Volume 29, Issue 3

July, 2008

Pages 1-26

An Empirical Analysis of Energy Intensity and Its Determinants at the State Level

By Gilbert E. Metcalf (Department of Economics, Tufts University and National Bureau of Economic Research)

Abstract

Aggregate energy intensity in the United States has been declining steadily since the mid-1970s and the first oil shock. Energy intensity can be reduced by improving efficiency in the use of energy or by moving away from energy-intensive activities. At the national level, I show that roughly three quarters of the improvements in U.S. energy intensity since 1970 results from efficiency improvements. This should reduce concerns that the United States is off-shoring its carbon emissions.

A state-level analysis shows that rising per capita income and higher energy prices have played an important part in lowering energy intensity. Price and income predominantly influence intensity through changes in energy efficiency rather than through changes in economic activity. In addition, the empirical analysis suggests that little policy intervention will be needed to achieve the Bush Administration goal of an 18 percent reduction in carbon intensity by the end of this decade.

Pages 27-46

Natural Gas Demand in the European Household Sector

by Frank Asche (University of Stavanger, Faculty of Science and Technology), Odd Bjarte Nilsen (University of Stavanger, Faculty of Science and Technology) and Ragnar Tveterås (University of Stavanger, Faculty of Science and Technology)

Abstract

This paper analyzes the residential natural gas demand in 12 European countries using a dynamic demand model, which allows for country-specific short- and long-run elasticity estimates. The own-price and income elasticities tend to be very inelastic in the short run, albeit with much greater responsiveness in the longer run. Our results support very limited technological substitution possibilities between different energy carriers in the short run. Furthermore, the results suggested structural differences of residential natural gas demand across European countries and provide support for employing a heterogeneous estimator such as the shrinkage estimator.

Pages 47-66

The Relationship of Natural Gas to Oil Prices

By Peter R. Hartley (Economics Department, and James A, Baker III Institute for Public Policy, Rice University), Kenneth B Medlock III (James A, Baker III Institute for Public Policy and Economics Department, Rice University) and Jennifer E. Rosthal (James A, Baker III Institute for Public Policy and Economics Department, Rice University)

Abstract

We investigate the relationship between the prices of natural gas and crude oil, and the factors that cause short run departures from the long run equilibrium price relationship. We find evidence that the link between natural gas and crude oil prices is indirect, acting through competition at the margin between natural gas and residual fuel oil. We also find that technology is critical to the long run relationship between fuel prices, and short run departures from long run equilibrium are influenced by product inventories, weather, other seasonal factors and supply shocks such as hurricanes.

Pages 67-90

Carbon Tax or Carbon Permits: The Impact on Generators' Risks

By Richard Green (Institute for Energy Research and Policy, University of Birmingham)

Abstract

Volatile fuel prices affect both the cost and price of electricity in a liberalized market.

Generators with the price-setting technology will face less risk to their profit margins than those with costs that are not correlated with price, even if those costs are not volatile. Emissions permit prices may respond to relative fuel prices, further increasing volatility. This paper simulates the impact of this on generators' profits, comparing an emissions trading scheme and a carbon tax against predictions for the UK in 2020. The carbon tax reduces the volatility faced by nuclear generators, but raises that faced by fossil fuel stations. Optimal portfolios would contain a higher proportion of nuclear plant if a carbon tax was adopted.

Pages 91-104

Demand-Side Management and Energy Efficiency Revisited

by Maximilian Auffhammer (University of California, Berkeley.), Carl Blumstein (University of California Energy Institute.) and Meredith Fowlie (University of Michigan, Department of Economics)

Abstract

The key finding of Loughran and Kulick (2004) is that utilities have been overstating electricity savings and underestimating costs associated with energy efficiency demand-side management (DSM) programs. This claim is based on point estimates of average DSM-related savings and costs implied by an econometric model of residential electricity demand. We first argue that the chosen test statistics bias results in favor of rejecting the null hypothesis that utility-reported savings reflect true values. We also note that utility estimates of average program savings and costs are rejected based on point estimates alone. We use the same data and econometric model to estimate the appropriate test statistics. We then construct nonparametric bootstrap confidence intervals. These intervals are quite large; we fail to reject the average electricity savings
and DSM costs reported by utilities. Our results suggest that the evidence for rejecting utility estimates of DSM savings and costs should be re-interpreted.

Pages 105-130

Randomly Modulated Periodic Signals in Australia's National Electricity Market

By John Foster (School of Economics, University of Queensland, Australia), Melvin J. Hinich (Applied Research Laboratories, University of Texas at Austin, Austin, TX) and Phillip Wild (School of Economics and ACCS, University of Queensland, St Lucia, Australia)

Abstract

In this article, we use half hourly spot electricity prices and load data for the National Electricity Market (NEM) of Australia for the period from December 1998 to August 2007 to test for randomly modulated periodicity. In doing so, we apply signal coherence spectral analysis to the time series of half hourly spot prices and megawatt-hours (MWh) load demand from 7/12/1998 to 31/08/2007 using the FORTRAN 95 program developed by Hinich (2000). We detect relatively steady weekly and daily cycles in load demand but relatively more unstable cycles in prices.

Pages 131-152

Learning-by-Doing and the Optimal Solar Policy in California

By Arthur van Benthem (Stanford University, Department of Economics), Kenneth Gillingham (Stanford University, Department of Management Science and Engineering) and James Sweeney (Stanford University, Department of Management Science and Engineering)

Abstract

Much policy attention has been given to promote fledgling energy technologies that promise to reduce our reliance on fossil fuels. These policies often aim to correct market failures, such as environmental externalities and learning by-doing (LBD). We examine the implications of the assumption that LBD exists, quantifying the market failure due to LBD. We develop a model of technological advancement based on LBD and environmental market failures to examine the economically efficient level of subsidies in California's solar photovoltaic market. Under central-case parameter estimates, including nonappropriable LBD, we find that maximizing net social benefits implies a solar subsidy schedule similar in magnitude to the recently implemented California Solar Initiative. This result holds for a wide range of LBD parameters. However, with no LBD, the subsidies cannot be justified by the environmental externality alone.

Pages 153-176

Technological Modifications in the Nitrogen Oxides Tradable Permit Program

By Joshua Linn (Department of Economics, University of Illinois at Chicago)

Abstract

Tradable permit programs allow firms greater flexibility in reducing emissions than command-and-control regulations and encourage firms to use low cost abatement options, including small-scale modifications to capital equipment. This paper shows that firms have extensively modified capital equipment in the Nitrogen Oxides Budget Trading Program, which covers power plants in the eastern United States. The empirical strategy uses geographic and temporal features of the program to estimate counterfactual emissions, finding that modifications have reduced emission rates by approximately 10-15 percent. The modifications would not have occurred under command-and-control regulation and have reduced regulatory costs.

BOOK REVIEWS

Pages 177-180

Competitive Electricity Markets and Sustainability,

Edited by François Lévêque (Cheltenham and Northampton: Edward Elgar, 2006)
(Book Review by Frank A. Felder)

Pages 180-182

The Politics of the Environment: Ideas, Activism, Policy,

by Neil Carter (Cambridge: Cambridge University Press 2007)
(Book Review by Daniel Kaffine)