Laboratory of Operations Research
Department of Economics
School of Humanities and Social Sciences
University of Thessaly

5th Conference

"Economics of Natural Resources & the Environment"

Thursday 1 - Saturday 3 November 2018

http://envecon.econ.uth.gr/main/


ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ
ΤΜΗΜΑ ΟΙΚΟΝΟΜΙΚΩΝ ΕΠΙΣΤΗΜΩΝ

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Introduction

Dear,

Invited guests, Colleagues and Students,

On behalf of the Scientific and Organizing Committee, I welcome you to Volos and more specifically to the Department of Economics, School of Humanities and Social Sciences, University of Thessaly for the 5th Conference on "Economics of Natural Resources and the Environment". The Laboratory of Operations Research in the Department of Economics of the School of Humanities and Social Sciences at the University of Thessaly organized successfully under the research project COOPERATION 2011 and the project entitled "Greenhouse Gas Emission Scenarios and Policies to Combat them by the year 2030, of Energy, Transport and Industry in Greece" the first two Pan-Hellenic Conferences on the Economics of Natural Resources and the Environment: Climate change on 26-27th March 2014 and October 31st and November 1st , 2014. Then the successful organization of the 3rd Pan-Hellenic Conference on Economics of Natural Resources and the Environment on October 30-31st, 2015 was followed. Continuing this effort, the 4th Pan-Hellenic Conference was organized on 4th-5th November 2016 in the lecture rooms of the Department (formerly French Institute, G. Kartalis 72).

The scope of the conference is to present the main issues that concern the Economics of Natural Resources and the Environment with emphasis on the various environmental problems and their management and solution policies. Its aim is to highlight the interdisciplinary nature of environmental research through the exchange of views and experiences of researchers from different scientific fields and the finding of common components of research approaches.

The conference schedule includes 12 Sessions which will take place in the classroom of the new building of the Department of Economics as well as 5 keynote speeches. Those 12 sessions include the following fields of research *quantitative methods in environmental and resource economics: econometrics, socio-economic environmental assessment, waste management – circular economy, environmental issues and concerns, environmental policies and assessment, sustainable transport, quantitative methods in environmental and resource economics: mathematics, energy issues and policies, environmental valuation, sustainable tourism, environmental efficiency and performance, and sustainable development.*

Similarly to the previous conferences, through those sessions we will have the opportunity to learn the research work, the scientific research as well as the scientific outcomes of the participating academic and research institutes. The interdisciplinarity governing the environment is also evident in this conference and shows once again how important the cooperation of different scientific fields is in the study and the effective management of the environment.

I would like to welcome and thank the keynote speakers of the conference, Professors Charles Perrings, Ann Kinzig, Anil Markandya, Shunsuke Managi, and Clevo Wilson who accepted the invitation to attend the conference and present their long-term remarkable research experience on relevant to the conference research topics.

Last but not least, I would like to thank the participants in the current and the previous conferences for their support to this scientific effort by continuously attending the conference from all over Greece and abroad. Personally, I promise to continue the conference at the highest possible level at a time so that we can all contribute even more to the development of Economics of Natural Resources and the Environment at both theoretical and applied levels, always guided by sustainable development that is characterized by environmental protection and effective natural resources management.

I wish to all academics, researchers and students, who either present their research results or comprehend the results of the research efforts of other researchers, a pleasant, constructive and generous experience of the full attendance of the Conference and the expected exchange of views and ideas.

Conference Scientific Coordinator

Professor George E. Halkos (PhD)

Director of Laboratory of Operations Research
Department of Economics
School of Humanities and Social Sciences
University of Thessaly, Volos, Greece

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Concise Conference Schedule		
Day	**Time**	**Sessions-Topics**
Thursday 01/11/2018	**12:00-14:00 Domotel Xenia Venue**	**Round Table:** **Presentation of Research Activities of Members of Laboratory of Operations Research**
	19:00-19:30	**Opening Ceremony**
	19:30-19:45	**Welcome Speech** *Aims, Scopes and Structure of the 5th ENVECON Conference* *Professor George Halkos*
	19:45-21:00 Saratsis Auditorium	**Keynote Speakers** *Professor Charles Perrings* *Professor Ann Kinzig*
Friday 02/11/2018	**08:30-09:30**	**Registrations**
	09:30-11:30 Room B1	**Session 1:** **Quantitative Methods in Environmental and Resource Economics: Econometrics**
	09:30-11:30 Room I2	**Session 2:** **Socio-economic Environmental Assessment**
	11:30-12:00 Room A2	Coffee Break
	12:00-13:00 Room B1	**Keynote Speaker** *Professor Anil Markandya*
	13:00-14:00 Room A2	Lunch Break
	14:00-16:00 Room B1	**Session 3:** **Waste Management/Cyclical Economy**
	14:00-16:00 Room I2	**Session 4:** **Environmental Issues & Concerns**
	16:00-17:00 Room B1	**Keynote Speaker** *Professor Shunsuke Managi*
	17:00-17:30 Room A2	Coffee Break

	17:30-19:30 Room B1	**Session 5: Environmental Policies and Assessment**
	17:30-19:30 Room I2	**Session 6: Sustainable Transport**
	19:30-20:30 Room A2	Dinner Break

Saturday 03/11/2018	**09:30-11:30 Room B1**	**Session 7: Quantitative Methods in Environmental and Resource Economics: Mathematics**
	09:30-11:30 Room I2	**Session 8: Energy Issues & Policies**
	11:30-12:00 Room A2	Coffee Break
	12:00-13:00 Room B1	**Keynote Speaker** *Professor Clevo Wilson*
	13:00-14:00 Room A2	Lunch Break
	14:00-16:00 Room B1	**Session 9: Environmental Valuation**
	14:00-16:00 Room I2	**Session 10: Sustainable Tourism**
	16:00-16:30 Room A2	Coffee Break
	16:30-18:30 Room B1	**Session 11: Environmental Efficiency & Performance**
	16:30-18:30 Room I2	**Session 12: Sustainable Development**
	18:30-19:00 Room B1	**Closing & Giveaways**
	20:30	Formal Conference Dinner

CONFERENCE SCHEDULE

Thursday 1 November 2018

Round Table **12:00-14:00** **Domotel Xenia Venue**

Topic: **Presentation of Research Activities of Members of Laboratory of Operations Research**

Chairperson: **Professor George Halkos**

12:00-12:20 *Environmental behavior in a private-sphere context: Integrating theories of planned behavior and value belief norm, self-identity and habit*
Anastasia Gkargkavouzi[1], George Halkos[2] & Steriani Matsiori[1]
[1] Department of Ichthyology and Aquatic Environment, University of Thessaly,
[2] Laboratory of Operations Research, Department of Economics, University of Thessaly

12:20-12:40 *Environmental regulation and economic cycles*
George Halkos, Emmanuel Halkos, George Papageorgiou & John Papageorgiou
Laboratory of Operation Research, Department of Economics, University of Thessaly

12:40-13:00 *Analyzing the energy market's most effective risk management tools and strategies*
Apostolos S. Tsirivis
Laboratory of Operation Research, Department of Economics, University of Thessaly

13:00-13:20 *Exploring the EMEP Input Output model of Air Pollution*
George Halkos, Kyriaki Barmpoudaki, George Voulagkas & Kyriaki Tsilika
Laboratory of Operation Research, Department of Economics, University of Thessaly

13:20-13:30 *Market Reactions and socio-economic Impact due to Unexpected Events, Environmental Hazards and Governmental/Business Announcements*
George Halkos & Argyro Zisiadou
Laboratory of Operations Research, Department of Economics, University of Thessaly

13:30-14:00 Discussion

Opening Ceremony **19:00-19:45** **Saratsis Auditorium**

Keynote Speakers **19:45-21:00** **Saratsis Auditorium**

Topic: Ecology and economics in the science of anthropogenic biosphere change
Professor Charles Perrings
Professor Ann Kinzig
School of Life Sciences, Arizona State University, USA

Friday 2 November 2018

1st Session **09:30-11:30** **Room B1**

Topic: Quantitative Methods in Environmental & Resource Economics: Econometrics

Chairperson: Professor George Halkos

09:30-09:50 *Climate-friendly interventions by central banks: the inclusion of green assets in Quantitative Easing purchases*
Stephanos Papadamou & Nikolaos A. Kyriazis
Department of Economics, University of Thessaly, 28th October 78 Street,

09:50-10:10 *Optimal Allocation of Renewable Energy Subsidy Licenses*
Oliver Hortay[1] & Bence Rozner[2]
[1]Department of Environmental Economics, Budapest University of Technology and Economics
[2]Department of Probability Theory and Statistics, Eötvös Lóránd University

10:10-10:30 *Revisiting the environmental Kuznets curve hypothesis: A dynamic panel VAR analysis*
Michael L. Polemis
Department of Economics, University of Piraeus, Piraeus,

10:30-10:50 *Revisiting the relationship between economic growth and forested areas: A cross-country assessment*
George Halkos[1] & Antonis Skouloudis[2]
[1] *Department of Environment, University of Thessaly, Volos*
[2]*Department of Environment, University of the Aegean, Lesvos*

10:50-11:10 The impact of market competition on CEO compensation in the US energy sector (1992-2015)
Konstantinos N. Konstantakis & Panayotis G. Michaelides & Efthymios M. Tsionas
National Technical University of Athens, Greece
Lancaster University Management School, UK

11:10-11:30 Discussion

2nd Session **09:30-11:30** **Room I2**

Topic: **Socio-economic Environmental Assessment**

Chairperson: **Associate Professor Steriani matsiori**

09:30-09:50 *Critical application of NEP scale in Greece*
Steriani Matsiori
Department of Ichthyology and Aquatic Environment, School of Agricultural Sciences
University of Thessaly

09:50-10:10 *The spatial-economic dimension of aquaculture in Greece*
Sophoclis E. Dritsas (PhD)
Department of Ichthyology and Aquatic Environment, School of Agricultural Sciences
University of Thessaly

10:10-10:30 *A bilevel scheduling algorithm for maximizing NPV in forests with different rotation ages*
Konstantinos Petridis[1] Angelo Sifaleras[1] Garyfallos Arabatzis[2]
Department of Applied Informatics, School of Information Sciences
University of Macedonia

10:30-10:50 *Why people care about climate change*
Nikiforos Lambrou, Steriani Matsiori, Sophoclis E. Dritsas
Department of Ichthyology and Aquatic Environment, University of Thessaly

10:50-11:10 *Pocket parks as urban commons: The case of 'Alexandrou Svolou Neighborhood' in Thessaloniki*
Christina Andreadi & Paschalis Arvanitidis
Department of Planning and Regional Development, Department of Economics
University of Thessaly

11:10-11:30 Discussion

Keynote Speaker **12:00-13:00** **Room B1**

Topic: Evaluating Agro-food Systems in a Sustainable Context
Professor Anil Markandya
Basque Centre For Climate Change (Klima Aldaketa Ikergai) Spain

3rd Session **14:00-16:00** **Room B1**

Topic: **Waste Management – Circular Economy**

Chairperson: **Associate Professor Konstantinos Evangelinos**

14:00-14:20 *Evaluating 22 EU Member States' 'waste culture' using Hofstede's and Schwartz's cultural dimensions*
George Halkos & Kleoniki Natalia Petrou
Laboratory of Operations Research, Department of Economics, University of Thessaly

14:20-14:40 *The added value of the cement industry in the circular economy*
Eric Waeyenbergh
Administrator of Go4Circle, the Belgian federation of private companies active in waste and the environment Administrator of EUCOPRO, the European Federation of private companies preparing alternative fuels for the cement industry Chairman of the Task Force Waste of CEMBUREAU, the European Cement association

14:40-15:00 *Circular economy aspects in sustainability reports: A critical overview of Greek market*
Konstantinos Evangelinos, Stefanos Fotiadis, Panagiotis Vouros, Christina Mpitsori, Antonis Skouloudis, Ioannis Nikolaou
Environmental Policy and Corporate Environmental Management Research Group, Department of Environment, University of the Aegean, Mytilini,
School of Economics, Business Administration & Legal Studies, International Hellenic University, Thessaloniki,
Democritus University of Thrace, Department of Environmental Engineering, Komotini,

15:00-15:20 *Circular economy in Greece: Evidence from Central Macedonia*
Sofia-Natalia Boemi[1], Chrysanthi Kiskini[1], Konstantinos Tertivanidis[1] and Konstantinos Befas[2]
[1]Regional Development Fund of Central Macedonia
[2] *Region of Central Macedonia*

15:20-16:00 Discussion

4th Session **14:00-16:00** **Room I2**

Topic: **Environmental Issues & Concerns**

Chairperson: **Professor Ann Kinzig**

14:00-14:20 *Measurement of green industrial performance: an enhanced GIP index*
Jaime Moll de Alba & Valentin Todorov
United Nations Industrial Development Organisation (UNIDO), Vienna International Centre

14:20-14:40 *Investigating the impact of wellbeing on economic performance: Evidence from European Union countries and regions.*
George Ekonomou & Dimitris Kallioras
Department of Planning and Regional Development, University of Thessaly

14:40-15:00 *The Relationship between Environmental Degradation, Economic Development and Corruption: A Panel Data Cointegration Analysis of Asian Emerging and Developing Countries*
Anam Shehzadi[a] and Heike Wetzel[a]
[a]Institute of Economics, University of Kassel

15:00-15:20 *Strategic analysis of competition among Russian gas producing companies: implications for domestic and international gas markets*
Sergei G. Parsegov[1], Amina Talipova[2]
[1]Texas A&M University, [2]Higher School of Economics (National Research University)

15:20-15:40 *Can we hedge an investment against a potential unexpected environmental disaster?*
George Halkos and Argyro Zisiadou
Laboratory of Operations Research, Department of Economics, University of Thessaly

15:40-16:00 Discussion

Keynote Speaker **16:00-17:00** **Room B1**

Topic: Inclusive Growth for Sustainability: Measurement from Inclusive Wealth Report 2018
Professor Shunsuke Managi
Urban Institute, Kyushu University, Japan

5th Session **17:30-19:30** **Room B1**

Topic: **Environmental Policies & Assessment**

Chairperson: **Professor Anil Markandya**

17:30-17:50 *Assessing the impact of a climate change adaptation intervention: Evidence from Central Highlands of Afghanistan*
Asadullah Jawid & Menusch Khadjavi
Department of Economics, Christian Albrechts University of Kiel

17:50-18:10 *What drives responsible business? Examining the links between reputation risk, non-government organization (NGO) pressure and responsible business performance*
James Wallace & Dr. George Iatridis
Department of Economics, University of Thessaly,
Group Communications and Corporate Responsibility, Allianz SE

18:10-18:30 *Prediction of Global Warming impacts using Fuzzy Cognitive Maps and Semantic Web techniques*
Athanasios Tsadiras[1] , Maria Pempetzoglou[2] & Iosif Viktoratos[1]
[1]School of Economics, Aristotle University of Thessaloniki,
[2]School of Social Administration and Political Science,
Democritus University of Thrace

18:30-18:50 *Towards better tools for effective environmental policy*
George E. Halkos & Kyriaki D. Tsilika
Laboratory of Operations Research, Department of Economics, School of Humanities and Social Sciences, University of Thessaly

18:50-19:10 *Identification of regimes in river behavior using nonlinear timeseries analysis*
Athanasios Fragkou, Theodoros Karakasidis, Antonios Liakopoulos
Laboratory of Hydromechanics and Environmental Engineering, Department of Civil Engineering, University of Thessaly

19:10-19:30 Discussion

6th Session **17:30-19:30** **Room I2**

Topic: **Sustainable Transport**

Chairperson: **Professor Vassilios Profillidis**

17:30-17:50 *Real-time road traffic forecasts – a hybrid approach using artificial intelligence and Singular Spectrum Analysis*
Stylianos Kolidakis[1], George Botzoris[1], Vassilios Profillidis[1], Panagiotis Lemonakis[2]
[1] School of Civil Engineering, Democritus University of Thrace
[2] University of Thessaly, Department of Civil Engineering

17:50-18:10 *Examining the determinants of CO2 emissions caused by the transportation sector activity: Empirical evidence from 12 European countries*
Vasiliki V. Georgatzi, Apostolos Vetsikas, and Yeoryios Stamboulis
Department of Economics, University of Thessaly

18:10-18:30 *Artificial Neural Networks: A Modern Tool for Empirical Modeling of Transport Demand*
Vassilios Profillidis, George Botzoris, Stylianos Kolidakis
School of Civil Engineering, Democritus University of Thrace

18:30-18:50 *The contribution of the road transport projects of the NSRF 2007-2013 to the development of a Greek region*
Christina Mavraki[1], Garyfallos Arabatzis[1], Apostolos Kantartzis[1] & Chrisovalantis Malesios[2]
[1]Department of Forestry and Management of the Environment and Natural Resources, Democritus University of Thrace
[2]Operations & Information Management Department, Aston Business School, Aston University

18:50-19:10 *Investigation of bicyclists' riding behaviour under normal traffic conditions in the road network of a mid-sized Greek city*
Konstantinos Zavitsanos[1], Athanasios Galanis[2], Panagiotis Lemonakis[1], George Botzoris[3] & Nikolaos Eliou[1]
[1]University of Thessaly, Department of Civil Engineering
[2]Technological Educational Institute of Central Macedonia, Department of Civil Engineering and Surveying Engineering and Geoinformatic
[3]Democritus University of Thrace, Department of Civil Engineering

19:10-19:30 Discussion

Saturday 3 November 2018

7th Session **09:30-11:30** **Room B1**

Topic: **Quantitative Methods in Environmental & Resource Economics: Mathematics**

Chairperson: **Professor Charles Perrings**

09:30-09:50 *Budget and environmental subsidies: Optimal management and a dynamic game*
George Emm. Halkos and George J. Papageorgiou
Laboratory of Operations Research, Department of Economics, University of Thessaly

09:50-10:10 *Modeling a closed economy by a lattice Hamiltonian*
Founta Konstantina, Benos Christos, Zachilas Loukas
Department of Economics, University of Thessaly,

10:10-10:30 *Adopting Tolerance Intervals in Environmental Economics*
Christos P. Kitsos Thomas T. Toulias
University of West Attika

10:30-10:50 *Wind energy potential based on Visibility Complex Network and Recurrence Plot time series analysis*
Avraam Charakopoulos[1], Theodoros Karakasidis[1], Ioannis Sarris[2]
[1] Laboratory of Hydromechanics and Environmental Engineering, Department of Civil Engineering, University of Thessaly
[2] Department of Mechanical Engineering, University of West Attica

10:50-11:10 *Towards an Economical Approach of Physical Phenomena*
Antonios Kanavouras[1] & Frank A. Coutelieris
[1]Department of Food Science and Human Nutrition, Agricultural University of Athens
[2]Department of Environmental & Natural Resources Management, University of Patras

11:10-11:30 Discussion

8th Session **09:30-11:30** **Room I2**

Topic: **Energy Issues & Policies**

Chairperson: **Professor Shunsuke Managi**

09:30-09:50 *Energy transition, poverty and inequality: Insights from panel data for Vietnam from 2004 to 2016*
Trung Thanh Nguyen[a*], Thanh-Tung Nguyen[a], Vincent Hoang[b], Clevo Wilson[b], Shunsuke Managi[c]
[a] School of Economics and Management, Leibniz University Hannover, Germany;
[b] School of Economics and Finance, Queensland University of Technology, Australia;
[c] Urban Institute, Kyushu University, Japan

09:50-10:10 *Assessing the sustainability of renewable energy sources with the combination of life cycle and SWOT analyses*
Demetrios N. Papadopoulos
Department of Environmental and Natural Resources Management, University of Patras

10:10-10:30 *Energy policy establishment for off-grid small isolated settlements*
Evangelos Tsiaras & Frank A. Coutelieris
Department of Environmental and Natural Resources Management, University of Patras

10:30-10:50 *Selection of optimal on shore wind farm sitting locations in Greece, using Multi criteria Decision Analysis*
Ioannou Konstantinos[1] Tsantopoulos Georgios[2] Arabatzis Garyfalos[3]
[1]Researcher, National Agricultural Organization – "DEMETER", Forest Research Institute
[2]Associate Professor, Democritus University of Thrace, Department of Forestry and Management of the Environment and Natural Resources
[3]Professor, Democritus University of Thrace, Department of Forestry and Management of the Environment and Natural Resources

10:50-11:10 *Determinants of household electricity consumption in Greece: A statistical analysis*
Dimitra Kotsila & Persefoni Polychronidoy
Hellenic Open University, Patras

11:10-11:30 Discussion

Keynote Speaker 12:00-13:00 **Room B1**

Topic: Could Revealed and Stated Preference Techniques Produce Similar Outcomes for Policy Decision-making?
Professor Clevo Wilson
School of Economics and Finance, Queensland University of Technology, Australia

Topic: **Environmental Valuation**

Chairperson: **Professor Clevo Wilson**

14:00-14:20 *Understanding people's perception about biodiversity importance, management and conservation*

George Halkos[1] and Steriani Matsiori[2]

[1] Laboratory of Operations Research, Department of Economics, University of Thessaly

[2] Department of Ichthyology and Aquatic Environment, School of Agricultural Sciences University of Thessaly

14:20-14:40 *Valuation of ecosystem services and assessment of their social impacts*

Nikoleta Jones[1], James McGinlay[1], Kostantinos Evangelinos[2]

[1]Global Sustainability Institute, Anglia Ruskin University

[2]Department of Environment, University of the Aegean

14:40-15:00 *How do motives and knowledge relate to intention to perform environmental behavior? Assessing the mediating role of negotiation and constraints*

Anastasia Gkargkavouzi[1], George Halkos[2] & Steriani Matsiori[1]

[1]University of Thessaly, Department of Ichthyology and Aquatic Environment, School of Agricultural Sciences

[2] Laboratory of Operations Research, Department of Economics, University of Thessaly

15:00-15:20 *Preferences and willingness to pay for protecting the marine and coastal environment from plastic waste: a case study of Syros Island, Greece*

Charalampos Mentis[1], Dionysis Latinopoulos[2], Kostas Bithas[1]

[1]Research Team on Economics of the Environment and Sustainable Development, Institute of Urban Environment and Human Resources (UEHR), Department of Economic and Regional Development, Panteion University of Social and Political Sciences

[2]School of Urban-Regional Planning and Development Engineering, Aristotle University of Thessaloniki

15:20-15:40 *Implementing Hedonic Pricing Models for valuing the visual impact of wind farms in Greece*

Konstantinos Skenteris[a], Sevastianos Mirasgedis[a] & Christos Tourkolias[b]

[a] Institute for Environmental Research & Sustainable Development, National Observatory of Athens

[b] Center for Renewable Energy Sources & Saving

15:40-16:00 Discussion

10th Session **14:00-16:00** **Room I2**

Topic: **Sustainable Tourism**

Chairperson: **Professor Christos Kitsos**

14:00-14:20 *Shark aggregation and tourism: Opportunities and challenges of an emerging phenomenon*
Nir Becker[a], Ziv Zemah Shamir[b] and Shiri Zemah Shamir[c]
[a]Department of Economics and Management, Tel-Hai College
[b]Marine Biology Department, M. Kahn Marine Research Station, University of Haifa
[c]School of Sustainability, Interdisciplinary Center Herzliya

14:20-14:40 *Alternative forms of sustainable development: The case of thermal tourism*
Delitheou Vasiliki & Georgakopoulou Stavroula
Panteion University of Social and Political Sciences, Department of Economic and Regional Development

14:40-15:00 *Integrating sustainable supply chain management (SSCM) amongst Greek supermarkets*
Eleni Sardianou* & Efthalia Christou**
*Harokopio University, School of Environment, Geography and Applied Economics, Department of Home Economics and Ecology, Graduate Program of Sustainable Development
**NATO Office of Resources (NOR)

15:00-15:20 *The use of carbon shadow pricing as a tool to drive the decarbonization of the Greek hotels operations*
Benjamin Karatzoglou
Department of Economics, University of Macedonia

15:20-15:40 *Wind energy, an energy solution for hospitality businesses*
Amalia Karabekou[1], Dimitrios Kovos[2], Stephanos Karagiannis[1] & Vasiliki Delitheou[1]
[1] Department of Economic and Regional DEevelopment, Panteion University
[2]Mechanical Engineer Design and Draftin, Sheridan College, Brampton, Ontario

15:40-16:00 Discussion

11th Session **16:30-18:30** **Room B1**

Topic: **Environmental Efficiency & Performance**

Chairperson: **Professor George Halkos**

16:30-16:50 *Two stage DEA & marginal effects of environmental variables to TE index*
George Halkos[1] & Christina Bampatsou[1,2]
[1]Laboratory of Operations Research, Department of Economics, University of Thessaly
[2]Ionian University, Faculty of Economic Sciences

16:50-17:10 *Research Intensities and R&D Input-Output Multipliers: An Examination of their Intertemporal Stability Using Data on the US Economy*
Lampros Nikolaos Maros[1], Christos T. Papadas[2], and Penelope Gouta[2]
[1] CIHEAM IAM Chania
[2]Agricultural University of Athens, Department of Agricultural Economics and Rural Development

17:10-17:30 *A merry triangle or a heavy cross? Environmental Efficiency, Productive Performance & Competitiveness under Technological Heterogeneity*
Nikos Chatzistamoulou[ab], Kostas Kounetas[b]
[a]School of Economics, University of Surrey, UK
[b]Department of Economics, University of Patras

17:30-17:50 *Measuring efficiency in forestry section using Network DEA approach: An application to EU countries*
Konstantinos Petridis[1] Ioannis Kyritsis[2]
[1]Department of Applied Informatics, School of Information Sciences, University of Macedonia
[2]School of Economic Sciences, Aristotle University of Thessaloniki

17:50-18:10 *European Industries' Energy Efficiency Performance Under Different Technology Regimes. The Role of Heterogeneity, Path Dependence and Energy Mix.*
Kostas Kounetas and Eirini Stergiou
Department of Economics, University of Patras

18:10-18:30 Discussion

12th Session **16:30-18:30** **Room I2**

Topic: **Sustainable Development**

Chairperson: **Professor Michael Zouboulakis**

16:30-16:50 *Assessing the independence of NRA in controlling the competition in Iranian energy market*
Tayebeh Saheb & Hassan Ganji Yahyazadeh
Tarbiat Modares University, Tehran University, School of Law

16:50-17:10 *Just how Smart is [Smart] Regulation? Achieving Sustainable Development with Regulation-induced Innovation*
Nicholas A. Ashford[a] & Abdelfeteh Bitat[b]
[a]Massachusetts Institute of Technology [b]Université Saint-Louis Bruxelles

17:10-17:30 *Assessing Safety in Public Areas with Space Syntax Application; Case Study of Tarbiat Pedestrian Area, Tabriz-Iran*
Kübra Cihangir Çamur[1] & Mehdi Roshani[2]
[1] Gazi University, Faculty of Architecture, City and Regional Planning Department
[2]Gazi University, Graduate School of Natural and Applied Sciences, City and Regional Planning Department

17:30-17:50 *The effect of growth-CO_2 emission relationship on sustainable development: Application of the Wavelet Transform Technique*
Ammouri Bilel[1], Issaoui Fakhri[2] & Zitouna Habib[3]
[1] Laboratoire DEFI, Ecole Supérieure de Sciences Economiques et Commerciales, Université de Tunis.
[2] Le Laboratoire de Recherche « Prospective, Stratégies et Développement Durable » Université Tunis EL-Manar, Faculté des Sciences Economiques et de Gestion de Tunis
[3] Faculté des Sciences économiques et de gestion de Nabeul

17:50-18:10 *Economic and environmental impact of low carbon technologies in German energy system*
Subhash Kumar and Reinhard Madlener
RWTH Aachen University, Germany Department: FCN, E.ON Energy Research Center

18:10-18:30 Discussion

Closing & Giveaways **18:30-19:00** **Room B1**

Topic: Closing & Final Giveaways
Professor George Halkos
Department of Economics, School of Humanities and Social Sciences, University of Thessaly

ABSTRACTS

ROUND TABLE: ***Presentation of Research Activities of Members of Laboratory of Operations Research***

Environmental behavior in a private-sphere context: Integrating theories of planned behavior and value belief norm, self-identity and habit

Anastasia Gkargkavouzi[1], George Halkos[2] & Steriani Matsiori[1]

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Abstract

This study explores the determinants of environmental behavior in a private-sphere context and proposes an integrative model that includes the constructs from two theoretical frameworks, the theory of planned behavior (TPB) and the value belief norm theory (VBN), along with two additional variables, habits and self-identity. A questionnaire survey method was used to collect the survey data and statistical analysis relied on application of structural equation modeling (SEM). The results show that intention is the best predictor of environmental behavior followed by habits and subjective norm is the main attendant of intention. Awareness of consequences has a positive impact on personal and subjective norms, attitudes and perceived behavioral control, while these constructs have in turn a significant influence on behavioral intention. Self-identity moderates the relationships between biospheric values and personal norm, attitudes, subjective norm, and perceived behavioral control. The proposed model exhibit superior predictive ability compared to the original TPB and VBN models verifying its utility and effectiveness in explaining environmental behavior. The results of this work can be used by governments and policymakers to design and implement conservation programs to promote a more sustainable lifestyle. Recommendations for future research are discussed in the last section of this paper.

Keywords: Theory of planned behavior; value-belief-norm theory; habit; self-identity; private-sphere environmental behavior.

JEL Codes: A14; C38; Q00; Q51; Q56; Q59.

Environmental regulation and economic cycles

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Abstract

This paper considers economic cycles that do not depend on the exogenous economic actions. More precisely, the paper develops a positive model of government behavior in order to define the intertemporal fiscal policies that are optimal for a country, determining the optimal level of the budget and the optimal level of the rate of environmental quality, as well. For this purpose, we setup an optimal control model involving the intertemporal subsidy strategies for an authoritarian (like a central European) government. It will be shown - applying the Hopf bifurcation theorem - that cyclical strategy, i.e. waves of regulation, environmental subsidies alternating with deregulation, cuts in social programmes, etc., may be optimal strategies. In this paper we propose an extremely simple optimal control model concerning budget surplus and environmental subsidies. We investigate the cyclical environmental policies applying one bifurcation theorem. A number of propositions are stated during the solution process.

Keywords: Budget, environmental resources, subsidies, Hopf bifurcation, optimal control

JEL Codes: E62, C61, H61, H23, Q50, C02,

ROUND TABLE: ***Presentation of Research Activities of Members of Laboratory of Operations Research***

Analyzing the energy market's most effective risk management tools and strategies

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Abstract

The current review emphasizes on the importance of the development of an effective price risk management strategy regarding energy products, as a result of the high volatility of that particular market. The study provides a thorough investigation of the numerous risk management methodologies and econometric techniques that were presented in the most representative academic researches, trying to shed light to the advantages, as well as the weaknesses of each approach. After a comprehensive examination of the relative literature, it is evident that although being able to predict the future variance through the advanced developments of the basic ARCH and GARCH models is essential to manage risk, however it fails to provide a clear view on the specific amount of money that is at risk on behalf of the investor or any party directly affected by the price fluctuations of a specific or multiple energy products. Thus, it is necessary for risk managers to make one more step trying to select the most appropriate and effective approach that will make possible an accurate forecast of the relative Value-at-Risk, which by definition provides a good measure of the total amount that is at stake. Nevertheless, despite the variety of the variance models that have been developed and the relative VaR methodologies, the vast majority of the researchers conclude that there is no model or specific methodology that outperforms all the others. On the contrary, the best approach to minimize risk and accurately forecast the future potential losses is to adopt that specific methodology that will be able to take into consideration the particular characteristic features regarding the trade of a specific or a certain group of energy products.

Keywords: Energy commodities, risk management, volatility modeling, ARCH-GARCH, Value-at-Risk (VaR), Extreme Value Theory (EVT)

JEL Codes: Q40; Q48; Q58

Exploring the EMEP Input Output model of Air Pollution

George Halkos, Kyriaki Barmpoudaki, George Voulagkas & Kyriaki Tsilika
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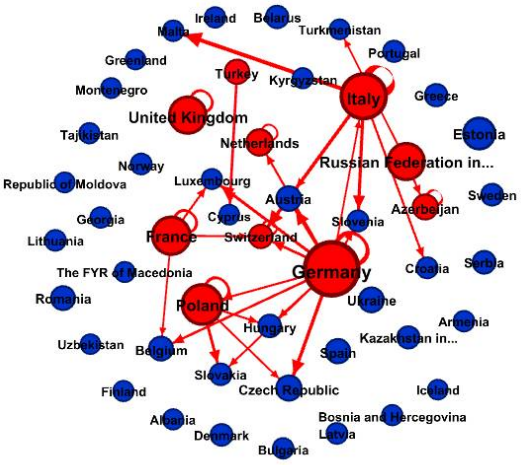
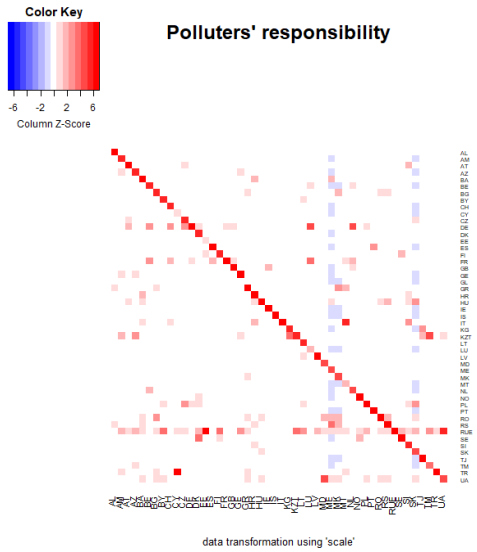
Abstract
The primary objective of this paper is the structural analysis of source-receptor air pollution problems in the EU region. Two views are provided for the analysis: an emission-driven view and a deposition-driven view. Different visualization modules are used to reproduce the global pollution network and identify the biggest sources and sinks of pollution. Visual modelling helps to understand the linkages and interconnections in the transboundary pollution network. Our interactive outputs give the options to zoom in specific areas of the global source-receptor air pollution scheme and highlight the top emitters or receptors of pollution. Ranking of countries in decreasing order of pollution responsibility and/or vulnerability using graph metrics is a main result. Data sources are emissions-depositions (or source-receptor) tables of air pollutants, available online from the data repository of the European Monitoring and Evaluation Program (EMEP) of the Long-Range Transmission of Air Pollutants in Europe. In our computer-based visual analysis, we employ solely open software.



Computer-based design and analysis of pollution networks in Gephi – receptors' view



Exploring linkages and interdependencies in source receptor air pollution problems with heat maps in R package – emitters' view

Keywords: source-receptor air pollution; network analysis; heatmaps.

JEL Codes: C63; C88; Q53; Q58.

ROUND TABLE: ***Presentation of Research Activities of Members of Laboratory of Operations Research***

Market Reactions and socio-economic Impact due to Unexpected Events, Environmental Hazards and Governmental/Business Announcements

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Abstract

The purpose of our study is to examine anything that is assumed to be unexpected, either positive or negative, and whether such an event can cause multiple impacts both to the markets and the economy. More specifically, the list of the unexpected, or as they are also called random, events contain terrorist attacks, natural environmental hazards such as earthquakes, volcanic eruption, floods etc, technological environmental hazards such as industrial explosions, nuclear power accidents, transport accidents etc, or even governmental announcements like the upgrade/downgrade of a country's credit rating, an upcoming default, a change of the political scenery or the detection of a new natural resource, as well as the business announcements which may include the upgrade/downgrade scenarios as well as an upcoming merger or acquisition. It is obvious that each category needs different approaches in order to draw some conclusions, however the ultimate purpose is to determine the factors that may lead to the occurrence of the "unexpected" event as well as the indicators that seem to be affected after the occurrence. We have already proven that the "unexpected" events are not totally unexpected. We may not be able to predict the exact time and/or target, however, based on the available data we will try to extract probabilistic curves which will indicate the risk someone is facing under curtain circumstances. In addition, map visualization techniques are used in order to illustrate the high-risk and low-risk areas across the globe. The next stage will be to examine whether there is a statistically significant reaction caused by the investors and if yes, whether the reaction tends to be significant to the positive or negative events. At the same time, we examine benefits or drawbacks that the economy, of a region, nation, or even continent, may face due to that event. For instance, a natural environmental hazard (e.g earthquake) has direct impacts (building demolition, fatalities, etc) as well as indirect impacts such as the increase of public health expenditures, the increase of the government's expenditures, the decrease of production etc. By examining all the different aspects that may be influenced by an unexpected event with the use of visualizations, statistical and advanced econometric modeling we aim to provide a priori information to governments' and corporations' policy makers as well as to the individual investors and investment advisors for the risk level they are about to adopt. Therefore, a system of equations will allow us to predict the possible losses we may face, giving us the ability to protect our capital in advance using hedging techniques. Finally, regarding the national or international level, knowing a priori the probability of occurrence may help the governments or the responsible organizations create preparedness and safety systems as well as recovery systems.

Keywords: market reactions, unexpected, disaster, hazard, hedging, government, corporate

JEL Codes: D53, E42, E44, G14, G15, G18, G28, G30, G32, G34, Q50, Q53, Q54; Q58,

KEYNOTE SPEAKERS:

Ecology and economics in the science of anthropogenic biosphere change

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Abstract

We examine the consequences of a forty-year experiment in interdisciplinary collaboration between ecologists and economists to understand anthropogenic impacts on the biosphere. Research on the linkages between biodiversity and ecosystem function has, for example, established the scientific basis for the valuation of many important natural assets, and has deepened our understanding of the stability and sustainability of natural resource systems. Focusing on biodiversity, we consider how the experiment has strengthened the science of biosphere change, but also how it has raised new challenges for both disciplines.

Climate-friendly interventions by central banks: the inclusion of green assets in Quantitative Easing purchases

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Abstract
This study investigates how unconventional monetary policies exercised by major economies hit by the Global Financial Crisis and the Eurozone sovereign debt crisis could render environmental-friendlier. The inclusion of ''green assets'', such as equities, bonds, infrastructure and real-estate loans as well as structured and securitized products could replace assets of emission-intensive sectors in the balance sheet of monetary authorities. We look into the possibility that the ''green investment gap'' may be lowered by high-level policy coordination and how this could be strengthened by coordination with fiscal policy and financial regulation. Therefore, we cast light on an innovative aspect of central bank policymaking by taking into consideration climate-related risks.

Keywords: Unconventional monetary policy; green assets; emission-intensive sectors

JEL Codes: E52; E58; Q43; Q48

Optimal Allocation of Renewable Energy Subsidy Licenses

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Abstract
Since 2014, EU member states had to transform their renewable energy support system: according to the new guideline of the European Commission (EC, 2014/C200/01), subsidy rights should be auctioned so the state regulator can no longer directly influence the amount of support.
In order to reach the renewable targets at the lowest cost, the member states should provide sufficient flexibility for investors and, in that respect, allocate an optimal amount of subsidy licenses. Flexibility reduces support costs but raises uncertainty and thus increases the role of the appropriate allocation strategy. We use Monte Carlo simulation to analyze state licensing strategies taking into account investors' real options behavior. The lessons learned from the research are that potentially significant cost savings can be achieved through a new allocation strategy perspective.

Keywords: Licensing Strategy; Renewable Energy Subsidy; Real Option Behavior; Feed-in Premium, Monte-Carlo Simulations

JEL Codes: C63; G11; H23; Q413; Q48.

Revisiting the environmental Kuznets curve hypothesis: A dynamic panel VAR analysis

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Abstract

This study is based on a balanced panel of pollutants (CO_2, SO_2 and NOx emissions per capita) drawn from the electricity sector of 51 U.S. regions covering the period 1990-2012. The empirical findings indicate a strong evidence of nonlinear cointegrated relationships between local (SO_2 and NO_x) and global (CO_2) emissions generated in the electricity sector with the level of economic growth. The dynamic Panel-VAR results using impulse response functions and variance decomposition support the validity of these findings further. These results call for the need to strengthen the effectiveness of environmental degradation policies by ensuring sustainability of the electricity sector in order to drastically reduce global and local pollutants.

Keywords: EKC hypothesis; Pollutants; Sustainability; Environmental degradation; Panel VAR.

JEL Codes: C11; C23; Q4.

Revisiting the relationship between economic growth and forested areas: A cross-country assessment

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Abstract
A critical challenge for sustainability is to preserve forested areas, along with the ecosystem services they provide, while enhancing enabling conditions towards economic development. In this study, the relationship between growth and forested areas is examined across 23 countries where the vast majority of primary forests occurs. Macroeconomic and institutional characteristics as well as population dynamics are hypothesized to have an impact on forested areas. By employing panel data appropriate methods we test the validity of the Environmental Kuznets Curve (EKC) hypothesis concerning the relationship between GDP/c and forest area. Likewise, we examine whether institutional and macroeconomic conditions affect forest area and if dynamics have any effect on forested areas in all assessed countries.

Keywords: Forested area; growth; economic development; panel data analysis, Environmental Kuznets Curve.

JEL Codes: O44; O57; Q01; Q23; Q56

The impact of market competition on CEO compensation in the US energy sector (1992-2015)

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Abstract
In this paper, we examine the impact of market competition on CEO compensation by analyzing a sample of all American firms in the energy sector in the 1992 - 2015 time span, and measuring market competition by means of the Herfindhal-Hirschman-Index. We divide industries into three sub-groups based on small, medium and high market concentration and try to expand our research by exploring the impact of the recent financial crisis. The paper investigates how CEO salaries are affected by firm-level determinants, e.g. firm size, returns on assets, returns on equity, capital expenditure, market concentration, Tobin's Q etc. as well as by the individual characteristics of each CEO, e.g. CEOs age, gender. Based on our findings, the market concentration index in the US energy sector has a negative and statistically significant impact on CEO compensation for all firms that operate in either a highly monopolistic or a purely competitive environment. The results of this empirical work are robust after examining for different alternative high order effects specifications. Our study could inspire future research in the hot heated field of energy economics.

Keywords: Energy sector; USA; Competition; CEO; Panel Data.

JEL Codes: Q40; Q49; L22; D22

Critical application of NEP scale in Greece

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Abstract
One of the most known measures of an environmental belief system is the NEP scale. The new NEP scale, according consists of fifteen items and has five sub-scales (limits to growth, antianthropocentrism, the fragility of nature's balance, rejection of exemptionalism, and the possibility of an eco-crisis). The NEP scale has been used in many countries, for different groups of people for measuring environmental attitude, beliefs and worldviews. Researchers have expressed their doubts about the validity of NEP scale and a lot of studies was carried out to explore them. Thus, there is a need to test the applicability and validity of NEP scale from the point of view of Greek people. The present study attempts to refine and validate NEP scale keeping in mind the Greek people. With this objective, data were collected using self-administered structured questionnaire from 1000 respondents from different cities. The approach combines of applied methodological research like Principal Component and Cluster Analyses together with logistic regression was used. Significant relationships are found between NEP scale factors and socioeconomic characteristics respondents.

Keywords: Biodiversity, People opinion, Natural environment management

JEL Codes: Q29; Q50; Q51; Q57

The spatial-economic dimension of aquaculture in Greece

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Abstract
Aquaculture is one of the fastest growing food industries worldwide as demand for fishery products is constantly increasing. The first units were established in our country in the early 1980s, and since then this sector is one of the most important branches of agricultural production and the most important branch of animal production. This activity has evolved into one of the most competitive sectors of our country's primary production and maintains one of the first positions in the production of Mediterranean species not only at European but also at international level. The aim of this research is to analyze the possible contribution of aquaculture enterprises to the development of coastal areas of Greece and especially to those municipal units where the specific production units have been installed and operated. In this context, the proposed methodology is based on the mapping of the municipalities of coastal areas in mainland and island Greece where aquaculture enterprises were established as recorded in the Register of Aquaculture Products Producers of the Veterinary Code for Pisces (Ministry of Rural Development and Food). An attempt is then made to systematically assess the socio-economic characteristics of the aforementioned municipalities through a comparative analysis with the corresponding features of the rest of the coastal area of Greece where aquaculture enterprises do not operate.

Keywords: Aquaculture; economic demography; coastal area; Greece.

JEL Codes: J10; Q22.

A bilevel scheduling algorithm for maximizing NPV in forests with different rotation ages

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Abstract
The forest harvest scheduling problem constitutes an important problem category of the forest management problems. Especially, when multiple forests are available with different forests with not the same rotation age, then the sustainability must be guaranteed in the end of the planning horizon. The present paper studies the maximization of the Net Present Value (NPV) under forest scheduling constraints. Specifically, a bilevel scheduling algorithm is proposed, for maximizing NPV in forests with different rotation ages. Furthermore, some preliminary computational results are also shown in order to assess the benefits of the proposed Bilevel Non Linear Programming (BLNLP) model. Finally, a discussion of the results of a scenario analysis is also presented.

Keywords: Bilevel optimization; linear programming; forest harvest scheduling problem; environmental economics.

JEL Codes: C61; C63; Q23; Q51.

2nd SESSION: ***Socio-economic Environmental Assessment***

Why people care about climate change

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Abstract
There is an increasing debate among many people about the existence of climate change. This debate has often focused. This debate often focuses on peoples' opinion about the causes of climate change, its consequences and the responsibilities. Climate change is an important issue facing the world today, but some think that is an overstatement. This research tries to contribute to the public debate aimed at a sample of 250 respondents of Cyprus. The research attempts to explore people's knowledge for climate change and segment the sample into groups according to whether people accept or reject the climate change. For data analysis a combination of applied methodological research techniques like Correspondence analysis and Principal Component Analysis was used. Using a significant amount of data, we examined the impact of direct experience with changes in weather conditions, beliefs, hierarchy of environmental issues, people information in order to justify their attitude towards the environment.

Keywords: Carbon emissions; decomposition analysis; growth, energy; European Union.

JEL Codes: O44; O47; O52; Q43; Q56.

Pocket parks as urban commons: The case of 'Alexandrou Svolou Neighborhood' in Thessaloniki

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Abstract
Common pool resources (CPR) refers to goods characterized by non-excludability and rivalry. As a result, they are often overused and mismanaged and eventually led to degradation and destruction, as Hardin's well-known "tragedy of the commons" indicates. One example of CPR which are located in urban spaces are pocket parks. These are vacant, derelict, or other "abandoned" urban plots that are often taken over by a self-organized local community in order to accommodate neighborhood needs. The current paper examines such a newly developed urban commons, that is the pocket park of the Neighborhood Alexandrou Svolou in Thessaloniki, in order to shed light on the governance structure, mechanisms, processes and problems this institution particularly, and urban commons, in general, encounter in their endeavor to self-manage the CPR in a sustainable way. To do so the research employs qualitative methodologies, using both primary (in-depth interviews and participant observation) and secondary (digital archives) data. The paper concludes that factors such as high social capital and a vivid multi-level governance structure have a positive impact, whereas the lack of participatory culture and the relatively low level of users' dependence on the resource might affect negatively the long-term viability of the specific institution in particular, and consequently, urban commons initiatives in general.

Keywords: Commons; urban commons; pocket parks; self-managed parks; self-organized institutions; neighborhood Initiatives.

JEL Codes: D02, O35, P48, Q01, Q24

KEYNOTE SPEAKER:

Evaluating Agro-food Systems in a Sustainable Context

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Abstract
The paper presents an overview of evaluation and valuation methods used to assess the dependence and impacts of agricultural and food (AGRIFOOD) production, processing, distribution and consumption activities on supporting ecosystems and their services, and on human wellbeing. The selection of evaluation criteria and valuation methods appropriate for various decision making processes along the AGRIFOOD value chain is illustrated with examples. Typical applications where evaluation and valuation could help would be in addressing the following questions:

1) To what extent can food security be improved through agricultural intensification, as opposed to expanding the area devoted to agricultural production, and in both cases what are the external costs and benefits?

2) Organic farming and low external input agriculture are presented as alternatives to conventional farm management systems, which proponents claim will better protect the health of soils, plants and wildlife. What are the impacts of these practices on society?

3) Food production has multiple environmental impacts and ecological dependencies. What farm management systems and practices can ensure food security while reducing adverse environmental impacts? What are the synergies and trade-offs involved?

3rd SESSION: *Waste Management - Circular Economy*

Evaluating 22 EU Member States' 'waste culture' using Hofstede's and Schwartz's cultural dimensions

George Halkos & Kleoniki Natalia Petrou
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Abstract
The issue of municipal solid waste (MSW) arisings has received great attention recently as it is a by-product of economic activity but also serves as an input to the economy through material or energy recovery. In relation to that, the main focus of this study is cultural formation and especially the current picture of waste culture and public perception across European Union (EU) Member States. Thus this study will first evaluate environmental efficiency with Data Envelopment Analysis (DEA) based on five parameters: waste, gross domestic product (GDP), labour, capital, and population density for 22 EU Member States and for the years 2005, 2010 and 2015 in order to evaluate which Member States are more efficient. Then the results from the efficiency analysis are contrasted to Hofstede's and Schwartz's cultural dimensions on STATA with the use of regression modelling. Results show that for year 2005 no significant relationship is noticed between the efficiency scores and the cultural dimensions' data from both researchers, whereas for years 2010 and 2015 there appears to be a significant connection with changes in the predictors also affecting the response variable. Among Hofstede's dimensions, individualism, uncertainty avoidance, long term orientation and indulgence were positively associated with the efficiency scores regarding waste arisings for 2010 and 2015. The relationship between Schwartz's cultural values and the DEA efficiency scores was not found to be significant. Findings suggest that Hofstede's cultural dimensions would be best to be considered when developing national level strategies and campaigns to manage waste arisings. The above mentioned findings can be associated with the financial crisis that has hit Europe after 2008 making people more sceptical on environmental issues and how waste is best to be managed making sense financially but also environmentally. At the same time EU legislations have laid out some important Directives in the field of waste management. Finally, along with the factors above, EU has been faced with severe environmental challenges due to waste arisings, as well as accidents and injuries for people working in this sector. All these factors have widely modified waste culture and public's approach towards waste as represented by the study's results as well.

Keywords: Environmental efficiency; waste culture; EU Member States; DEA; environmental policy; regression analysis; cultural dimensions

JEL Codes: O44; Q53, Q56; Z1.

The added value of the cement industry in the circular economy

Eric Waeyenbergh

Administrator of Go4Circle, the Belgian federation of private companies active in waste and the environment Administrator of EUCOPRO, the European Federation of private companies preparing alternative fuels for the cement industry Chairman of the Task Force Waste of CEMBUREAU, the European Cement association

Abstract

The production and recycling of concrete is of upmost importance in the context of the circular economy. Waste resulting from the treatment of construction and demolition waste can be recycled in the concrete production. But waste can also be recycled in the production of cement; participating to the implementation of the circular economy. The presentation covers the safety and health aspects related to the recycling of waste in the cement production, climate change and energy saving, environmental impacts and the potential of applying the principle of the circular economy, with the recycling of post-consumer waste, considering the social impact and responsibility of the recycling of waste.

Keywords: Cement industry; circular economy; recycling; waste treatment.

JEL Codes: Q53; Q56.

Circular economy aspects in sustainability reports: A critical overview of Greek market

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Abstract

The concept of Circular Economy (CE) comprises a unique sector of interest for businesses, governments and local communities as several opportunities and challenges stem from its implementation. This paper aims to emerge CE aspects distracted from forty sustainability reports published in 2016 as well as their application in Greek Market. A compound disclosure index was drawn reckoning on five Environmental Category indicators close to the CE concept. Findings show that only a small number of sample firms present a leniently good performance and comply with the proposed CE indicators. The general trends indicate that the absence of communal or national law over CE's matters in combination with the unawareness of the benefits from its implementation, contributes to low integration. In contrast, a recognized definition of CE protected by the proper legislative framework should be set up inciting the whole Greek business sector to adhere to the suggested indicators while preparing annual Corporate Social Responsibility (CSR) Reports.

Keywords: Circular Economy; CSR Reports; Sustainable Development.

JEL Codes: Q56; Q57.

Circular economy in Greece: Evidence from Central Macedonia

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Abstract

Sustainability, in terms of economic models, is defined as the achievement of current needs without directly or indirectly compromising the needs of future generations. This is closely linked to circular economy (CE). Circular economy represents a systemic shift that builds long-term resilience, generates business and economic opportunities, and provides environmental and societal benefits. At EU level, circular economy concept is receiving increasing attention not only in the enterprise sector but also at the academic. In fact, the European Environmental Agency, recorded that the annual net benefits for EU-27 businesses from implementing resource-efficiency/CE measures, such as waste prevention, the recovery of materials, changing procurement practices and the re-design of products are estimated to range from EUR 245 billion to EUR 604 billion, representing an average of 3–8% of annual turnover for 2016. In the aforementioned framework, this study analyses regional policies that should be introduced in order to force Greek enterprises to take advantage of the recirculation of resources and energy and the recovery of value from waste and the current challenges. Finally, the study briefly examines the integration opportunities between SMEs with other companies and industry associations or clusters to develop industrial symbiosis and close their materials loop.

Keywords: Circular economy; economic growth; policies; Central Macedonia.

JEL Codes: Q01; O44; O47; E32; E21.

4th SESSION: *Environmental Issues & Concerns*

Measurement of green industrial performance: an enhanced GIP index

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Abstract
The green industrial performance (GIP) index provides policy-makers and development specialists with a sound tool to analyse and compare the performance of economies in terms of green manufacturing. The development of such an index responds to the demands for an environmentally-respectful industrial development process as per the 2030 Sustainable Development Agenda. The demand for sustainable development seems not be matched with the existence of an analytical framework to measure to how green the change of an economy is. Building on our earlier research, the article introduces methodological improvements to the green industrial performance (GIP) index. In previous research, we identified and constructed a set of indicators covering the various facets of the green industrial performance of economies. We also introduced a composite index to rank economies according to their green industrial performance. In this article we address some of the limitations of the index and how it is calculated. To improve the non-satisfactory data coverage, we investigate alternative imputation methods; refine our list of "green" products; and test new outlier detection methods. Using the enhanced GIP index, we carry out an analysis of green industrial performance covering a large set of economies.

Keywords: Green manufacturing; structural change; sustainable development; composite index.

JEL Codes: O14; Q01; Q56.

Investigating the impact of wellbeing on economic performance: Evidence from European Union countries and regions.

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Abstract

Every society seeks to achieve an advanced level concerning the status of well-being both in social and economic level. Gross Domestic Product (GDP) indicates a primary measure of determining economic development between regions, within countries, across nations. Hence, it is considered a fundamental statistical measure the level of which might be crucial to make decisions and choose a direction concerning the course and level of development within a territory unit. In this perspective, the purpose of this study lies in investigating potential impacts that a wide range of well-being and world governance composite indicators exert on regional GDP per capita for the year 2016 (cross-sectional approach). Regressors found to positively impact regional GDP per capita implying that even non-material conditions might become crucial to achieve regional economic development. Significant practical implications have been derived based on research findings which in turn can be incorporated in relevant regional policies.

Keywords: regional economics, development

JEL Codes: I31 , R10 , O10

The Relationship between Environmental Degradation, Economic Development and Corruption: A Panel Data Cointegration Analysis of Asian Emerging and Developing Countries

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Abstract

According to the International Monetary Fund (IMF, 2017), the share of Asian emerging and developing countries in the world's gross domestic product (GDP) doubled from about 16% in 1998 to about 32% in 2017. Within the same period the annual average growth in real GDP of Asian emerging and developing countries amounted to about 7.43 %, whereas the world's average growth in GDP was only about 3.78% (IMF, 2017). These numbers show that within the last 20 years the economic development in emerging and developing Asia significantly increased. Projections suggest that this trend will hold at least for the next five years (IMF, 2017).Unfortunately, in line with this development, the amount of climate-damaging carbon dioxide (CO2) emissions also increased. While in 1998, CO2 emissions from burning of fossil fuels and the manufacture of cement in emerging and developing Asia amounted to about 4.91 million kilotons, this number increased to about 13.67 million kilotons in 2014. Overall, Asian emerging and developing countries were responsible for about 38 % of the world's CO2 emissions in 2017 (World Bank, 2017). A potential solution to this problem is given by the theoretical concept of the so called Environmental Kuznets Curve (EKC) hypothesis. The hypothesis states an inverted U-shaped relationship between environmental degradation and economic development. That is, initially environmental degradation increases with economic development, but after a certain level of economic development environmental degradation turns to decrease (Grossman and Krueger, 1991). Numerous studies in the area of developing and environmental economies have studied the relationship between economic growth and environmental degradation in the context of the EKC hypothesis (see e.g. Stern (2004), Dinda (2004) and Kaika and Zervas (2013)) for extensive reviews). However, only a few have empirically analyzed the impact of corruption on this relationship (see e.g. Welsch (2004), Cole (2007) and Leitao (2010)).

Overall, previous research indicates a three dimensional relationship between environmental degradation, economic growth and corruption. However, findings for the indirect and direct effects within this nexus are mixed. Our study contributes to the empirical literature by analyzing the long-run relationship betweenCO2 emissions, gross domestic product (GDP) and control of corruption for 25 Asian emerging and developing countries in the period from 1998 to 2014. In order to do so, we apply recently developed second generation panel data cointegration methods that account for a number of estimation problems such as unobserved heterogeneity, cross-sectional dependence and endogenous regressors. Thereby, we are able to provide state-of-the-art research results that account for several limitations in previous studies. Furthermore, by focusing on Asian emerging and developing countries we aim to shed light on the importance of good institutional quality for a sustainable growth path in one of the fastest growing regions in the world.

Keywords: Economic development; degradation; corruption; panel data analysis; Asian emerging countries; developing countries

JEL Codes: C23; Q50; Q56.

4th SESSION: ***Environmental Issues & Concerns***

Strategic analysis of competition among Russian gas producing companies: implications for domestic and international gas markets

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Abstract
Competition landscape in the Russian natural gas industry is dramatically changing. Two large independent producers – Novatek and Rosneft appeared in the domestic market, while the state-owned monopoly company - Gazprom lost almost half of it. With high prices in the European market, Gazprom paid little attention to shrinking domestic share, stayed more focused on risks of Third Energy Package (TEP) that came into force in 2011 to strategically diversify gas import. The situation changed after 2014 with oil price meltdown triggered lagging oil-linked long-term (LT) gas export contracts. The emergence of shale producers resulted in new competing LNG export projects in the USA and set the basis for arbitrage in regional gas markets. Losing competitiveness in both traditional markets, Gazprom renewed its interest in domestic gas market reforms towards price deregulation. In 2016 the Federal Antimonopoly Service of Russia (FAS) proposed first stage liberalization of the local market, declaring the increasing competition and consumer surplus as the primary goals. Gazprom in its turn actively supported this initiative and increases traded volumes on a captive gas exchange - SPIMEX establishing a new pricing benchmark. At the same time, efforts to repeal the price floor in three key Russian regions showing an intense clash of interests in the multi-stage game for higher profits. In this article, we provide a quantitative assessment of proposed deregulation, gas pricing model and state of competition in the industry. We use a modification of Bertrand–Edgeworth model of the oligopoly at Russian gas industry in assessing the expected profit and losses for producers. Also, we qualitatively compare reforms of Russian market and mature markets of the USA, the UK, and EU. This paper clarifies controversy over proposed measures to stimulate competition among gas producers in Russia and highlights risks for independent producers.

Keywords: Russian gas market, monopoly regulation, Bertrand–Edgeworth model, gas exchange.

JEL Codes: K21, Q48, L43, B23, L13.

Can we hedge an investment against a potential unexpected environmental disaster?

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Abstract
The purpose of this paper is to approach the way investors perceive the risk associated with unexpected environmental disasters. More specifically, the paper examines certain types of natural and technological disasters, which tend to be associated. The literature describes these types of disasters as "na-tech", wishing to emphasize the fact that a natural disaster can lead to successive natural or technological disasters. Based on literature and historical sources, the most common types of such disasters are geophysical and industrial environmental disasters. All the unexpected events that have occurred since the beginning of the new millennium and belong to these sub-categories are examined in an attempt to determine whether an unexpected event may affect the investor's point of view of the risk associated with the event and consequently his investment psychology. In order to study the investment response to the potential risk of a natural disaster, the prices of country bonds are used, and in the case of technological disasters, the share prices of the enterprise which is responsible for the disaster are used. The methodology proposed by the literature for field inquiries is being applied with purpose to obtain results that will allow us to accept or reject the hypothesis regarding the possible market reactions. The results of the survey can be used by investment advisors to provide investors with a-priori information to avoid volatility and instability after a devastating event. They can also be used by governments, especially of those countries who are more susceptible to these catastrophes or countries that tend to invest on those countries, in order to compensate and hedge for their potential risk in advance.

Keywords: Natural, technological disaster; market reaction; investor's psychology.

JEL Codes: C58; C59; F21; Q50: Q54.

KEYNOTE SPEAKER:

Inclusive Growth for Sustainability: Measurement from Inclusive Wealth Report 2018

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Abstract
The Inclusive Wealth Index is a new way of measuring a nation's wealth, taking into account human capital (education, skills, earning potential, life expectancy, and population) and natural capital (fossil fuels, minerals, forest resources, fishery, and land), as well as produced capital (roads, railroad tracks, buildings, vehicles, machineries, etc.). This is a more comprehensive index than previous ones such as GDP, which measures income, and HDI, which incorporates education and life expectancy in addition to income. In our new UN published report, as a director of the report on 140 countries from 1990, I provide the valuable insights into investment strategies of countries on nature, health, education and demonstrates the use of the Inclusive Wealth Index as a key indicator for sustainable, stronger, and more peaceful development. This provides message to inclusive growth discussion on SDGs framework.

Assessing the impact of a climate change adaptation intervention: Evidence from Central Highlands of Afghanistan

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Abstract
This paper evaluates the impacts of the first climate change adaptation project in Afghanistan, supported under the Least Developed Countries Fund (LDCF). Using a novel dataset of 169 farmers, we employ propensity score and regression-based methods to estimate the community level impacts of the treatment in Bamiyan Province. The findings suggest positive impacts of the intervention on female engagement in farming, risk of drought, on-farm employment, and use of improved types of seeds and crop varieties. Our results, however, do not show any significant project effects on the risk of flood. The results are robust to a number of different specifications and existence of mild unobserved covariates. We conclude that while the project has been a successful demonstration of adaptation interventions; in order to fully address the existing and expected climate-related risks, however, a long-term, full-size intervention should follow.

Keywords: Climate change; adaptation; Least Developed Countries Fund; Afghanistan.

JEL Codes: C21, Q25, Q54, Q58.

What drives responsible business? Examining the links between reputation risk, non-government organization (NGO) pressure and responsible business performance

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Abstract
This paper investigates the comparative influence of reputation risk and NGO pressure on corporate activity in the field of environmental responsibility. The paper revisits research to test if there is a perverse incentive between environmentally damaging industries and perceived environmental performance, reputation and disclosure. Access to industry leading database sources are also utilized to test the hypotheses more rigourously and improve on original data. Through new research, the role of NGO's is tested to understand the comparative strength of this relationship. The finance sector is also incorporated into a second set of samples to test in view of the increasing focus by campaign groups on the sector as a facilitator of damaging sectors. The sample sets are derived from the Newsweek Green 500 published annually by Forbes. A regression analysis is conducted on all metrics along with various forms of correlation testing on all relationships. Testing indicates the role of NGO's being more significant than reputation risk metrics or alignment to responsible investor ratings. Within the sample set the role of finance companies is also more pronounced than the traditionally supposed environmentally damaging issues. A negative correlation between financial performance and one of the disclosure metrics is also found.

Keywords: Environmental; NGOs; Ratings & Ratings Agencies; Reputation; Social Responsibility.

JEL Codes: G24; L14; L31; M14; Q56.

Prediction of Global Warming impacts using Fuzzy Cognitive Maps and Semantic Web techniques

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Abstract
One of the most important problems of our era is Global Warming. Both the ecological-economic impacts of Global Warming and also the mechanisms that cause the Greenhouse Effect are thoroughly studied and reported. In this paper, a model of the causal relationships that exist in the field of global warming is created, using the well-established Artificial Intelligence technique of Fuzzy Cognitive Maps (FCMs). The FCM technique incorporates ideas from Artificial Neural Networks and Fuzzy Logic. Various scenarios are imposed to the FCM model and predictions are made on these, by simulating FCM dynamic behavior and studying the equilibrium that the FCM dynamic system reaches. For making these simulations, a semantic web software tool was created that also makes the results and various models easily accessible to other users or systems, through the Internet. Policy makers can use this technique and tool to make predictions by viewing dynamically the consequences that the system predicts to their imposed scenarios.

Keywords: Global Warming; Computational Techniques, Simulation Modeling; Neural Networks and Related Topics; Forecasting and Prediction Methods, Simulation Methods.

JEL Codes: Q54; C63; C45; C53.

Towards better tools for effective environmental policy

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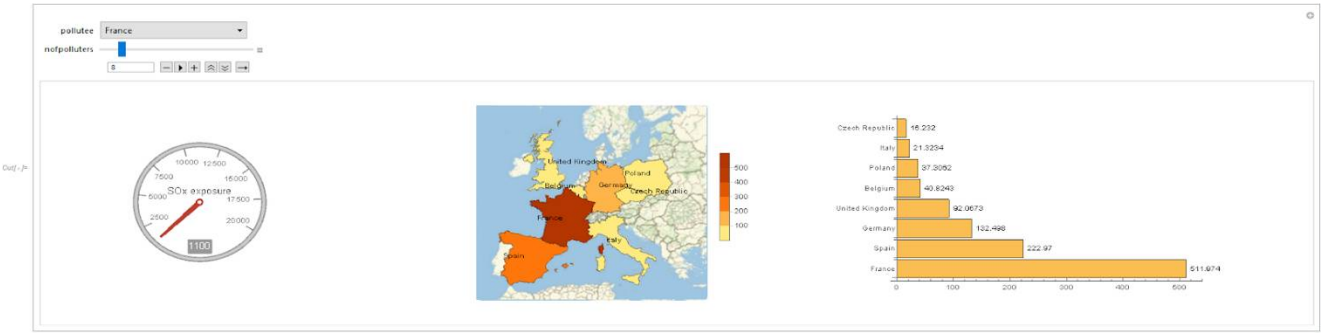
Abstract

Effective environmental policy should be based on robust information on trends. Our objective in this paper is to make data-driven decisions: we aim at policies that are built on officially reported emission data and we make use of intuitive tools and interfaces to guide environmental policy with completeness and consistency. Transboundary air pollution is a two-sided problem involving a polluter and a pollutee. The visualizations we have created allow a user to conceive the transboundary air pollution scheme from either the polluters' or pollutees' perspective. Based on the European Monitoring and Evaluation Program (EMEP) source-receptor records during 2004 to 2014, we develop comprehensive pollution monitoring systems. Our systems are created in visualization software in order to bring out the status, attributes and dynamics of transboundary air pollution. Our monitoring applications consist of different visualization modules. All of these modules carry their own information, which can be used separately or together to serve specific visualization tasks: either the polluters' responsibility or the pollutee's vulnerability. Several interactive interventions are integrated into each module to achieve particular visualization goals. Controls are added for the number of polluters, the year of study, the level of pollution, the geographical zone, all within the extended EMEP area.



Environmental damage on the EMEP scale of SOx pollution in France (left), localization of SOx pollution responsibility (center) and raking of pollution responsibility (right) for SOx pollution in France, 2010.

Keywords: Visual analytics; pollution monitoring system; geographical heat maps.

JEL Codes: C63; C88; Q53; Q58.

Identification of regimes in river behavior using nonlinear timeseries analysis

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Abstract
Non linear timeseries analysis covers a wide field of applications with methods based on phase space reconstruction which are giving useful results for understanding the system's dynamics. In the present work we apply nonlinear time series methods and more specifically the method of Recurrence Plots (RP) and Recurrence Quantification Analysis (RQA on 16 year of daily values of the Nestos river water level recorded at the Temenos measurement station. From this analysis important parameters such as "%Recurrence", "Determinism", "Laminarity" and "Tapping Time" are extracted giving important information about system's periodicities and phase transitions which help us to locate seasonal changes and extract useful conclusions about possible changes of the behavior of the environmental dynamical system as years passing by (climate changes).

Keywords: Non Linear Timeseries Analysis; Recurrence Plots; Recurrence Quantification Analysis; Climate Change.

JEL Codes: C02; C22.

Real-time road traffic forecasts – a hybrid approach using artificial intelligence and Singular Spectrum Analysis

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Abstract

The paper presents a hybrid methodology of time series analysis and forecasting, applied on road traffic data, which leverages from Singular Spectrum Analysis (SSA) and Artificial Neural Network (ANN). The main objective of the research was to develop a short–term forecast of daily traffic of toll roads across Greek National Highway Network. The proposed methodology was implemented and evaluated upon an integrated software, based on Mathworks MatLab, which was developed by the authors. Experimental outcomes on daily data, from specific tolls, show a superior prediction accuracy of hybrid SSA–ANN forecasting methodology, when compared to performance of statistical criteria such as root mean squared error (RMSE), mean absolute error, MAE) and coefficient of determination R^2. Results comparison reveals that the hybrid SSA–ANN improve the forecasting accuracy of an ANN model in daily traffic load forecasting. An Intelligent Transport Systems (ITS) with embedded hybrid SSA–ANN forecasting methodology can enable proactive decisions to mitigate the economic and environmental impacts of transport infrastructure congestion.

Keywords: Singular spectrum analysis; artificial neural network; traffic load; forecasting; transportation

JEL Codes: C45, C53, C55, R41.

Examining the determinants of CO_2 emissions caused by the transportation sector activity: Empirical evidence from 12 European countries

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Abstract
The transportation sector consists the second most important sector that contributes in the production of the CO2 emissions worldwide, while it consumes more that the one third of total energy consumption within the country-members of the EEA. Towards climate change mitigation, policies and regulations, and new infrastructure investments are employed so as to facilitate the route to a low carbon economy. In this paper we investigate possible determinants of CO2 emissions caused by the transportation sector activity for 12 European countries over the period 1994 to 2014. We examine the effects of Environmental Policy Stringency, Climate Change Mitigation Technologies related to transportation, share of value added by the transport sector and infrastructure investments (rail, inland and road). We employ panel data analysis; panel unit root tests, panel cointegration tests, the Fully-Modified OLS (FMOLS) approach, the Dynamic OLS (DOLS) approach and Granger causality test are employed in order to examine the relationship between CO2 emissions caused by the transportation sector activity and their statistically significant determinants.

Keywords: Transportation sector; climate change mitigation; CO_2 emissions; European countries.

JEL Codes: C23; C33; O33; Q56; Q58.

6th SESSION: *Sustainable Transport*

Artificial Neural Networks: A Modern Tool for Empirical Modeling of Transport Demand

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Abstract
In the present paper it is analyzed how modelling and forecast of future transport demand can be conducted with application of artificial intelligence and particularly of the method of artificial neural networks (ANN). This method permits to derive conclusions for the evolution of a phenomenon for which a set of input – output data are available, without any requirement to know how input data are transformed to output data. ANN is an empirical method inspired from the way of operation of biological neurons, how and under what conditions are biological neurons activated, operating and learning. The method of ANN is used in the paper to model and forecast future transport demand in relation to the evolution of GDP and other driving forces of the problem, for mature and developing air transport markets.

Keywords: Empirical models; artificial intelligence; artificial neural network; forecasting, transport demand.

JEL Codes: R41; C45, C52; C53; R15

The contribution of the road transport projects of the NSRF 2007-2013 to the development of a Greek region

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Abstract

The purpose of the present paper is to study how the actions of the road projects of National Strategic Reference Framework (NSRF) 2007-2013 contributed to the development of the Region of Eastern Macedonia and Thrace, as these actions were included in the respective Operational Program of Eastern Macedonia and Thrace 2007-2013. It analyzes the European regional policy, examines the cohesion policy of the European Union, which aims to reduce regional inequalities and ensure the social, economic and territorial cohesion. In Greece, the cohesion policy implementation for the period 2007-2013 was achieved through the NSRF 2007-2013, where the present study presents its training philosophy and the priorities set. The study area concerns the Region of Eastern Macedonia and Thrace, followed by the analysis, characteristics and results of the Operational Program of the Region of the same period, through which 87 road projects were implemented. Data are collected for each of these projects and, through the presented research methodology, conclusions are drawn on the contribution of these actions to the development of the Region.

Keywords: Regional Development; Regional Policy; Regional Inequalities; European Cohesion Policy; Operational Program for East Macedonia and Thrace.

JEL Codes: O18; R50; R58.

6th SESSION: ***Sustainable Transport***

Investigation of bicyclists' riding behaviour under normal traffic conditions in the road network of a mid-sized Greek city

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Abstract

This study examines the bicyclists' riding behavior under normal traffic conditions in the urban road network of Volos which is a mid-sized Greek city. In order to conduct this study, a new methodology was developed based on the use of GPS technology embedded in instrumented vehicles for the acquisition of behavioral and performance data parameters such as speed, position and lateral/longitudinal accelerations. All these parameters are crucial for 2-wheeler road users compared to the 4-wheeler ones. Although extensive literature review refers to naturalistic driving studies, no relevant research of naturalistic riding studies for bicyclists has been conducted so far. This study proposes a practical, low cost and time effective process to evaluate the perception of traffic conditions under the bicyclist's point of view. This study concludes that it is feasible to record bicyclists' speed and acceleration profiles with accuracy and speed. Moreover, supports that there is a strong indication that bicycle is a rather controllable and predictable transport mode. However, in order to generalize the conclusions drawn in a wider proportion of road users, more experiments including a greater number of participants and road sections should be conducted.

Keywords: Bicycle; road safety; speed; acceleration; naturalistic study.

JEL Codes: O18; O33; R41.

Budget and environmental subsidies: Optimal management and a dynamic game

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Abstract
This paper is concerned with a classic topic of intertemporal environmental economics: the optimal management of environmental quality over time by the environmental regulator and the dynamic conflict between two groups of economic agents involved in environmental quality. The traditional management model with subsidies is extended towards a two–state model in which any taken environmental subsidy is treated as a result of historical adjustments, i.e. as a stock variable. As a consequence of this extension, an equilibrium dynamics with bifurcations and limit cycles occur. In the next step we discuss conflicts as a game with two types of players involved: the enjoyers of the good environmental quality and the heavy equipped exploiters of the environmental quality. Both players have a common interest to consume: the subsidy function, thought as a budget harvesting function, which is dependent both on utility enjoyed by the citizens and on the intensity of the extractors effort.

Keywords: Budget; subsidies; environmental quality; optimal control; differential games.

JEL Codes: H61; H23; Q50; C60; C72.

Modeling a closed economy by a lattice Hamiltonian

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Abstract
This research uses a physics model, i.e. particles in lattice, in order to study a closed economy of an isolated place (e.g. planet or island). The 3−particle Toda model is Hamiltonian and thus fully conservative. We reproduce an economy of three populations (human, fauna, flora), instead of a lattice of three particles. Higher populations lead to higher positive energies (that represent their effect on environment), up to infinity. But, incomplete information, imperfect technology and adaptation make this idea unrealistic. Instead, odd order truncations have pretty realistic properties, applicable on environment: for low positive populations, their effect on environment is positive and increasing. After a level of maximum benefit, effects become decreasing and, inevitably, negative. These (over)populations might destroy their environment. In parallel, higher populations create chaotic trajectories. Higher order of truncation have similar properties, but higher populations can survive, since they are closer Toda approximations, representing technological developments, macrocultural evolution and better adaptation to environment. Overpopulation and disaster point exist, no matter how high the odd−order truncation is. In a perfect world, infinite odd order truncation can be achieved and can eliminate overpopulation limits.

Keywords: Hamiltonian dynamics; Closed economy; Overpopulation; Ecosystem Sustainability.

JEL Codes: Q56; Q57; C61.

Adopting Tolerance Intervals in Environmental Economics

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Abstract
When limited knowledge is associated with the underground problem under investigation we are not certain on the process we have to follow, therefore there is uncertainty. The measure of uncertainty is associated with the Fisher's information. Notice that uncertainty in practice is related with the physical problem under investigation. A typical example can be the Environmental Economics system under study. There is a number of model specifications estimating eventually the Benefit Area, as the intersection of the given marginal abatement function, with the marginal damage cost function. The point of their intersection is known as the optimal level of pollution. The corresponding in damage reduction axis point is known as the optimal level of reduction pollution. For the optimal level of pollution we can evaluate the corresponding tolerance region – either the classical or the expected tolerance interval – and therefore we obtain four possible optimal level of pollution and the corresponding tolerance interval for the reduction pollution point. The associated four Benefit Areas can be evaluated, due to the adopted Tolerance Region procedure, rather than a Confidence Interval approach.

Keywords: Uncertainty; Environmental Economics; Mathematics; Statistics.

JEL Codes: C02; C60; Q00; Q50.

Wind energy potential based on Visibility Complex Network and Recurrence Plot time series analysis

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Abstract

Renewable energy sources where wind power is an important part are increasingly participating in developing economy and environmental benefits. The present work approaches the problem of identification of the underlying dynamic characteristics and patterns through the Complex Network and the Recurrence Plots (RP) time series analysis of velocity and angle wind time series. The data were collected by cup anemometers located in a measurement tower installed in the mountains of the region Achaia, Peloponnesus, Greece. We have demonstrated that the proposed analysis provides useful information which can characterize distinct regions of the time series and also identify and detect dynamical transitions in the system's behavior. The results will be useful for the prediction of the produced wind energy.

Keywords: Non Linear Time series Analysis; Recurrence Plots; Recurrence, Quantification Analysis Complex Networks, Visibility algorithm, Wind time series

JEL Codes: C02; C22.

Towards an Economical Approach of Physical Phenomena

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Abstract

This present work introduces an illustration of natural phenomena and quantification of the natural factors involved, based on a direct analogy between their evolution processes to an oligopolistic competitive environment. In particular, the authors aim to deal with "oxidation processes" as such production sites that use ("consume") the "raw materials" (oxygen molecules) according to their incoming production capacity (oxidation potential): the imported commodity (oxygen), the recipient companies operating in a limited market (oxidation substrate) and the determinant factor that resembles borders, affecting the size of the productive activities of the overall market (packaging as a the controller of the incoming goods) and the related by-products, such as the cost of production resources, that are directly related to the activation energy requirements of these reactions occurring positions and the availability of the raw materials. Therefore, describing natural phenomena in a stochastic mathematical way will allow the use of those fundamental elements of statistical physics to integrate deterministic processes (and quantities) into a micro-scale. It is the opinion of the writers, that the innovation of this work is the use of economic laws for the world of natural phenomena, against the, commonly used and generally accepted, inverse process.

Keywords: Natural phenomena; oligopolistic competition; stochastic mathematical Modeling; statistical physics.

JEL Codes: E220; E230; E250; E270; F120; F140; F170; F410.

8th SESSION: ***Energy Issues & Policies***

Energy transition, poverty and inequality: Insights from panel data for Vietnam from 2004 to 2016

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Abstract

We use panel data of a nationally representative household survey on energy consumption expenditure of more than 9,000 households to investigate the changes in household energy use, energy poverty and energy inequality in Vietnam over the period 2004 to 2016. Results show that households tend to move from biomass based to cleaner energy sources of gas, petroleum and electricity. However, this transition is different across regions, between ethnicities and welfare groups. This progress is more clearly seen in the Red River Delta region where households reduce significantly their expense on coal and biomass, and increase the consumption of gas and electricity. By comparison, poor and ethnic minority households in the Northern Mountainous region still heavily rely on coal and biomass to meet their energy demands. Regarding energy poverty incidence, rural households of the minority ethnic groups in the Northern Mountainous region are the poorest in most of poverty indicators. During this period, the electricity – based energy poverty has decreased, but in terms of the burden of energy cost, this poverty indicator has experienced a significant increase. Regarding inequality indicators, energy consumption inequality tends to decrease more than household income and consumption inequalities. Among energy sources, gas, oil and electricity inequalities tend to decrease whereas coal inequality has increased.

Keywords: Energy transition; poverty; inequality, panel data; Vietnam.

JEL Codes: O13; P25; O53.

Assessing the sustainability of renewable energy sources with the combination of life cycle and SWOT analyses

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Abstract
The production and consumption of energy, as well as the environmental problems that arise, occupy a prime interest for all states on a global scale. The adoption of a policy towards green energy has been greatly improved, but it has to become more concrete. This study will assess various renewable energy sources using life cycle analysis (LCA) and SWOT. Applying life cycle analysis to a product enables the optimization of raw materials, energy and environmental impacts. Similarly, implementing a life cycle analysis on renewable energy sources can highlight the most environmentally friendly source of energy. Simultaneously, the SWOT analysis shows positive and negative elements and as a result, it helps in preventing strategic planning errors for energy production. The combination of these two analyses helps decision-making, strategic planning and environmental management as regards the choice of the most appropriate renewable energy source.

Keywords: Life cycle analysis; SWOT analysis; energy sustainability; renewable energy; energy policy.

JEL Codes: O13; P18; Q28; Q48; Q58; Q01; Q29; Q42.

Energy policy establishment for off-grid small isolated settlements

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Abstract
This work presents a methodology for identifying the most appropriate location(s) for installing low-scale RES-based hybrid electricity production systems to cover the local energy demands without grid connection. The selection is initially based on geographical, geospatial and demographical data, while the proposed method is based on the optimal combination of the meteorological data (solar and wind potential), the available resources (in terms of free space and of investment costs) and the desired load. On top of that, optimization of both the size and the operation of the hybrid system is also performed. To efficiently match the produced energy with the demands, a potential interconnection with one nearby settlement with the same characteristics is also considered. Finally, the economic balance of costs (installation, operation & maintenance, replacement) and benefits is presented, and the proposed system is judged against it. In conclusion, this study could act as a policy tool for off-grid power production in national level.

Keywords: Off-grid power production; Renewables.

JEL Codes: Q28; Q42; Q48; Q56.

8th SESSION: ***Energy Issues & Policies***

Selection of optimal on shore wind farm sitting locations in Greece, using Multi criteria Decision Analysis

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Abstract
The usage of Renewable Energy Sources (RES) is increasing throughout the world as there is a global effort to reduce the dependence from fossil fuels which are considered as a main cause for climate change. Wind Farms currently are rated among the most common forms of RES applications especially in countries like Greece. The optimization of spatial planning in order to identify the most suitable places for the installation of wind farms is one of the most difficult problems because there is a need to identify and calculate the effect of a variety of both qualitative and quantitative parameters. Multi Criteria Decision Making Methods (MCDM) are commonly used in order to solve this problem and are combined with Geographic Information Systems (GIS) to spatially represent the results from the application of the MCDM methodology. In this paper we demonstrate a methodology which applies the current legislation and uses an MCDM methodology called Analytical Hierarch Process (AHP) and GIS in order to determine the most suitable locations for wind farms installation.

Keywords: Multi Criteria Decision Making Methods; Analytical Hierarch Process; Geographic Information Systems.

JEL Codes: Q01; Q20; Q28; Q47; Q48.

8th SESSION: ***Energy Issues & Policies***

Determinants of household electricity consumption in Greece: A statistical analysis

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Abstract
Over the last decades, the contemporary way of living, as well as, the technology development have increased the household electricity consumption. However, the excessive use of electricity consumption has an impact on the environment increasing the carbon footprint and contributing to the climate change. Governments are concerned about the way that our societies consume energy and are committed to reduce the greenhouse emissions. As the residential sector contributes to electricity consumption, it is crucial to investigate the socio-economic parameters, dwellings' characteristics and climate conditions that determine the electricity consumption in households. The data of this study are collected from 1,801 dwellings from all Greece regions. In the statistical analysis two models are built, agreeing that the most significant determinants that influence the electricity consumption are the number of occupants, the size of the dwelling, the number of bedrooms, the heating type, the heating and cooling hours, the weather conditions and the fact of occupants not going on winter holidays.

Keywords: Electricity; consumption; determinants; socio-economic; statistical analysis.

JEL Codes: P18; P28; Q4; C1.

KEYNOTE SPEAKER:

Could Revealed and Stated Preference Techniques Produce Similar Outcomes for Policy Decision-making?

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Abstract
Most green spaces have amenity values. However, during certain months of the year green spaces turn into dis-amenities. Bushfires are a case in point. In this presentation we attempt to show that residents on average are willing to pay more to live closer to green space than farther away thus discounting the possibility of bushfires. Where recent bushfires have occurred the process is reversed. Our initial research findings suggest that it is possible to validate results of a revealed preference approach with a stated preference approach. Selected suburbs from Brisbane and Rockhampton, Australia are selected for this work. The potential implications of this study are discussed.

9th SESSION: ***Environmental Valuation***

Understanding people's perception about biodiversity importance, management and conservation

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Abstract
The aim of present study is to contribute to a better understanding of the ways of the wider public reason about issues of biodiversity change and management, and more to determine the factors that influence people support for biodiversity management measures due to climate changes. For this reason a face-to-face survey of 468 respondents randomly selected was carried out. The sample was stratified to ensure adequate sample sizes to compare results from three geographical areas: 48.7% of the sample was from Pagasetic Gulf area, 26.1% from the Crete-Rethymno area, and 25.2% from the Lesbos (Mytilini). For this purpose, a combination of applied methodological research techniques like Correspondence analysis and Principal Component Analysis was used. The results indicated the relative importance of region to respondents' perceptions knowledge and concern about biodiversity. According to the results biodiversity loss will mainly influence our country due to consequences to environment quality, heritage and financial wealth, following the impacts to world economy, knowledge and inspiration.

Keywords: Biodiversity; People opinion; Natural environment management.

JEL Codes: Q54; Q57; Q58.

9th SESSION: ***Environmental Valuation***

Valuation of ecosystem services and assessment of their social impacts

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Abstract
In the past decade there has been an increasing discussion regarding the links between ecosystem services and their impacts on human well-being. This is an important research field, especially in the context of designated Protected Areas, as the provision of ecosystem services is closely linked with the level of public acceptability for such policy initiatives. Numerous techniques have been proposed in order to measure and value ecosystem services. However, a gap remains in the literature in regards to the most appropriate ways to assess their impacts. The present article proposes new links between valuation techniques for ecosystem services and assessment of social impacts taking into consideration the complexities of the socio-ecological systems of Protected Areas. In particular, the authors of the paper propose that the assessment of social impacts needs to be part of the scientific process of valuing ecosystem services in order to have a more holistic understanding of the services provided from an ecosystem and how these impacts acceptability for conservation initiatives.

Keywords: Ecosystem Services; Social impact assessment; economic valuation techniques; well-being.

JEL Codes: Q57.

9th SESSION: ***Environmental Valuation***

How do motives and knowledge relate to intention to perform environmental behavior? Assessing the mediating role of negotiation and constraints

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Abstract
This study explored how motives and knowledge are associated with intention to adopt environmental behavior through the mediating role of negotiation and constraints. Additionally, it assessed structural models of associations among barriers to environmental behavior, negotiation through barriers, motives to participate in eco-friendly actions, and environmental knowledge. Two broad types of barriers were assessed (psychological and structural or contextual barriers) to shed light on the limiting factors of environmental behavior. Drawing on the Goal Framing Theory, we investigated three incentive types that motivate individuals to participate in pro-ecological activities, namely gain, hedonic and normative motives. A questionnaire survey method was used to obtain a representative sample of Greek citizens (n=1551). We applied Confirmatory Factor Analysis (CFA) to assess the reliability and validity of the study constructs and Structural Equation Modeling (SEM) to test the research hypotheses and reveal the interrelationships among the variables. The main findings indicated that barriers and negotiation mediate the impact of environmental knowledge and motivation on behavioral intention, and negotiation mediates the influence of barriers on intention to perform environmental behavior. A significant but negative relationship was observed between barriers and intention, motives and barriers, knowledge and barriers, as well as between negotiation and barriers. The possible contribution of the research findings to the design and implementation of policy interventions that consider constraints to environmental behavior and future research directions are discussed.

Keywords: Psychological barriers; contextual barriers; recycling; energy conservation behavior; water conservation behavior; personal factors; social factors.

JEL Codes: A14; C38; Q00; Q51; Q56; Q59.

9th SESSION: ***Environmental Valuation***

Preferences and willingness to pay for protecting the marine and coastal environment from plastic waste: a case study of Syros Island, Greece

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Abstract
The presence of plastic waste in the coastal/marine environment poses a high economic burden and is closely associated with social costs in terms of pollution and waste. Thus, in order to preserve the healthy functioning of ecosystem services and ensure environmental sustainability it is deemed critical to reduce all forms of plastic waste at once. This study aims to explore citizens' and stakeholders' preferences and willingness to pay (WTP) for the reduction of plastic waste and especially plastic bags in the coastal/marine environment of Syros Island (Greece). In this framework, two separate surveys were conducted during May-June 2016 and May 2017. In the first survey a choice experiment method was used to assess the values of several ecosystem services most likely to be affected by the accumulation of plastic litter in the coastal/marine environment. A total of 341 completed and useful questionnaires were collected from Syros' Island citizens. In the second survey a contingent valuation technique was used, focusing on a specific target group (hotel/room rental facilities owners), resulting in the collection of 40 useful questionnaires. According to the valuation results of both surveys a significant percentage of both residents and hotel owners of Syros are supporting policies for the protection and conservation of the local coastal/marine environment.

Keywords: marine/coastal environment; plastic waste; willingness to pay; ecosystem services valuation; choice experiment method.

JEL Codes: Q51; Q53; Q57; C25; Q25.

9th SESSION: ***Environmental Valuation***

Implementing Hedonic Pricing Models for valuing the visual impact of wind farms in Greece

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Abstract

Even though wind energy is a pollution-free and in finitely sustainable form of energy, there is considerable concern over some environmental effects resulting from wind power development. Criticism focuses primarily on the visual impact due to the installation of wind turbines and transmission lines, which results in the deterioration of the landscape and may harm the associated economic activities, namely tourism, real estate, etc. This study presents an application of the Hedonic Pricing Method for valuing the landscape externalities associated with the large-scale exploitation of wind power at the local level. Specifically, the presented research investigates roughly 1,800 sales of single-family homes surrounding 17 existing wind facilities in two Greek islands, namely Evia and Kefalonia. Developing four different hedonic models in the two areas, the results derived diverge. In Evia case study we found that the value of the dwellings per unit area increases with the distance from the nearest wind farm. On the other hand, in Kefalonia case study, neither the view of the wind facilities nor the distance of the home to those facilities is found to have a statistically significant effect on sales prices.

Keywords: Visual impact; wind energy; hedonic pricing; energy externalities.

JEL Codes: Q42, Q51.

10th SESSION: ***Sustainable Tourism***

Shark aggregation and tourism: Opportunities and challenges of an emerging phenomenon

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Abstract
In the last few winters, sharks have been aggregating near the Israeli Mediterranean coast, at a specific point, near Hadera power station. This unusual phenomenon has fascinated residents, visitors, kayakers, divers and swimmers. We analyse the effects of this intense human interest on the sharks, using contingent behaviour, in Hadera and in Ashkelon, where sharks are present but not the infrastructure for their observation. We also report on changes in shark behaviour due to change in tourism intensity. We find a change of about ILS 4.1 million annually for both sites but a larger individual consumer surplus in Hadera, where sharks are currently observable. Touristic intensity crosses the threshold level by about 12% and making the socio-equilibrium sustainable for both humans and sharks would have a social cost of ILS 0.157 million.

Keywords: Shark aggregation; shark behaviour; human-wildlife conflict; Mediterranean; Travel cost; tourism.

JEL Codes: Q26; Q51; Q57.

10th SESSION: ***Sustainable Tourism***

Alternative forms of sustainable development: The case of thermal tourism

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Abstract
Thermal tourism is a special form of providing tourist services at special facilities that use recognized thermal natural resources. Thermal tourism blooms in Europe with pioneer country Germany. There are 1,400 developed bathing sites in Europe, visited by millions of patients from all over the world. This industry employs about 750,000 people and has an annual turnover of approximately 45 billion euros. In Greece, thermal tourism is an important part of our cultural heritage and not only because Greece is one of the richest countries in natural sources with excellent quality water. Despite the fact that Greece is the first country in Europe in the quality and uniqueness of natural thermal resources, its thermal tourism is declining. Furthermore, in this article, efforts will be made to identify the causes that contribute to the reduction of thermal tourism, as well as to draw some conclusions with a view to improving and sustaining the thermal tourism.

Keywords: Alternative tourism; thermal tourism; sustainable development.

JEL Codes: Q01; Z32.

10th SESSION: ***Sustainable Tourism***

Integrating sustainable supply chain management (SSCM) amongst Greek supermarkets

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Abstract

The retail supermarket sector has been affected by the recession experienced in recent years in Greece. That is why, supermarkets targeted to increase their performances, achieve reduction to operating costs employing sustainable supply chain management (SSCM). The purpose of the present paper is to analyze green logistics decisions within the retail supermarket sector by using economic, social, operational and environmental metrics. The research problem of this study is to examine the barriers and drivers that affect manager's perceptions on relation to sustainable supply chain management (SSCM), employing data from supermarket managers in Athens, Greece. Managers adopted several sustainable supply chain practices in order to increase the performance of the super market stores, such as material handling, waste management and reverse logistic. Results indicate that managers' decision to adopt green supply chain practices combined both organizational and economic criteria.

Keywords: Retail businesses; Supply chain management; Sustainability

JEL Codes: M59; Q01; Q55.

10th SESSION: ***Sustainable Tourism***

The use of carbon shadow pricing as a tool to drive the de-carbonization of the Greek hotels operations

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Abstract

Nations regard tourism as a low-impact development option and massively invest in tourist-drawing infrastructure. However, recent research has shown that tourism is a carbon intensive activity, accounting for almost 8% of global GHG emissions. The accommodation sector in particular accounts for approximately 20% of tourism emissions resulting from ventilation, heating, air-conditioning and facility operations with data varying according to the location, type, size, occupancy and category of the establishments. The average carbon footprint of an overnight stay aggravates heavily if a life cycle perspective is used. The hospitality sector's target for carbon reduction to mitigate global warming and meet the Paris-set 2◦ Celsius cap requires that hotels reduce their absolute carbon emissions by 66% by 2030 and by 90% by 2050, against a 2010 baseline. These figures are significant but technically achievable and demanded if the industry commits to decoupling its strong growth from emissions escalation. A number of actions, tools, and innovative approaches must be adopted by hotels to decarbonise their activities. Carbon shadow-pricing is such a tool which, if effectively applied, may accelerate the available solutions. This paper suggests the use of internal (shadow) pricing by Greek hotels as an instrument to appraise the sustainable profitability of a hotel project, de-risk business, identify energy inefficiencies, and incentivize low carbon innovation within departments; it also proposes a methodology on how to set an internal carbon price in the Greek hospitality domain and how to make the most out of this initiative.

Keywords: Carbon emissions; hotel operations decarbonization; carbon internal pricing; carbon shadow pricing.

JEL Codes: O44; O47; O52; Q43; Q56.

10th SESSION: ***Sustainable Tourism***

Wind energy, an energy solution for hospitality businesses

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Abstract

Energy is a driving force for everyday human activities, both in the economy and in the technology. Many countries worldwide have realized the urgent need for clean, non-polluting power generation and are trying to be the main driver for electricity, renewable energy. (Kaplanis, 2003). According to recent studies, the most economical and affordable renewable energy source has become the wind power. Wind systems are widely used in our time, and in this study we would like to present you the proposal of a team of Sheridan college engineers in Ontario, Canada, where they created a small wind turbine that promises to meet the electrical needs of a small hospitality unit, ie to produce energy reliably and at low cost. Greece has an extremely rich wind potential and the wind power is practically an inexhaustible source of energy. The exploitation of its high potential in our country, coupled with the rapid development of technologies embedded in small, modern, efficient wind turbines, is of paramount importance for sustainable development, saving energy resources, protecting the environment and tackling climate change.

Keywords: Wind power, small wind turbines, hospitality units, sustainable development

JEL Codes: Q01, L83, O13, P28, Q42

Two stage DEA & marginal effects of environmental variables to TE index

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Abstract
In the present study, the non-parametric method of Data Envelopment Analysis (DEA) is applied, in order to determine the technical efficiency (TE) index of G7 countries when variable returns to scale (VRS) hold for the entire period under consideration, 1993 to 2012. As inputs labor and capital are used while we utilize GDP as output. In the second stage of our analysis the DEA bootstrap approach along the line of Simar and Wilson (2007) is applied, as a way to deal with the disadvantages of the non-parametric DEA method. The bootstrap provides a convenient way to simulate repeatedly the data generating process using resampling method so that the resulting DEA efficiency indices, of each simulated sample, mimic the sampling distribution of the original DEA efficiency indices. Through the procedure proposed by Simar-Wilson, we investigate the relationship between the efficiency evaluation of DMUs as calculated by the DEA method, in the first stage of our analysis, and the variables of arable land, total greenhouse gas emissions and total primary energy consumption. In addition, for these variables and through the estimated regression coefficients, elasticities and marginal effects to both TE and GDP index are calculated.

Keywords: Data envelopment analysis; Environmental Economics; Carbon emissions; Eco-Efficiency; Total factor productivity index.

JEL Codes: O11; O57; Q01; Q40; Q43; Q48; Q50; Q58; R15.

11th SESSION: ***Environmental Efficiency & Performance***

Research Intensities and R&D Input-Output Multipliers: An Examination of their Intertemporal Stability Using Data on the US Economy

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Abstract
Input-Output (IO) Analysis methods and their expansion to cover Research and Development (R&D) issues, resulted in the adoption of extended IO R&D multipliers. The latter show how changes in one or more sectors' final demands affect R&D expenditures in all sectors of the economy. The concept of sectoral research intensity defined as the R&D expenditures of a sector per unit of its own production value, is a necessary tool for the estimation of IO R&D multipliers. These intensities and multipliers are particularly useful for the quantitative analysis of the relationships between economic growth with R&D activities at a detailed sectoral level and for the whole economy as well. Knowledge of such relationships is particularly useful in order to device R&D policies and incentives. In order to achieve such a goal and make safe predictions, the stability of multipliers and intensities is a prerequisite. Using OECD data on the US economy, i.e. US IO tables and sectoral R&D expenditures for a series of years, we estimate sectoral research intensities and multipliers. Subsequently, their stability is evaluated using several established criteria in the literature with encouraging results which are presented and discussed.

Keywords: Input-Output Multipliers; Research and Development; Research Intensities.

JEL Codes: C67; D57; 031.

11th SESSION: ***Environmental Efficiency & Performance***

A merry triangle or a heavy cross? Environmental Efficiency, Productive Performance & Competitiveness under Technological Heterogeneity

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Abstract
We investigate the relationship between environmental efficiency, competitiveness and productive performance by adopting the country frontiers approach under a DEA meta-frontier framework. The interest is placed on 9 industries of Manufacturing and 4 of the transportation sector in 17 European countries from 1999 through 2006. Using a directional distance function we estimate environmental efficiency while at the second stage, we explore the potential of the latent instrumental variables approach to alleviate endogeneity concerns between the measures of performance. To cope with the case where sufficient instruments are not readily available, we attempt to identify the model through heteroscedasticity-based instruments. Findings under the no-endogeneity assumption indicate that the influence of competitiveness on environmental efficiency is weaker when productive performance is considered. Relaxing that assumption, we estimate the model constructing instruments as simple functions of the model's data while afterwards we augment the generated instruments using foreign direct investments as an instrument to find that competitiveness is not a sufficient condition for environmental performance improvement. Productive performance affects negatively and significantly environmental efficiency while its combined effect with competitiveness exerts no influence on the latter. Preliminary findings indicate that the particular triangle does not work, at least in the case examined herein.

Keywords: Environmental Efficiency; Competitiveness; Heterogeneity; Latent Instrumental Variables Approach

JEL Codes: C36; Q50; D20.

Measuring efficiency in forestry section using Network DEA approach: An application to EU countries

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Abstract

Forest production has become one of the most researched topics due to climate change and increased trend in demand for forest products (namely wood and paper). To measure the efficiency of forest production, the operations are de-composed into two stages. The first stage approximates the management of raw material which will be fed into the second stage, decomposed into two sub-processes; manufacturing of paper and wood final products. Since the efficiency of the proposed problem is decomposed into different stages, a Network DEA model is formulated and applied to EU countries based on data from EUROSTAT.

Keywords: Resource Economics, Forestry, Network DEA, Performance Measurement

JEL Codes: C61; C63; Q23; Q51.

11th SESSION: ***Environmental Efficiency & Performance***

European Industries' Energy Efficiency Performance Under Different Technology Regimes. The Role of Heterogeneity, Path Dependence and Energy Mix.

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Abstract
Energy consists an indispendable input into production function and plays a crucial role on countries' growth. Because of the strong and sustained economic growth that exists in the last decades, the demand for energy has been increased massively. Thus, European Commision has devoted sizable resources towards energy efficient and saving policies through the adoption of social and physical infrastructures to support the long term mitigation of global warming and encourage global sustainable dependence. We model the productive and energy efficiency performance of European industries taking into account both desirable and undesirable outputs in the production process under a metafrontier framework. This allows for a detailed consideration of the efficiency improvements made possible via technological spillovers within a given class of membership. Our dataset consists of 27 European countries and 14 industrial sectors of manufacturing which are studied for the period 1995 to 2011. In a first stage, DEA and DDF approaches were used for the estimation of productive performance, energy efficiency and technology gaps. In a second stage, Tobit and fractional model estimators are employed in order to investigate possible factors that affect energy efficiency and the role of the implied technology as it is conveyed by the level of each country.

Keywords: Energy efficiency, Directional Distance Functions, European, Industries, Metafrontier analysis, Energy mix

JEL Codes: Q40; D24; D22; C30

12th SESSION: ***Sustainable Development***

Assessing the independence of NRA in controlling the competition in Iranian energy market

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Abstract
Energy regulators play a major role in the development of a competitive market for energy production and supply. Recently, according to the law of "Amendment on the law of the General Policies of the Principle 44 of Constitution law) 2018)" in Iran, the Competition Council in Iran has been authorized to foresee and establish regulators in various areas, including energy sector. This paper tries to investigate whether the recent reform leads to the independence of the National Regulatory Authority (NRA) from the three dimensions of decision-making, budget and staff. The result of this study shows that although, compared to the former situation, the recent reform is a step forward, this reform was also unsuccessful in the realization of the full independence of the NRAs especially in the energy sector which the major players of the industry are state-dependent. Therefore, in order to achieve the full independence of the NRAs especially in the energy sector in Iran, it is suggested to consider the European Union's Third Energy Package to make the most effective amendments in the regulatory of the energy market in Iran.

Keywords: NRA; Competition; Energy Market; Monopoly; Goods; Independence and Responsibility.

JEL Codes: K00; K2; K21; K23; K32; D42; L4; L43.

12th SESSION: ***Sustainable Development***

Just how Smart is [Smart] Regulation? Achieving Sustainable Development with Regulation-induced Innovation

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Abstract
Endogenous technological change theory provides a framework that enables to understand how firms' dynamic respond to policies. It also allows to model the interplay between sustaining innovation by incumbents and radical innovation by new entrants as well as imitation through the diffusion of innovations. In this paper, we show how stringent regulation can affect market dynamics, and economic growth, by stimulating the entry of fringe players that are more likely to rise to the challenge (Schumpeter creative destruction) instead of regulated firms that are more likely to respond through incremental changes to existing technology (Arrow's replacement effect). As such, we distinguish between weak and strong regulation-induced technological change. We also distinguish between regulations that will stimulate radical entrants that introduce new technologies as opposed to the ones that stimulate imitative entrants through knowledge spillovers. Lastly, we argue that stringent regulation might be beneficial for both incumbents and new entrants when the diffusion deficit is addressed.

Keywords: Sustainable development; innovation; policy; environmental regulation; endogenous technological change

JEL Codes: Q01; Q55; Q58.

12th SESSION: ***Sustainable Development***

Assessing Safety in Public Areas with Space Syntax Application; Case Study of Tarbiat Pedestrian Area, Tabriz-Iran

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Abstract

In studying the urban complex issues, simulation and modelling of public space use considerably helps in determining and measuring factors such as urban safety. Depth map software for determining parameters of the spatial layout techniques; and Statistical Package for Social Sciences (SPSS) software for analysing and evaluating the views of the pedestrians on public safety were used in this study. Connectivity, integration, and depth of the area in the Tarbiat city blocks were measured using the Space Syntax Method, and these parameters are presented as graphical and mathematical data. The combination of the results obtained from the questionnaire and statistical analysis with the results of spatial arrangement technique represents the appropriate and inappropriate spaces for pedestrians. This method provides a useful and effective instrument for decision makers, planners, urban designers and programmers in order to evaluate public spaces in the city. Prior to physical modification of urban public spaces, space syntax simulates the pedestrian safety to be used as an analytical tool by the city management. Finally, regarding the modelled parameters and identification of different characteristics of the case, this study represents the strategies and policies in order to increase the safety of the pedestrians of Tarbiat in Tabriz.

Keywords: Pedestrian Safety; Urban Public Space; Space Syntax; Tarbiat; Tabriz; Iran.

JEL Codes: Q01; R00; R40; R52.

The effect of growth-CO_2 emission relationship on sustainable development: Application of the Wavelet Transform Technique

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Abstract

Despite the relative abundance of works that has attempted to identify the relationship between economic growth and CO2 emissions, they have not been able to answer many questions, most of which is the effect of this relationship on sustainable development. Also, the techniques used to know the nature of this relationship suffers from several problems because they only inform about the existence of causality and its nature (unidirectional, bidirectional). To overcome its shortcomings we have opted for the application of wavelet technique (over several countries) to know both the nature of the causality and the phase difference that can take place between the economic growth of countries and CO2 emissions.

Keywords: Carbon emissions; Growth, Sustainable development, Wavelet transform.

JEL Codes: Q01; Q2; Q28; Q34.

12th SESSION: ***Sustainable Development***

Economic and environmental impact of low carbon technologies in German energy system

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Abstract

The Federal Government of Germany sets ambitious targets for energy and climate policy with the introduction of an Energy Concept in 2010. In this concept, greenhouse gas emissions are to be reduced by 80% by 2050 as compared to 1990 levels and renewable are to supply 80% of electricity. In addition, due to the Fukushima disaster, Germany decided to phase-out nuclear energy by 2022 from energy mix. In order to enable the implementation of large scale renewable energy supply, smart grids are needed to manage the high intermittency of renewable energy sources. This study investigates the possible components, design and prospects of creating a sustainable renewable energy system with such a smart grid. This investigation is conducted by using the EnergyPlan model. The analysis is based on hour-by-hour computer simulations leading to the structure of a smart grid capable of balancing energy supply and demand in Germany. Three different renewable energy scenarios are developed to project the state of the German energy grid up to 2050. The simulation results indicate that the proposed renewable energy systems will even be associated with fewer costs than today's energy system. In a heavy renewable scenario, CO2 reduced by 94.2% while electricity supply is almost completely by renewable i.e. RES share of 92.3%. Results of this study show that decarbonisation of the German energy system is indeed technically and economically possible and worthwhile, if this transition is supported by political and public willingness.

Keywords: Low carbon Technology; Germany; Energy sector; Environmental mitigation; Energy Plan model

JEL Codes: Q41; Q42; Q47; Q51.

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