COURSE OUTLINE

(1) GENERAL

SCHOOL	ECONOMICS and BUSINESS ADMINISTRATION		
ACADEMIC UNIT/PARTICIPATING UNITS*	Department of Economics		
PARTICIPATING INSTITUTIONS**	-		
POSTGRADUATE PROGRAMME: TITLE OF POSTGRADUATE PROGRAMME	Innovative and Sustainable Entrepreneurship		
LEVEL OF STUDIES	Post-graduate		
COURSE CODE	KAE-11	SEMESTER	2nd
COURSE TITLE	Efficiency and Productivity Analysis		
INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*		WEEKLY TEACHING HOURS	CREDITS
		3	6
COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Specialized background.		
PREREQUISITE COURSES:	Quantitative Methods of Analysis & Business Decision Making		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek with English terminology.		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No.		
COURSE WEBSITE (URL)	To be announced		

*Στην περίπτωση Διακρατικού, Διιδρυματικού ή Διατμηματικού ΠΜΣ συμπληρώνονται όλα τα συμμετέχοντα Τμήματα και χαρακτηρίζεται σε παρένθεση το επισπεύδον, π.χ. Φυσικής (επισπεύδον)

**Συμπληρώνεται μόνο στην περίπτωση Διακρατικού ή Διιδρυματικού ΠΜΣ

(2) LEARNING OUTCOMES

Learning outcomes *The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.* *Consult Appendix A* • *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area* • *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong*

Learning and Appendix B

- *Guidelines for writing Learning Outcomes*

Upon successful completion of the course, students will be able to:

- Understand the efficiency and productivity analysis techniques used to estimate production functions, including Data Envelopment Analysis and Stochastic Frontier Analysis.
- Understand concepts such as diffusion effects and knowledge transfer in the context of meta-boundary and hierarchical structures.
- Gain proficiency in managing technological heterogeneity in benchmarking processes by ensuring accurate evaluation of the performance of decision units in the context of peer effects and knowledge transfer.
- Investigate the factors contributing to productivity differences between decision units, including production practices, the external environment and heterogeneity under alternative technology hierarchical structures.
- Analyse and interpret dynamic efficiency related to the change in total factor productivity using production frontier methods such as the Malmquist productivity index.
- Gain experience in estimating production frontiers using the open access software R, enhancing their analytical skills as well as their ability to present and interpret results.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

Search for, analysis and synthesis of data and information, with the use of the necessary technology, Adapting to new situations, Decision-making, Production of new research ideas, Respect for the natural environment, Criticism and self-criticism, Production of free, creative and inductive thinking.

(3) SYLLABUS

The course offers specialized knowledge in efficiency and productivity analysis. In particular, the course covers the following topics: Introduction to efficiency and productivity analysis. Estimation of the production function through the non-parametric technique of Data Envelopment Analysis and its parametric counterpart Stochastic Frontier Analysis. Production models and technology. Presentation of methods and theoretical foundations. Dynamic efficiency through the calculation and decomposition of the change in total factor productivity using frontier methods; the Malmquist productivity index. Empirical application through frontier estimation using R. Handling technological heterogeneity: the meta-frontier framework. The concept of meta-boundary is introduced to compare the performance of

productive entities under heterogeneous technologies, i.e. classified into different groups. The basic analytical framework necessary to define a meta-boundary is presented and estimated using non-parametric (Data Envelopment Analysis - DEA) and parametric methods (Stochastic Frontier Analysis - SFA). The issues of technological change, time-varying technical inefficiencies, multiple outputs, different efficiency orientations and firm heterogeneity are also explored. Hierarchical structures, heterogeneity, endogeneity & Knowledge Diffusion Phenomena. Two types of heterogeneity are introduced, each referring to different stages of the performance evaluation process. A heuristic algorithm for identifying the type of heterogeneity that is relevant to the decision-making unit and associated with each entity is discussed. To identify the type of Hierarchical Structural Heterogeneity that arises under alternative hierarchical structures, heterogeneity thresholds are defined. A control function approach to account for endogeneity is applied to a dynamic panel probit model with an endogenous regressor. The concept of the meta-frontier framework together with a second-stage GMM system estimation procedure is discussed to investigate the effect of technological diffusion and path dependence on the productive. The role of the learning trace and introduction of a heuristic algorithm based on peer effects to identify the most influential decision units is discussed. Information and Communication Technologies, Knowledge Economy and Productivity, Structural Reforms and Efficiency.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Distance Learning</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>• Use of PowerPoint during lectures
• Posting of educational material on the asynchronous e-learning platform in the course area
• Provision of bibliographic references for study on the asynchronous tele-education platform at the course site
• Posting of information of interest and announcements related to the course on the asynchronous e-learning platform in the classroom
• Communication via e-mail/eclass</td></tr>
<tr><td>TEACHING METHODS
The manner and methods of teaching are described in detail.
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.

The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures (3 hours/week x 13 weeks)</td><td>39 hours</td></tr>
<tr><td>Independent study</td><td>111 hours</td></tr>
<tr><td>Course total (25 hours of workload per ECTS credit)</td><td>150 hours
(total student workload)</td></tr>
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STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	Lectures and examinations within the course are conducted in person exclusively. Student assessment is based on a written final examination in Greek with English terminology, where necessary, which may include multiple choice questions, short answer questions, solving exercises, interpretation of results and/or a combination of the above.

(5) RECOMMENDED BIBLIOGRAPHY

- *Suggested bibliography:*

- Bogetoft, P., & Otto, L. (2010). Benchmarking with dea, sfa, and r. (Vol. 157). Springer Science & Business Media.
- Bogetoft, P., Otto, L., & Otto, M. L. (2015). Package 'benchmarking'. Benchmarking: Benchmark and Frontier Analysis Using DEA and SFA.
- Coelli, T. J., Rao, D. S. P., O'Donnell, C. J., & Battese, G. E. (2005). *An introduction to efficiency and productivity analysis. springer science & business media.*
- Kounetas, Kostas & Chatzistamoulou, Nikos. Applied Operations Research and Linear Programming. Solutions using R. *Applications in Economics and Management Science. Kritiki Publishing, 2020.*

- Related academic journals:

- Chatzistamoulou, N., Kounetas, K., & Tsekouras, K. (2024). Knowledge flows in Data Envelopment Analysis. The role of peer effects. *Omega*, *129*, 103137.
- Chatzistamoulou, N., Kounetas, K., & Tsekouras, K. (2022). Technological hierarchies and learning: Spillovers, complexity, relatedness, and the moderating role of absorptive capacity. *Technological Forecasting and Social Change*, *183*, 121925.
- Giles, J., & Murtazashvili, I. (2013). A control function approach to estimating dynamic probit models with endogenous regressors. *Journal of Econometric Methods, 2(1), 69-87.*
- Tsekouras, K., Chatzistamoulou, N., & Kounetas, K. (2017). Productive performance, technology heterogeneity and hierarchies: Who to compare with whom. *International Journal of Production Economics, 193, 465-478.*
- Tsekouras, K., Chatzistamoulou, N., Kounetas, K., & Broadstock, D. C. (2016). Spillovers, path dependence and the productive performance of European transportation sectors in the presence of technology heterogeneity. *Technological Forecasting and Social Change, 102, 261-274.*
- Dosi, G., & Nelson, R. R. (2013). The evolution of technologies: An assessment of the state-of-the-art. *Eurasian business review,3(1), 3-46.*

- *Dosi, G., Lechevalier, S., & Secchi, A. (2010).* Introduction: Interfirm heterogeneity—nature, sources and consequences for industrial dynamics*. Industrial and Corporate Change, 19(6), 1867-1890.*
- O'Donnell, C. J., Rao, D. P., & Battese, G. E. (2008). Metafrontier frameworks for the study of firm-level efficiencies and technology ratios*. Empirical economics, 34(2), 231-255.*

Related academic journals (Indicatively): Techonological Forecasting and Social Change, International Journal of Production Economics, Annals of Operations Research, Journal of the Operations Research Society, Omega, Journal of Productivity Analysis.