



Wageningen School
of Social Sciences

THEORY AND PRACTICE OF EFFICIENCY & PRODUCTIVITY MEASUREMENT: STATIC & DYNAMIC ANALYSIS

**Subal Kumbhakar, Chris Parmeter,
Spiro Stefanou, Alfons Oude Lansink**

8-12 and 15-19 July 2019

**Course organised by the Wageningen School of Social Sciences (WASS),
Wageningen University**

Introduction

Productivity growth entails changes in scale, efficiency gains and technological change. Innovations are needed to keep pushing the competitive envelope, and efficiency gains are needed to ensure that implemented technologies achieve their potential. Conventional economic approaches assume that all firms operate rationally and efficiently. This summer school, however, challenges this assumption and presents concepts, models and tools needed to analyze and quantify the levels of inefficiency and productivity at a point in time and their movement over time.

The summer school is designed to bridge the gap between theory and practice. It is organized into distinct parts: “Parametric, Static Approaches” (Week 1) and “Dynamic Approaches” (Week 2). Participants may enrol for either week 1 or 2, or both weeks. Although each week is independent, participants are encouraged to take both weeks.

Week 1 (8 - 12 July 2019): Parametric Efficiency and Productivity Analysis

Lecturers:	Subal Kumbhakar Professor of Economics Binghamton University, USA	Chris Parmeter Associate Professor of Economics University of Miami, USA
------------	---	--

The parametric course uses Stochastic Frontier Analysis and semi-parametric techniques to measure efficiency and productivity by letting the data span the frontier to establish best practice. This approach coupled with the microeconomic theory of the firm provides firm-specific measurements of efficiency and best practice role models for improving performance.

Week 2 (15– 19 July 2019) : Data Envelopment Analysis : Static and Dynamic Efficiency and Productivity Analysis

Lecturers:	Spiro Stefanou Professor of Food and Resource Economics University of Florida, USA	Alfons Oude Lansink Professor of Business Economics Wageningen University, NL
------------	--	---

The second week introduces the students into Data Envelopment Analysis (DEA) and the dynamic perspective to measuring efficiency and productivity. DEA is a nonparametric technique for measuring efficiency and productivity. The technique does not require distributional assumptions on the efficiency term and is a flexible approach that can be applied to many situations. Dynamic efficiency and productivity analysis is a relatively new approach that has found a more wide application the economics literature. The approach explicitly accounts for the role of adjustment costs in investments.

Course activities

The course consists of theory and method sessions in the morning followed by an afternoon practicum session. The practicum will include applications of the theory, computer analyses with actual data sets, and interpretations in practice. Applications to various economic sectors will be considered such as agriculture, banking and finance, chain management, health, electrical power generation, and sports. Extensions of these models will be addressed that measure input-specific technical efficiency and characterize the dynamic linkages in decision making, and introduce hybrid nonparametric-parametric approaches.

Objectives

Participants will learn the theories concerning efficiency and productivity measurement and will develop proficiency with software to facilitate the initiation of their own research in efficiency and productivity measurement. The course deals with both conceptual and methodological issues.

In particular, after successful completion (of either module) participants are expected to be able to:

- Understand sources of efficiency from the perspective of technical feasibility, allocating scarce resource among competing ends, and the firm scale of operations;
- Understand the input and output perspectives of technical and allocative efficiency;
- Characterize efficiency and productivity growth from a primal, dual and distance function perspective;
- Decompose productivity growth that explicitly accounts for the presence of inefficiency;
- Use DEA models to measure technical, allocative, and scale efficiency levels and productivity growth;
- Characterize definitions of variables of interest to be employed (goods and services; inputs, outputs, environmental, nonmarket goods/services);
- Assess the appropriate use of parametric and nonparametric approaches given the data and problem setting (understanding the advantages and disadvantages of both perspectives);
- Use these approaches to articulate the forces driving efficiency gains and productivity growth;
- Use these approaches for benchmarking, identifying best practice and role models to plan for performance enhancement/gains;

The Dynamic Analysis"" course will further cover:

- Delineation of variable and quasi-fixed factors and their treatment in efficiency and productivity;
- Use of econometric approaches to address efficiency and productivity change measurement over time.

Target group

The course is oriented toward PhD candidates, postdoctoral researchers and others with background in agricultural and applied economics.

Assumed prior knowledge

Microeconomic theory at the graduate level such as the treatment in H. Varian, Microeconomic Analysis, W.W. Norton. Completion of a course in dynamic optimization is strongly recommended. Econometric theory and applications at the graduate level to include topics in Maximum Likelihood Estimation and System Estimation are required and some exposure to panel data econometrics is desirable.

Course Materials:

Kumbhakar, S. and C.A.K. Lovell, Stochastic Frontier Analysis, Cambridge University Press, 2000. (Parametric and Dynamic Course) Reading materials on dynamic production analysis prepared by the authors will be sent to participants in advance of course.

Participants should make sure they have these books before the course starts (books are not included in participation fee). Articles and other accompanying materials will be distributed during the course

Course fees

The course fee for each week is €600. For PhD candidates of Wageningen School of Social Sciences with an approved TSP the course fee is reduced to €300. For those registering for both weeks the course fees are €950 (€475 for WASS PhDs with an approved TSP). The course fee does not include books. It includes additional training material, coffee / tea, lunches and an informal dinner.

Outline of the Course in Hours

For each week of the summer school, participants will have to make a take home exam, which in turn makes them eligible to obtain the amount of 3 credits (according to ECTS) per week, meaning that the work load of each part of the summer school is 84 hours. For participation in the full 2-week programme, which entails 168 hours of preparation, attendance and exam, 6 ECTS can be obtained.

Course Schedule

Parametric Efficiency & Productivity Analysis Course Schedule and Plan, July 8-12, 2019

Day	Lecture	Practicum
1	Introduction Cross-Sectional Methods • Distribution Free Methods • Maximum Likelihood Methods Skewness • Tests of Skewness • The Wrong Skew Problem Estimating Firm Specific Inefficiency • Confidence Intervals • Tests of Correct Distributional Form	Estimation/Inference of Cross-Sectional SF models in R
2	Panel Data Methods • Distribution Free Methods • Maximum Likelihood Estimation • Time Constant Variables Measurement of Technical Change	Estimation/Inference of Panel Data SF models in R
3	System Methods Cost System Issues • Input/Output Oriented Inefficiency • Fixed Inputs • Greene's Problem	System Estimation/Inference of SF models in R
4	Determinants of Inefficiency • The Scaling Property • Mean versus Variance effects Alternative SF models (mixture models/ZISF)	Estimation in R
5	Non- and semiparametric methods for estimating SF models • Kernel Smoothing • Semiparametric Production Frontier • Deconvolved Technical Inefficiency • Nonparametric Estimation of the Determinants of Inefficiency	Estimation of Non/semiparametric SF models in R

DEA: Static and Dynamic Efficiency & Productivity Analysis Schedule and Plan, July 15-19, 2019

Day	Lecture	Practicum
1	Establishing Production Technologies - Nonparametric representation of technology (SES) - Axioms - Constructing cost and profit maximization as LP problem - Radial Distance Functions (SES) - Input distance functions - Output distance functions - Duality between input distance functions and Cost function - Duality between output distance functions and Revenue function - Directional Distance Functions (AOL) - Definition and properties - Translation - Duality between Directional Distance function and Cost and Profit functions	Introduction to R for nonparametric analysis Computational approaches to Data Envelopment Analysis - Constructing nonparametric benchmark technologies - Generating cost and profit maximization problems for actual data using nonparametric technology framework - Generating the nonparametric distance functions for actual cases
2	Characterizing Dynamic Production and Efficiency - Overview (SES) - Defining Dynamic Production Possibility Sets (SES) - Congestion & Weak Disposability (SES) - Dynamic Optimization (SES) - Technical Efficiency measures (AOL) - Graphically piece-wise linear technology - Radial & Directional Distance measures Representing Dynamic Production Possibilities - Input Requirement Set (SES) - Measuring the boundaries with DEA (SES)	Starting Dynamic Data Envelopment Analysis Application: NY Dairy Farm panel; US electric utility firms panel Students may use their own data as well
3	Representing Dynamic Production Possibilities - Cost Efficiency (AOL) - Dynamic Duality with the directional input distance function (AOL) - Decomposition of cost efficiency (allocative & technical) (AOL) - Efficiency of variable and quasi-fixed factors of production (AOL) Dynamic Econometric Approaches - Stochastic Frontier Estimation (SES) - Dynamic Directional Distance (SES) - Dynamic Dual Approaches (SES)	Operationalizing efficiency concept measurement with Dynamic DEA Application: Using panel of dairy farms; electric utility panel
4	Productivity Growth (SES) - Defining TFP Growth under dynamic adjustment (SES) - TFP growth decompositions (SES) - Nonparametric Approaches (AOL) - Parametric Approaches to: (SES) - Dynamic duality	TFP Growth estimates using econometric estimation of - Dynamic Dual system with efficiency - Dynamic Directional Distance Function with efficiency

	○ Dynamic directional distance function	
5	Some New Directions & Discussion New Directions: (SES and AOL) • Evolution of Efficiency (advanced) • Incorporating real options and dynamic efficiency Open Questions (SES and AOL) • Parametric v. Nonparametric • Structural Modeling v. Technical Modeling • Where is the literature going?	

Location

The sessions will be held in building “De Leeuwenborch”, Hollandseweg 1 in Wageningen, The Netherlands. The exact rooms will be announced later.

Registration

Registration is possible electronically via the WASS courses page:

<http://www.wageningenur.nl/en/Education-Programmes/PhD-Programme/Graduate-Schools/Wageningen-School-of-Social-Sciences/Courses/Registration.htm>

The maximum number of participants is set at 20, the minimum at 10.

Please make sure that you provide the most recent contact details so that in case of any changes you will be notified promptly. After your internet registration you will receive a short notification that your name has been registered. At least two weeks before the course you will receive a confirmation about the location and the schedule. WASS will also send an invoice to the address indicated in the registration form.

Please e-mail to Marcella.Haan@wur.nl in case you have not received the second confirmation two weeks before the course.

Cancellations

Cancellations may be made free of charge until 1 month before the start of the course. Cancellation fee of 100 % applies if participants cancel the course less than 1 month prior to the course. The organisers have a right to cancel the course not later than 1 month before the course starts. The participants will be notified of any changes at their e-mail addresses.

Further information

On course content please contact the course organiser, Alfons Oude Lansink . He can be reached through Alfons.OudeLansink@wur.nl

For details about the logistics, accommodation, registration, fees, study materials, etc. please contact

Marcella Haan

Tel +31 317 484126

Marcella.haan@wur.nl

Contact addresses:

Wageningen School of Social Sciences

Wageningen University

Hollandseweg 1

6706 KN WAGENINGEN

The Netherlands

Useful information on accommodation for participants from outside Wageningen

Wageningen International Centre,
Hof van Wageningen: 75 euro for 1 person
room, 98.50 euros for 2 persons room (including
breakfast) <http://www.hofvanwageningen.nl/>

Hotel de Wageningseberg: 62.50 euro 1 person
room, 97.50 euro for 2 persons room (including
breakfast) www.wageningseberg.com

Hotel Nol in 't Bosch: 83,50 euro for 1 person
room, 110 euro for 2 persons room, also
including breakfast; <http://www.nolintbosch.nl/>

Hotel de Nieuwe Wereld (Hotel School): 50-60
euro for a 1 person room.
<http://www.denieuwewereld.nl> (only in Dutch)

Bed&Breakfast De Heksenspeeltuin:
25 euro for a 1 person room
Eindhovenstraat 15, 6706JA Wageningen
Phone: +31 317-418161
E-mail: callyd@zonnet.nl
www.heksenspeeltuin.nl

Villaria Bed en Breakfast:
32-38 euro for a 1 person room
Nassauweg 21, 6703CG Wageningen
Phone: +31 317-419636
Email: villaria@hari.demon.nl

Ons Bakhuus Bed & Breakfast:
25 euro for a 1 person room
Dolderstraat 64, 6706 JG Wageningen
Phone.:+31 317-411994
E-mail: janny.wijbo@chello.nl

Knollywood Bed & Breakfast:
35 euro for a 1 person room
L. Roggeveenstraat 39, 6708 SL Wageningen
Phone: +31 317-420970
E-mail: Knollywood@hetnet.nl

De Herbergh Bed & Breakfast:
45 euro for a 1 person room
Generaal Foulkesweg 8, 6703 BR Wageningen
Phone: +31 317-410747
E-mail: glindenbergh@wanadoo.nl

Het Torentje Bed & Breakfast:
60 euro for a 1 person room
Nassauweg 19, 6703 CG Wageningen
Phone: +31 (0)6 55 802 865
e-mail: info@het-torentje.nl
website: <http://www.het-torentje.nl>

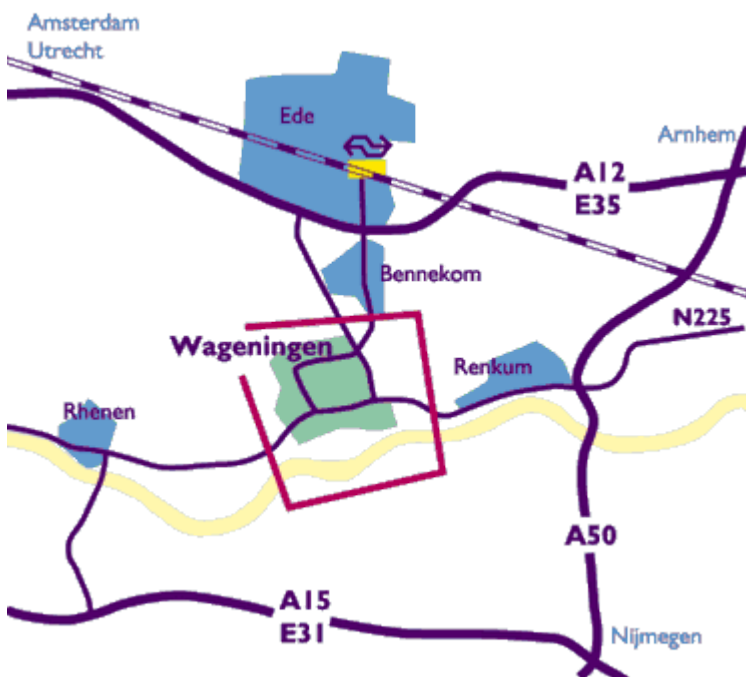
From Schiphol Amsterdam Airport to Wageningen

At the Airport you can buy a train ticket in the 'arrivals' area by the baggage claims. You will see the sign "Train tickets" near the exit. Then follow the signs 'Nederlandse Spoorwegen' (NS) or 'Trains and busses' to the railway station.

Purchase a one-way ticket to the Ede-Wageningen train station, this will cost € 14,10 (plus a service charge if you buy the ticket at the ticket counter). It is also possible to buy the ticket from the ticket vending machines in the station.

There are direct connections from Schiphol Amsterdam Airport to Ede-Wageningen every 30 minutes. Additionally, twice an hour there is a connecting service from Schiphol to Ede-Wageningen where you have to change trains in Utrecht. The destination boards on the platform will indicate the different stations where the train will stop. Check for the names Ede-Wageningen or Utrecht and board the train and when necessary change in Utrecht. The trip from Schiphol to Ede-Wageningen takes you a bit more than one hour.

For Dutch train connections use www.ns.nl, www.thalys.com, www.db.de



The train station is not located directly in Wageningen. This lack is fully compensated by fair means of transportation by buses and taxis. From railway station Ede-Wageningen you can take a taxi (approx. 15 min.). Taxis leave at the north side of the station. You can also come by bus: line 52 (direction Wageningen/ Arnhem) departs from the north side of the station or bus line 88 (Valleilijn, direction Wageningen) leaves from the south side of the station. You have to purchase a ticket from the driver in the bus, which will cost about 2 euros.