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Pages 1-48

Willingness-to-Pay for Quality of Service: An Application to Efficiency Analysis of the UK Electricity Distribution Utilities

By William Yu (Judge Business School, University of Cambridge), Tooraj Jamasb (University of Cambridge, Faculty of Economics, United Kingdom), Michael Pollitt (Judge Business School, University of Cambridge)

Abstract

Efficiency analysis of electricity distribution networks is often limited to technical or cost efficiency measures. However, some important non-tradable aspects of their service such as quality of service and network energy losses are often not part of the analysis. Moreover, technical or cost efficiency should not be achieved at the expense of allocative and economic efficiency. Valuation of service quality for regulatory models is particularly difficult. This paper presents an empirical approach to measure and incorporate service quality and energy losses into the analysis of technical and allocative efficiency of the utilities. We apply our method to the case of the distribution networks in the UK between 1990/91 and 2003/04 using the data envelopment analysis technique. We find that the efficiency of the utilities improved during the first and second five-year distribution price control reviews but exhibited a slight decline during the third review period. We find relatively low allocative efficiency – i.e. a mismatch in allocating resources among expenditures, service quality, and network energy losses. The results suggest that currently the utilities may not be correctly incentivised to achieve socially optimal trade-offs between these.

Pages 49-80

Comparing the Uncertain Impacts of Policy on a Pre-commercial Low-carbon Energy Technology

Gregory F. Nemet (Assistant Professor, La Follette School of Public Affairs and Nelson Institute for Environmental Studies, Madison, WI) and Erin Baker (Associate Professor, University of Massachusetts, Amherst, MA)

Abstract

We combine an expert elicitation and a bottom-up manufacturing cost model to compare the effects of R&D and demand subsidies. We model their effects on the future costs of a low-carbon energy technology that is not currently commercially available, purely organic photovoltaics (PV). We find that: (1) successful R&D enables PV to achieve a cost target of 4c/kWh, (2) the cost of PV does not reach the target when only subsidies, and not R&D, are implemented, and (3) production-related effects on technological advance—learning-by-doing and economies of scale—are not as critical to the long-term potential for cost reduction in organic PV than is the investment in and success of R&D. These results are insensitive to two levels of policy intensity, the level of a carbon price, the availability of storage technology, and uncertainty in the main parameters used in the model. However, a case can still be made for subsidies: comparisons of stochastic dominance show that subsidies provide a hedge against failure in the R&D program.

Pages 81-112

Interregional Sharing of Energy Conservation Targets in China: Efficiency and Equity

Dan Wei (School of Policy, Planning and Development, University of Southern California, Los Angeles, CA) and Adam Rose (School of Policy, Planning and Development, University of Southern California, Los Angeles, CA)

Abstract

Energy conservation is a long-term strategic policy in China to support its economic and social development. This strategy is important for saving resources, protecting the environment, and ensuring a secure supply of energy. However, energy conservation often involves large amounts of investment and may also have dampening impacts on some local and regional economies. Moreover, energy conservation has many features of a public good. Therefore, government policy will have to play a strong role to foster local efforts and interregional cooperation on this issue. This paper analyzes a promising policy instrument – an interregional energy conservation-quota trading system. An operational model is developed to simulate the workings of this policy instrument for a variety of quota allocations among regions. The results indicate that a tradable quota system can help China achieve its conservation target in a cost-effective way and in accordance with its regional development strategy.

Pages 113-140

Green Accounting for Black Gold

By Robert D. Cairns (Department of Economics, McGill University, Montreal QC Canada)

Abstract

In the petroleum industry, valid green economic accounting magnitudes are influenced by natural and other constraints on production, by non-convexity of technology and by non-optimality of output. The paper undertakes an economic analysis of oil extraction that explicitly represents the conditions and constraints that influence the decisions of a firm. This microeconomic analysis diverges from conventional, “Hotelling” macroeconomic models of nonrenewable-resource extraction and has substantially different findings. Optimality conditions such as Hotelling’s rule or first-order conditions are not utilized in defining accounting statistics. Contrary to the findings of many studies, it is found that traditional (non-green) accounting practice for commercial natural resources such as petroleum sensibly balances the aims of economic accounting. Instead, adjustments to practice are most needed for non-commercial values such as pollution or amenities.

Pages 141-154

Revisiting the Inflationary Effects of Oil Prices

By Shiu-Sheng Chen (Department of Economics, National Taiwan University)

Abstract

This paper uses a structural vector autoregression model to investigate the inflationary effects of oil prices. Rather than simply infer the oil price changes as oil supply shocks, we identify three different shocks in the crude oil market: the oil supply shock, the global aggregate demand shock, and the oil-market specific demand shock. We then use impulse response functions to compute the conditional oil price pass-through ratios. It is found that the largest oil price pass-through is caused by oil supply shocks. However, evidence from historical decompositions suggests that the oil price movements have been driven by shocks from strong global aggregate demand and oil demand while only minor contributions come from oil supply shocks. Disentangling demand and supply shocks in the crude oil market helps to uncover the fact that a recent decline in unconditional oil price pass-through may come from the low conditional pass-through caused by global demand shocks.

Pages 155-180

Modeling Optimal Economic Dispatch and System Effects in Natural Gas Networks

By Kjetil T. Midthun (SINTEF Technology and Society, Dept. of Applied Economics / Norwegian University of Science and Technology), Mette Bjørndal (Department of Finance and Management Science, Norwegian School of Economics and Business Administration, Norway) and Asgeir Tomasgard (SINTEF Technology and Society, Dept. of Applied Economics / Norwegian University of Science and Technology)

Abstract

In this paper we present a modeling framework for analyzing natural gas markets, taking into account the specific technological issues of gas transportation. We model the optimal dispatch of supply and demand in natural gas networks, with different objective functions, i.e., maximization of flow, and different economic surpluses. The models take into account the physical structure of the transportation networks, and examine the implications it has for economic analysis. More specifically, pressure constraints create system effects, and thus, changes in one part of the system may require significant changes elsewhere. The proposed network flow model for natural gas takes into account pressure drops and system effects when representing network flows. Pressure drops and pipeline flows are modeled by the Weymouth equation. A linearization of the Weymouth equation makes economic analyses computationally feasible even for large networks. However, in this paper, the importance of combining economics with a model for pressure drops and system effects is illustrated by small numerical examples.

BOOK REVIEWS

Pages 181-185

Energy

By Joseph M. Dukert
(Westport: Greenwood Publishing, 2008)
(Book Review by Maureen S. Crandall)

Pages 185-189

Liberalizing European Energy Markets; An Economic Analysis

By Finn Roar Aune, Rolf Golombek, Sverre A.C. Kittelsen and Knut Einar Rosendahl.
(Cheltenham and Northampton: Edward Elgar, 2008)
(Book Review by Tor Arnt Johnsen)

Pages 189-192

Quantitative economics: How sustainable are our economies?

By Peter Bartelmus
(New York, NY: Springer 2008)
(Book Review by Jess Chandler)

Pages 192-195

Deregulation, Innovation and Market Liberalization

By L. Lynne Kiesling

(London and New York: Routledge, 2009)

(Book Review by Frank A. Felder)

REFEREE ACKNOWLEDGMENTS

Pages 197-206

INDEX TO VOLUME 30

Pages 207-211