In Memoriam: Lennart Hjalmarsson, 1944–2012

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Professor Lennart Hjalmarsson died in an accident while felling trees in his forest on February 21, 2012 (5 weeks before his 68th birthday). He had three loves in his life—his wife and family, economics, and the forests and farms of his native Swedish countryside. Lennart grew up on a farm in Borås, Sweden. After getting married, he lived on his wife's farm nearby where he raised two sons. Working on the farm and in the forest was not a chore to Lennart. On the contrary, it was a source of energy and a break from his academic chores. Lennart loved to take guests from the economics department in Gothenburg to his farm. His wife's hospitality and fantastic home cooking were unforgettable. The farm was an idyllic place for his city slicker

colleagues who quickly understood why Lennart wanted to stay there during the summer.

After working on his Ph.D. in Oslo for 3 years under Leif Johansen, he obtained his degree at University of Gothenburg and subsequently became a full professor there at a young age in 1979. He happily spent the rest of his career in Gothenburg and became one of the most outstanding economists in Sweden. His main research fields were industrial economics, productivity, production theory, energy economics, deregulation, public economics and taxation. He published regularly in both general interest economics journals and top field journals. He served as an editor of *Scandinavian Journal of Economics* and was associated with several other production and industrial economics journals. Lennart was a founding member of *Journal of Productivity Analysis* and served as a co-editor from 1988 to 1991 and was on the Advisory board afterwards from 1992 to 2009.

The theme of his Ph.D. thesis was the Scandinavian concept of “structural rationalisation”. In his first scientific paper “Optimal Structural Change and Related Concepts” (*Swedish Journal of Economics*, 75(2), 176–192, 1973) he developed the idea of optimal structure based on dynamic production theory using the production function framework of Leif Johansen (1972). The size distribution of firms is a topic related to structural rationalisation. Lennart studied this topic in two papers: “The Size Distribution of Establishments and Firms Derived from an Optimal Process of Capacity Expansion” (*European Economic Review* 5, 123–140, 1974) and “Capacity Expansion and Its Implications for the Size Distribution of Firms: Reply” (*European Economic Review* 7, 287–292, 1976) connecting distribution of capacity within a putty-clay model.

The idea of productive efficiency was a natural extension of Lennart's work on Leif Johansen's production

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function. The frontier production function concept, based on the ex ante micro production function, was used in the paper “On the Measurement of Productive Efficiency” (Swedish Journal of Economics, 76(2), 141–154, 1974, coauthored with Finn R. Førsund). This paper also introduced the concept of dynamic vintage efficiency.

Lennart continued working on Leif Johansen’s production functions and published both theoretical and empirical extensions. These publications were: “Frontier Production Functions and Technical Progress: A Study of General Milk Processing in Swedish Dairy Plants” (Econometrica, 47(4), 883–900, 1979), “Generalised Farrell Measures of Efficiency: An Application to Milk Processing in Swedish Dairy Plants” (Economic Journal, 89, 294–315, 1979), and “Technical Progress and Structural Change in the Swedish Cement Industry 1955–1979” (Econometrica, 51, 1449–1467, 1983, (all with Finn R. Førsund as a coauthor). More in-depth analysis of how to apply the Johansen approach on discrete data with empirical applications was documented in the book “Analyses of Industrial Structure. A Putty-Clay Approach” (1987) (coauthored with Finn R. Førsund). The last journal paper on this project was “The Interplay between the Micro Frontier and Short-run Industry Production Functions” [Scandinavian Journal of Economics, 98(3), 365–386, 1996 (Finn R. Førsund and Timo Summa as coauthors)]. Here estimations of ex ante functions over time and short-run industry functions were combined. The paper demonstrated how three production function concepts of Leif Johansen could be utilised to give a complete structural description of an industry.

Lennart also worked (with various coauthors) on productive efficiency using the non-parametric method (viz., Data Envelopment Analysis, DEA). Some of these works were published in Journal of Econometrics (1980), Journal of Productivity Analysis (1992, 1996 and 2007), Scandinavian Journal of Economics (1992), Journal of Public Economics (1995), Computers and Operations Research (1996), Transportation Planning and Technology (1996), Journal of Operational Research Society (2004).

Lennart did also contribute to applications in stochastic frontier production functions. These publications were in European Economic Review (1998), Scandinavian Journal of Economics (1999), Journal of Productivity Analysis (1996, 2002) and International Journal of Industrial Organization (1997) with Almas Heshmati and Subal C. Kumbhakar as coauthors.

Productivity and energy problems were close to his heart. In addition to his 39 papers in scientific journals and 29 book chapters, he devoted a lot of time in writing government reports (in Swedish) and dissemination of knowledge in popular Swedish outlets. He participated (often as chairman) in 15 expert commissions in Sweden that dealt with topics such as energy, tax and productivity,

and authored 12 international consulting reports mainly on energy-related issues. Lennart was a proponent of nuclear power and followed the development of this industry closely. He was a member of the International Panel of Experts on the Closure of Chernobyl Nuclear Power Plant. Since he was a member of a panel for the European Commission on Nuclear Safety in Central and Eastern Europe, he also acted as an international consultant on energy issues. He was involved in deregulation and restructuring of electricity markets and electric utilities in Sweden, Norway, New Zealand and Thailand.

For many years he had been a member of the Royal Swedish Academy of Engineering Sciences and the Royal Society of Arts and Sciences in Gothenburg. Other accolades include the Erik Lindahl Award, the Jan Wallander Award for International Scientific Publications and an honorary professorship and an honorary doctorate at the Academiei de Studii Economice, Bucuresti, Romania.

Lennart had many doctoral students over the years in Gothenburg. He encouraged students from abroad to join in the Ph.D. program. He took good care of his students, encouraging them to participate in conferences abroad and even used his own funds to finance some of their travels.

Lennart was full of positive energy and had a unique warmth, generosity and concern for those who were lucky to have him as a friend. He will be deeply missed by everyone who knew him.

To honor and celebrate Lennart’s contributions some of his friends and colleagues (Arne Bigsten, Finn R Førsund, Almas Heshmati, Subal Kumbhakar and Hans Löf), organized a conference in Gothenburg on December 7–8, 2012: <http://economics.handels.gu.se/english/research/conference-in-memory-of-lennart-hjalmarsson/>. Fifty-four researchers from several countries participated in the conference. A total of 22 papers were presented in the conference. Out of these papers 18 were submitted to this special issue, and subsequently 12 of them were accepted. We included papers that use DEA, Malmquist and Stochastic frontier approach to estimate efficiency and productivity. We also included papers that are related to productivity but not to efficiency. In terms of coverage we have both methodological and applied papers. The applications include electricity distribution, banking, dairy farming, pollution, hospital, manufacturing and tax offices. Below we give a brief description of the papers that are included in this issue.

In “Are distance measures effective at measuring efficiency? DEA meets the vintage model” Constantin Belu develops a model of capacity expansion, based on Lennart’s 1973 paper, that accounts for differences in the productivity of the installed capital due to technical progress exhibited by the ex ante production function. He assumes a putty-clay set-up which allows flexible input

coefficients and substitution possibilities ex-ante but fixed input coefficients ex-post. Based on the model, he generates a capacity distribution of DMUs (vintages) describing an industry with a homogeneous output and performs an efficiency analysis employing DEA. The results show that in some circumstances older vintages appear on the efficiency frontier, unlike some newer vintages that are found to be inefficient, despite benefiting from the advancement of the technology.

In “Foreign aid and productivity” Ann Veiderpass examines the long debated question of whether foreign aid enhances economic growth and efficiency in resource use. While most previous studies have relied on simple cross country regressions, this study suggests a new approach by evaluating country performance in a production theory context using productivity as a benchmark. She applied the non-parametric Malmquist Productivity Index, used in Hjalmarsson and Veiderpass (1992a, 1992b), and then linked this country performance index to the amount of foreign aid received. A balanced panel of 89 low and middle income countries from five different geographical categories is studied over a period of 11 years. Using a visual test she grouped the countries into three categories: significant productivity decline, growth and no change. The different categories are based on confidence intervals resulting from bootstrapping. When linking country performance to aid in a more traditional way, she finds a significant but weak correlation.

In “On structural and average technical efficiency” Giannis Karagiannis explains the discrepancy between the efficiency of the average production unit proposed in Førsund and Hjalmarsson (1979) as a measure of structural efficiency) and average efficiency by means of a covariance term relating size and technical efficiency and the extent of reallocation inefficiency. He shows that, regardless of the degree of reallocation efficiency, the efficiency of the average production unit is lower than average efficiency when either size or efficiency are uncorrelated or larger units are more efficient than smaller ones. If however larger units are less efficient than smaller ones, the efficiency of the average production unit is higher than average efficiency as long as reallocation efficiency prevails. Furthermore, he finds that reallocation efficiency and a zero covariance term are sufficient conditions for the efficiency of the average production unit to be equal to average efficiency.

In “Productivity of tax offices in Norway” Finn R. Førsund, Dag Fjeld Edvardsen and Sverre Kittelsen examine the performance of local tax offices over time using DEA to calculate a Malmquist productivity index. The index has the proper homogeneity properties of a total factor productivity index. They applied a bootstrap approach to establish confidence intervals for the individual indices

enabling an identification of units that have significant productivity decline, growth, or no change. They find that the confidence intervals tend to be wider the larger the units, thus providing more accurate insights than point estimates for actions to improve productivity. Based on the positive and negative changes in cost and productivity they classified the development of offices into four categories of interest to policymakers: efficient cost increase, efficient cost saving, inefficient cost saving and inefficient cost increase.

In “Decomposing the productivity differences between hospitals in the Nordic countries” Sverre A. C. Kittelsen, Benny Adam Winsnes, Kjartan S. Anthun, Fanny Goude, Øyvind Hope, Unto Häkkinen, Birgitte Kalseth, Jannie Kilsmark, Emma Medin, Clas Rehnberg and Hanna Rätto compare productivity of Finnish hospitals with those of other Nordic countries. Since there is no natural pairing of observations between countries they estimate productivity levels rather than a Malmquist index of productivity differences, using a pooled set of all observations as a reference. Then they decompose the productivity levels into technical efficiency, scale efficiency and country specific possibility sets (technical frontiers). They use data on operating costs and patient discharges in each diagnosis related group for all hospitals in the four major Nordic countries, Denmark, Finland, Norway and Sweden. They find that there are small differences in scale and technical efficiency between countries, but large differences in production possibilities (frontier position). The country-specific frontier is the main source of the Finnish productivity advantage. There is no statistically significant association between efficiency and status as a university or capital city hospital. The results are robust to the choice of bootstrapped DEA or stochastic frontier approach as frontier estimation methodology.

In “Scale economies, technical change and efficiency in Norwegian electricity distribution, 1998–2010” Subal C. Kumbhakar, Roar Amundsveen, Hilde Marit Kvile and Gudbrand Lien investigate scale economies, technical change and efficiency in Norwegian electricity distribution companies from 1998 to 2010. This study is inspired by Lennart’s earlier work on efficiency of Swedish electricity distribution companies (Kumbhakar and Hjalmarsson, 1998). The importance of this study comes from the fact that the organization and structure of this sector has become an important political question. They use panel data from the Norwegian Water Resources and Energy Directorate to address this issue. In particular, they use input distance function to examine scale economies, technical change and technical efficiency in the distribution companies. In modeling technical inefficiency, they also separate company-specific effects from inefficiency. Their results show that the potential for scale economies is generally highest among small companies.

In “The effects of efficiency and TFP growth on pollution in Europe: a multistage spatial analysis” Morakinyo Adetutu, Anthony J. Glass, Karligash Kenjegalieva and Robin C. Sickles use a two-stage empirical methodology to examine the effects of efficiency and TFP growth on pollution. First, in stage 1 they obtain estimates of efficiency, growth and total factor productivity (TFP) growth using a stochastic production frontier for European countries (1995–2008), from which they omit emissions. Second, in Stage 2 these measures of productive performance are used as regressors in spatial models of per capita nitrogen and sulfur emissions. From their preferred Stage 2 spatial models they find that a country’s TFP growth must fall to reduce its per capita nitrogen and sulfur emissions. A special feature of Stages 1 and 2 of the analysis is the modeling of the cross-sectional spatial dependence.

In “Are all firms inefficient?” Seunghwa Rho and Peter Schmidt extended the stochastic frontier model to accommodate fully efficient firms. In the standard stochastic frontier model, all firms are inefficient, because inefficiency is represented by a non-negative random variable and the probability that inefficiency is exactly zero equals zero. They modify this model by adding a parameter p which equals the probability that a firm is fully efficient. The model is then estimated by MLE to obtain estimates of the fraction of firms that are fully efficient and of the distribution of inefficiency for the inefficient firms. Their model considers some extensions of the model proposed by Kumbhakar, Parmeter, and Tsionas (2013), especially problems involved in testing the hypothesis that $p = 0$.

In “Financial center productivity and innovation prior to and during the financial crisis” Claudia Curi and Ana Lozano-Vivas assess and test the response of banks operating in financial centers to the financial crisis by investigating the actual productivity change and its components, viz., pure efficiency change, scale efficiency change and technological change (innovation). Their findings show that both branch and subsidiary banks responded to the financial crisis with productivity improvements and, in both cases, this improvement is driven primarily by a positive technical change. However, the branch banks outperform the subsidiary banks. In addition, for the three categories of big, medium and small banks, they find a positive productivity reaction to the crisis, driven mostly by a technical change.

In “Decompositions of productivity growth into sectoral effects”, Erwin Diewert provides some new decomposition of labor productivity growth and TFP growth into sectoral effects. These new decompositions draw on the earlier work of Tang and Wang (2004). The economy wide labor productivity growth rate turns out to depend on the sectoral productivity growth rates, real output price changes and changes in sectoral labor input shares. The economy wide

TFP growth decomposition into explanatory factors is similar but has some extra terms due to real input price change make their appearance in the decomposition.

In “Sources of productivity spillovers: panel data evidence from China”, Badi H. Baltagi, Peter H. Egger and Michaela Kesina assess sources of productivity spillovers in China’s electric and electronic manufacturing industry using a rich panel data-set of 25,360 firms observed over the period 2004–2007. In particular, the paper focuses on the role of other firms’ productivity as well as productivity shifters in affecting own firm-level TFP. In addition, this paper examines the possible difference between spillovers from foreign-owned units and units which participate at global markets through exporting in comparison to domestically owned and non-exporting units. They find evidence of stronger spillovers from exporting firms than from non-exporting firms, which holds for foreign-owned as well as domestic exporters. Further, the strength of the spillover effects differs across subsectors.

In “Broad breeding goals and production costs in dairy farming”, Daniel Muluwork Atsbeha, Dadi Kristofersson and Kyrre Rickertsen estimate the effects of genetic progress in different traits on variable costs of production. A variable cost function that is augmented with indices of dairy cows’ genetic merit in different groups of traits is estimated by using farm-level panel data. They find that a genetic progress of one standard deviation in production and functional traits reduces variable costs by 0.4 and 0.6 %, respectively. The cumulative variable cost reduction from genetic progress in functional traits between 1999 and 2007 is about 1 % for the average farm. Genetic change is permanent and the discounted perpetual cost reduction because of genetic progress in functional traits is about NOK 160 million for Norwegian dairy farms.

We were fortunate to have an army of capable referees who provided excellent criticism and feedback on the research reported here, which undoubtedly improved the quality of the special issue. We would like to personally thank the referees for their dedicated service in helping us put this special issue together and ensuring that the submissions were of highest quality.

We would like to express our sincere thanks to Arne Bigsten and Eva-Lena Neth Johansson for doing all the chores before, after and during the workshop to make it a success. Almas Heshmati, a good friend and collaborator of Lennart, was very helpful in planning the workshop and persuading Hans Lööf to join hands in organizing it. We are very thankful to them. We also thank the Hjalmarsson family members for their support in planning it. Financial help from the University of Gothenburg and the KTH Royal Institute of Technology is greatly appreciated. Finally, we like to thank Robin Sickles and Bill Greene for their help in commissioning and preparation of the special issue.