable desarrollo de la literatura, persiste la necesidad de análisis empíricos detallados, particularmente en entornos altamente regulados como el europeo. Este trabajo propone la aplicación de un modelo no orientado de distancia direccional tipo Weighted Russell (WRDDM), incorporando las emisiones de CO₂ como output no deseable. Este enfoque representa una contribución novedosa al análisis de la eficiencia técnica en el ámbito portuario, al permitir ajustes no proporcionales entre inputs, outputs deseables y emisiones. El análisis empírico se centra en el sistema portuario español (considerando los 23 puertos más relevantes en términos de movimiento de carga) durante el período 2016–2020. Resultados preliminares indican que, en promedio y manteniendo constantes las demás condiciones, los puertos deberían reducir sus inputs en un 8,65%, ajustar los outputs deseables en un 21,62% y disminuir las emisiones de CO₂ en un 22,4% para alcanzar la frontera técnicamente eficiente. Más allá de la medición, el estudio aporta evidencia relevante sobre los trade-offs entre objetivos operativos y ambientales, así como sobre las implicaciones en términos de competitividad y resiliencia derivadas de la asimetría regulatoria que enfrentan los puertos europeos en el proceso de transición energética.

Transforming Port Activity into Revenue: An Efficiency Assessment of the Spanish Port System

David Paz Saavedra (U. de Cantabria); Xosé Luís Fernández (U. de Cantabria); Marta de la Fuente (U. de Cantabria); Pablo Coto-Millán (U. de Cantabria); Fernando González Laxe (U. de A Coruña)

Resumen

This study investigates the efficiency with which Spanish ports transform their operational activity into revenue generation. Using Data Envelopment Analysis (DEA), it evaluates how 26 ports convert operational inputs—cargo traffic, concessioned area, and vessel calls—into fee-based revenues (utilization, occupancy, and activity fees) over the 2018-2023 period. The results indicate that the current port tariff system may adversely affect the largest ports. While the average pure technical efficiency is relatively high (0.93), substantial scale inefficiencies are evident, particularly among major hubs. Interestingly, small and medium-sized ports consistently outperform their larger counterparts, indicating that neither port size nor traffic volume alone ensures optimal efficiency. These findings highlight the need for context-specific management strategies and differentiated regulatory approaches to enhance the overall competitiveness of the Spanish port system.

How Do We Measure Hotel Efficiency? An Application for Switzerland

Xosé Luís Fernández (U. de Cantabria); Roland Schegg (Institut de Tourisme (ITO), HES-SO Valais-Wallis)

Resumen

This paper examines hotel efficiency in Switzerland using frontier-based methods, with the aim of contributing to a relatively underexplored context in the tourism efficiency literature. The study develops a comprehensive framework to measure hotel performance by combining traditional input-output indicators with extended dimensions such as customer satisfaction, sustainability practices, and

technology adoption. Methodologically, the analysis relies on Data Envelopment Analysis (DEA). The production process is carefully specified to reflect the multidimensional nature of hotel activity, while potential statistical issues related to sample characteristics are explicitly considered. In addition to estimating efficiency scores, the paper explores the role of internal and external determinants, including hotel characteristics and geographical factors. The empirical application is based on a newly constructed dataset that integrates multiple sources of information on Swiss hotels. The paper aims to provide a structured assessment of hotel efficiency in Switzerland and to discuss the relevance of incorporating non-traditional performance indicators into frontier models. The findings are expected to offer insights for both academic research and industry stakeholders, particularly in terms of benchmarking and performance improvement strategies.

Infrastructure Development Efficiency (in Latin America and the Caribbean): Outcomes and Insights from Two Decades of Public and Private Sector Investment

José Luis Bonifaz (U. del Pacífico); *Ancor Suárez-Alemán* (Banco Interamericano de Desarrollo); *Tomás Serebrisky* (Banco Interamericano de Desarrollo)

Resumen

This paper examines the efficiency of infrastructure development in Latin America and the Caribbean (LAC) over the past two decades, highlighting key challenges and potential avenues for improvement. Despite notable progress in expanding access to basic infrastructure services, the region continues to face a significant infrastructure gap in both quantity and quality relative to its level of development. Addressing this gap is critical, as infrastructure plays a central role in promoting economic growth, enhancing productivity, reducing inequality, and supporting environmental sustainability. However, increasing investment alone is insufficient; improving the efficiency of existing investment is essential. Using a dataset covering 67 countries, for the years 2000, 2015 and 2020, this study evaluates infrastructure efficiency through an output-oriented stochastic frontier analysis (SFA) framework. The model incorporates public, private, and public-private partnership (PPP) capital stocks—proxied through gross fixed capital formation—as key inputs in the production of infrastructure services. The output is measured as a composite indicator of infrastructure coverage and quality, including access to electricity, water and sanitation, internet, health services, and transport infrastructure. The aim is to estimate the inefficiencies in infrastructure investment and whether they are still considerable, especially in the public sector, where cost overruns, delays and poor maintenance planning are frequent. At the same time, the growing role of private participation and PPPs may offer opportunities to improve efficiency, although the results depend critically on institutional quality, regulatory frameworks and project design. The document aims to explore strategies to close the infrastructure gap in the LAC: improve the efficiency of public spending and strengthen the conditions for effective and sustainable participation of the private sector. It also aims to show that improving governance, reducing inefficiencies and prioritizing high-quality investments are essential to maximize the impact on infrastructure development in the region.

VIERNES, 4 DE SEPTIEMBRE

09:30–12:00 | Sesión: APLICACIONES SECTORIALES

¿Mejora la sostenibilidad el rendimiento financiero? Un análisis del sector hotelero canario

Violeta de Vera; *Irene López-Armas*; *Marta Arbelo-Pérez* (U. de La Laguna, Instituto Universitario de La Empresa)

Resumen

La presente investigación tiene como objetivo profundizar en la relación entre el rendimiento ambiental y el rendimiento financiero corporativo en el sector hotelero canario, una región especialmente condicionada por sus recursos naturales para garantizar la sostenibilidad de la actividad turística a largo plazo. Este trabajo aborda la temática tratando de superar algunas limitaciones identificadas en la literatura, como la ausencia de mediciones del impacto financiero basadas en indicadores relativos, la escasez de estudios que integren un análisis conjunto de oferta y demanda, y la frecuente

simplificación de la sostenibilidad como una variable dicotómica. Para ello, se realizaron dos encuestas: una dirigida a una muestra de 172 hoteles y otra a 313 turistas, con el objetivo de captar la percepción de ambos agentes respecto a la sostenibilidad mediante la construcción de dos índices sintéticos a partir de un Análisis de Componentes Principales. Posteriormente, el índice correspondiente a los hoteles se incorporó como variable continua en un modelo de Frontera Estocástica con coeficientes aleatorios, con el fin de analizar su efecto sobre la eficiencia de beneficios en el periodo 2018–2024. Los resultados muestran que la sostenibilidad ejerce un efecto positivo sobre la eficiencia de beneficios de los hoteles. No obstante, al comparar este resultado con el índice construido a partir de los turistas, se observa que dicho efecto parece estar más vinculado a mejoras en la eficiencia interna de costes que a una respuesta efectiva del mercado hacia ofertas ecosostenibles.

Demand Volatility, Capacity Utilization and Input Productivity in the Hotel Sector

David Boto García; Inés Sustacha; José Baños-Pino (U. de Oviedo)

Resumen

A large literature documents substantial productivity differences across firms and establishments within narrowly defined industries. A growing body of evidence suggests that part of these differences may reflect differences in the demand environment rather than genuine differences in productive efficiency. This paper examines this hypothesis in the context of Spanish tourism destinations. Using panel data for 279 municipalities from the Spanish Hotel Occupancy Survey for the period 2003–2023, we construct several indicators of within-year demand volatility at the municipal level, including the coefficient of variation of monthly travellers and overnight stays, a Herfindahl-Hirschman index of monthly demand concentration, and the share of demand concentrated in summer months. We then estimate panel fixed effects regressions linking these volatility indicators to measures of input productivity, namely hotel occupancy rates and output per annual-equivalent worker, controlling for municipality and year fixed effects. The central prediction, grounded in a simple model of production with quasi-fixed capital and adjustment costs, is that destinations facing more volatile demand will exhibit lower capacity utilization not because they are less efficiently managed, but because hotel rooms, once built, cannot be costlessly adjusted to match seasonal fluctuations in demand. In contrast, if labour is more flexible than capital, labour productivity should be less affected by demand volatility, as workers can be more easily hired and released across seasons. Consistent with these predictions, we find that municipalities with more concentrated seasonal demand patterns display systematically lower occupancy rates across all three indicators of volatility, while the effect on output per worker is substantially smaller and less robust. This asymmetry between capital and labour productivity suggests that the adjustment burden of demand volatility falls primarily on the quasi-fixed factor, hotel capacity, rather than on the more flexible labour input. These results imply that standard measures of hotel productivity conflate genuine productive inefficiency with structural features of the local demand environment, and that destinations facing high seasonality are penalised in productivity rankings for reasons largely beyond their control. The findings have direct implications for the design of policies aimed at reducing seasonality in the Spanish tourism sector and for the broader interpretation of productivity dispersion in service industries with geographically segmented markets.

Assessing the Efficiency and Productivity of Socio-Labour Insertion Programmes for Rural Women: Evidence from Los Pedroches, Andalusia

Victoria Vicario-Modroño; María Moyano-García (U. de Córdoba)

Resumen

Gender inequality in rural labour markets remains a structural constraint on inclusive territorial development, particularly in depopulated areas where limited diversification, weak service provision and persistent gender norms restrict women's employment opportunities. This paper evaluates the efficiency and productivity of socio-labour insertion programmes aimed at improving women's labour-market integration in Los Pedroches, a rural comarca in northern Córdoba, Andalusia. The analysis combines a socio-labour diagnosis with a non-parametric frontier assessment for the 17 municipalities of the comarca over the period 2011-2024. Using official municipal data disaggregated by sex, the study constructs a panel in which the input is female registered unemployment, while outputs capture three

dimensions of female labour insertion: permanent contracts, contracts in traditionally male-dominated sectors, and contracts in services. An output-oriented Data Envelopment Analysis model under variable and constant returns to scale is used to estimate technical efficiency, while a Malmquist productivity index decomposes intertemporal performance into efficiency change, technological change and scale effects. The findings indicate that socio-labour insertion programmes are important tools for promoting employability and empowerment, although their effectiveness varies across the region. Medium-sized and more economically diversified municipalities are closer to the efficiency frontier, while smaller and more primary sector-dependent municipalities exhibit persistent inefficiencies, lower productivity gains, and greater sensitivity to scale limitations. At the aggregate level, the Malmquist index reveals a slight cumulative decline in total factor productivity, mainly due to limited technological progress and insufficient consolidation of efficiency gains. These results suggest that the success of active employment policies in rural areas depends not only on programme design, but also on territorial characteristics, institutional coordination, and the ability to create stable and empowering employment opportunities for women.

Análisis coste-utilidad en tecnologías sanitarias: una aplicación práctica

Pablo Oscar Roza Miguel (Cátedra MBA Institute de Investigación Médica y Biomecánica, U. de Oviedo); *Laia López Capdevilla* (Hospital de la Santa Creu i Sant Pau, Barcelona); *Nuria García Rodríguez* (U. de Oviedo); *Eduardo González Fidalgo* (U. de Oviedo)

Resumen

El análisis coste-utilidad es clave en la evaluación económica de tecnologías sanitarias. Relacionando costes y resultados en salud (medidos en años de vida ajustados por calidad, AVACs), cuantifica la eficiencia de las alternativas disponibles. Aplicamos esta metodología en la evaluación de alternativas en el tratamiento de las úlceras del pie diabético. Éstas son una de las complicaciones más graves de la diabetes, con una mortalidad del 50% a cinco años y costes directos que, en Estados Unidos, son comparables a los del cáncer. El transporte óseo transversal (TBT) es una técnica basada en la distracción ósea con resultados prometedores. Este estudio evalúa su adopción en España desde la óptica de la eficiencia en la asignación de recursos sanitarios. Un modelo de Markov comparó el tratamiento estándar con el TBT en un horizonte de 30 años. Las utilidades se obtuvieron de la literatura, al igual que los costes, que se ajustaron mediante paridades de poder adquisitivo. La efectividad clínica del TBT se basó en el mayor metaanálisis disponible. Se estimó el coste incremental, los AVACs ganados y la razón coste-efectividad incremental (ICER), comparándola con un umbral de disposición a pagar de 25.000 €/AVAC. Asimismo, se realizó un análisis de sensibilidad probabilístico (PSA), se estimó el beneficio monetario neto (BMN) y se llevó a cabo un análisis de impacto presupuestario. El TBT generó una ganancia incremental de 2,813 AVACs con un coste adicional de 13.527 €, lo que resulta en un ICER de 4.808 €/AVAC (5.183 €/AVAC según el PSA), manteniéndose por debajo del umbral considerado. El BNM esperado fue 54.146 € superior para el TBT al umbral considerado, y la probabilidad de que el TBT fuera coste-efectivo ascendió al 93%. El análisis presupuestario estimó un incremento del gasto de 3.549 millones de euros en 15 años (237 millones anuales de media).

Management Control Systems and Productive Performance of Spanish Agrifood SMEs

Darío Blanco Fernández; *Beatriz Cornejo*; *José Antonio Pérez*; *Alan Wall* (U. de Oviedo)

Resumen

Agri-food companies in Europe operate under increasingly stringent traceability and food safety requirements and face increasing institutional pressure from EU sustainability agendas. This study examines the impact of Management Control Systems (MCS), which can be defined as formal, information-based routines and procedures used to monitor and influence organizational activities—on the productive performance of these firms. We use a novel panel data set of 202 Spanish agri-food small and medium-sized enterprises (SMEs) observed over the period 2019-2024 which combines survey data on the use of MCS with firm-level financial information from the Iberian Balance Sheet Analysis System (SABI) database, allowing managerial variables to be combined with verified accounting data. Using stochastic frontier analysis, and taking into account measures of environmental and social sustainability, we estimate the relative effects on firm performance of the following

managerial variables: (i) the interactive use of MCS (i.e., dialogue-oriented and forward-looking use of control systems); (ii) a transformational leadership style (i.e., leadership that promotes change and organizational learning); (iii) measures aimed at integrating environmental objectives into strategic business planning; and (iv) the use of data analytics (systematic use of data to support managerial decision-making).

09:30–12:00 | Sesión: SECTOR PÚBLICO Y EQUIDAD

Beyond Performance: Productivity and Equity Dynamics across OECD Education Systems

Gabriela Sicilia (U. Autónoma de Barcelona); *Giovanna D’Inverno* (U. di Pisa); *Cristina Polo* (U. de Extremadura); *Rosa Simancas* (U. de Extremadura)

Resumen

This paper examines the evolution of productivity and equity in OECD education systems over the last decade and the institutional factors shaping these dynamics. The empirical strategy builds on four pillars. First, we measure productivity gaps using a conditional Global Malmquist index, enabling cross-country comparisons over time and decomposing productivity change into efficiency (catch-up) and technological shifts while identifying benchmark systems. Second, to assess equity trends, we combine a robust conditional Benefit-of-the-Doubt (BoD) model with Global Malmquist indices to construct a multidimensional equity composite indicator. By incorporating conditional models, we account for cross-country socioeconomic heterogeneity and obtain more comparable evaluations of productivity and equity dynamics. Third, we jointly analyse productivity and equity trajectories to examine whether efficiency gains involve trade-offs or complementarities with equity over time, distinguishing between frontier systems that improve in both dimensions and catch-up systems with greater scope for progress. Finally, we relate these dynamics to institutional arrangements and policy features — including private sector participation, early tracking, ability grouping and grade retention — providing new comparative evidence on the policies associated with more productive and equitable education systems.

Beyond Rankings: Bayesian Stochastic Frontier Analysis of the Determinants of University Efficiency

Zaira García-Tórtola (U. Jaume I); *David Conesa* (U. de València); *Joan Crespo* (U. de València); *Emili Tortosa-Ausina* (U. Jaume I)

Resumen

University rankings predominantly focus on outputs while neglecting the efficiency with which institutions convert resources into outcomes. We contribute to addressing this limitation by analyzing the determinants of university efficiency using a Bayesian stochastic ray frontier model applied to 47 Spanish public universities over the 2016–2021 period. Unlike traditional approaches, our methodology jointly estimates efficiency and its determinants in a single stage. We adopt a multi-output framework encompassing the three university missions: teaching, research, and knowledge transfer. Using backward stepwise selection with the deviance information criterion, we identify key efficiency determinants including the average department size, number of campuses, academic staff characteristics, and multi-province location. Results reveal substantial efficiency variations across universities, with approximately half showing positive efficiency changes over the period. The Bayesian approach provides full efficiency distributions rather than point estimates, enabling robust statistical comparisons. Our findings offer valuable insights for university managers and policymakers seeking to enhance institutional performance beyond traditional output-based rankings.

Designing a Counter-Cyclical Fiscal Stabilisation Mechanism for Spanish Autonomous Communities

Jorge Onrubia Fernández (ICEI-UCM, FEDEA); *Hugo Quiñones* (ICEI-UCM); Antonio Jesús Sánchez Fuentes (ICEI-UCM)

Resumen

This paper develops a proposal for a counter-cyclical fiscal stabilisation mechanism for the Spanish Autonomous Communities (ACs), tailored to Spain's regional financing system and inspired by the institutional principles underlying the European Stability Mechanism (ESM, or MEDE, from its Spanish acronym Mecanismo Europeo de Estabilidad). Building upon our previous causal analysis of regional funding, efficiency, and indebtedness (Onrubia et al., 2026), we argue that the prevailing model of ex-post liquidity provision is institutionally inadequate. The Spanish Regional Fiscal Stabilisation Mechanism (SRFSM) proposed is conceived as a mandatory, rule-based, counter-cyclical fund with a dual, interlinked objective: to ensure the short-term financial sustainability of ACs during economic downturns while safeguarding the long-term provision and quality of Fundamental Public Services (FPS), notably healthcare and education. The mechanism's design intricately links contribution and withdrawal rules to metrics of fiscal effort, spending efficiency on FPS, and regional economic performance. We employ a dual empirical strategy: first, a full retrospective simulation (2009–2023) applying the MEDE's liability reallocation formula, isolating the effects of financing asymmetries and cyclical shocks; second, a detailed counterfactual analysis of the post-COVID period (2020–2023), illustrating the mechanism's potential role as a powerful automatic fiscal stabiliser. Our findings suggest that SRFSM would have substantially mitigated pro-cyclical fiscal adjustments, reduced inter-regional disparities in debt accumulation, and crucially, protected FPS expenditure during critical stress periods.

A Dynamic Analysis of Productivity Gaps between Public and Government-dependent Private Schools in Spain

José Manuel Cordero (U. de Extremadura); Cristina Polo (U. de Extremadura); Daniel Santín (U. Complutense de Madrid); Rosa Simancas (U. de Extremadura)

Resumen

This paper analyzes productivity gaps between public and government-dependent private schools (GDPS) in Spain using data from the 2018 and 2022 waves of the Programme for International Student Assessment (PISA). The study applies a dynamic group-comparison framework to evaluate differences in school performance over time, extending the methodological approach recently proposed by Cordero and Santín (2025) to the analysis of repeated cross-sectional educational data. Given that the schools participating in PISA 2018 are not necessarily the same as those observed in 2022, the empirical strategy follows the pseudo-panel framework proposed by Aparicio and Santín (2018), which allows consistent comparisons of group performance over time in contexts where the evaluated units vary across periods. To estimate and compare productivity gaps between both groups of schools, we apply a methodology based on the use of a synthetic reference group uniformly distributed within a unit hypercube. Within this framework, productivity differences can be decomposed into two complementary components: efficiency gaps and technological gaps. This decomposition makes it possible to determine whether the relative performance of public schools and GDPS is mainly associated with differences in managerial efficiency or with disparities in the underlying educational technology. The analysis relies on nonparametric frontier techniques and exploits the rich microdata available in PISA to estimate comparable educational production technologies for both groups of schools over time. The paper contributes to literature in two main respects. First, it extends dynamic productivity gap analysis to the comparison of school ownership models in a repeated cross-sectional context, an issue that has received limited attention in previous studies. Second, it provides new evidence on one of the central debates in the economics of education, namely whether the observed differences in student outcomes between public schools and GDPS are associated with superior managerial performance, technological advantages, or both.

15:30–17:30 | Sesión especial en honor de KNOX LOVELL**Beyond Business Profit: Measuring Social Profit Inefficiency**Humberto Brea-Solis; *Emili Grifell-Tatjé*; [y C.A.K. Lovell]**Resumen**

Much has been written about the shortcomings of profit as a measure of business social performance, and of GDP and similar economic indicators as measures of aggregate social performance. While profit is an adequate measure of a business' financial performance, it excludes a range of externalities, positive as well as negative, a business creates, and while GDP is an adequate measure of an economy's economic output, it excludes externalities, also positive as well as negative, resulting from the production activities that generate GDP. While these arguments have become influential, they lack an analytical framework that would enable statements of refutable hypotheses and empirical testing of these hypotheses. We provide such an analytical framework of social value creation within which to study organizational value creation and distribution, both internal to capture the distribution of its added value to its owners and other stakeholders, and external to capture the distribution of its added value to society's stakeholders. We provide an empirical application to a panel of US agricultural production and distribution to illustrate the methodology.

Second-Order Boosting with Monotonicity and Envelopment Constraints for Frontier Estimation*Juan Aparicio*; Xabier Barber (U. Miguel Hernández)**Resumen**

We propose a boosting procedure for estimating production frontiers that pairs Efficiency Analysis Trees (EAT) as base learners with certain regularization machinery as second-order optimization and L2 penalization on leaf values. EAT supplies a split rule aimed directly at the upper boundary of the production set, and leaf values are obtained from a regularized quadratic program that we prove is strictly convex and admits a unique global optimum. By construction, the estimator respects free disposability in inputs and outputs and envelops the sample. Two add-ons extend its scope: a convexification step that aligns the fit with the DEA convexity postulate, and a repair step that preserves envelopment when row subsampling is used. We benchmark the technique against DEA, C2NLS, and other methods in simulations spanning several input dimensions and sample sizes.

When Low Rates Become Costly: Monetary Policy, Financial Fragility, and Bank Efficiency in Europe*Ana Lozano Vivas* (U. de Málaga)**Resumen**

This paper investigates how monetary policy affects bank cost efficiency in the European banking sector, identifying financial fragility as a primary transmission channel. We depart from the traditional "bank-lending channel" focus on credit volume to argue that monetary shocks fundamentally alter the productive environment and the monitoring incentives of financial intermediaries. Specifically, we posit that prolonged periods of ultra-low and negative interest rates (NIRP) reduce cost efficiency by fostering the buildup of systemic vulnerabilities and eroding the quality of the loan-screening process. Within the euro area, the persistence of the Negative Interest Rate Policy (NIRP) created a structural friction: the effective lower bound on retail deposits. This friction, together with narrowing net interest margins (NIMs), reduced returns on conventional intermediation and safe assets. Building on the "impaired monitoring" framework, we hypothesize that this environment weakened bankers' incentives for rigorous borrower screening and ex-post monitoring. As credit risk accumulated on balance sheets, banks were compelled to reallocate resources toward loan-loss provisioning, liquidity management, and heightened regulatory compliance. This shift in resource allocation increases the input requirements for a given level of output, thereby driving banks away from the stochastic cost frontier. We conceptualize financial fragility not merely as a terminal state of instability but as a dynamic economic mechanism that produces productive inefficiency. In this framework, monetary policy shocks generate deviations from optimal costminimization, even in the absence of immediate, observable defaults or banking distress.

Governance serves as the internal filter for these shocks; while robust oversight may preserve the frontier, short-term incentives can amplify the negative efficiency effects of accommodative policy. To identify this mechanism, we exploit significant shifts in European Central Bank (ECB) policy as quasi-natural experiments. Our identification strategy integrates a Difference-in-Differences (DiD) framework directly into the inefficiency component of a four-part stochastic frontier model. This single-step DiD-SFA approach allows us to test whether banks with high ex-ante exposure to NIRP experienced statistically significant increases in time-varying cost inefficiency. Critically, this methodology enables us to distinguish between persistent inefficiency, linked to structural managerial or governance traits, and transient inefficiency arising from policy-induced fragility and deteriorating risk conditions. By embedding monetary policy shocks within a production-theory framework, this research advances the literature on the risk-taking channel and banking efficiency. Our findings suggest that the "cost" of low interest rates extends beyond systemic stability risks to the operational health of the banking industry, as compressed margins and heightened vulnerability impair institutions' ability to manage costs efficiently at the frontier.

Evaluating the Impact of Waiting Lists on Hospital Efficiency and Costs

Ana Rodríguez-Álvarez; David Roibás (U. de Oviedo)

Resumen

This paper develops a new primal approach for the estimation of marginal costs under conditions in which technical efficiency is explicitly incorporated into the cost evaluation. To do this, we exploit the dual relationship between the input distance function and the cost function. We apply this framework in order to analyse the impact of hospital waiting lists on efficiency and costs. Waiting lists have a dual effect on social welfare. On the one hand, delays in healthcare provision exacerbate patients' health problems. On the other hand, redistributing patient care from periods of high demand to those of lower demand allows the healthcare system to operate closer to full capacity, thereby enhancing hospital technical efficiency. However, when waiting lists become excessively long, this effect diminishes, as idle times are eliminated. Moreover, patients' health may deteriorate significantly, leading to increased treatment costs that may outweigh the savings associated with reduced idle time. In this context, we estimate the marginal cost of hospital output while accounting for waiting lists and their impact on technical efficiency. Our results indicate that, while moderate waiting lists can improve productive efficiency and reduce costs, excessively long waiting lists may negate these benefits.