The Long-Run Evolution of Energy Prices

by Robert S. Pindyck (Sloan School of Management, Massachusetts Institute of Technology)

Abstract

In this paper I examine the long-run behavior of oil, coal, and natural gas prices, using up to 127 years of data, and address the following questions: What does over a century of data tell us about the stochastic dynamics of price evolution, and how it should be modelled? Can models of reversion to stochastically fluctuating trend lines help us forecast prices over horizons of 20 years or more? And what do the answers to these questions tell us about investment decisions that are dependent on prices and their stochastic evolution?

Economic Development and the Structure of the Demand for Commercial Energy

by Ruth Judson (Board of Governors, U.S. Federal Reserve System), Richard Schmalensee and Thomas Stoker (Sloan School of Management, Massachusetts Institute of Technology)

Abstract

To deepen understanding of the relation between economic development and energy demand, this study estimates the relations between per-capita GDP and per-capita energy consumption in major economic sectors. Panel data covering up to 123 nations are employed, and measurement problems are treated both in dataset construction and in estimation. Time and country fixed effects are assumed, and flexible forms for income effects are employed. There are substantial differences among sectors in the structure of country, time, and income effects. In particular, the household sector's share of aggregate energy consumption tends to fall with income, the share of transportation tends to rise, and the share of industry follows an inverse-U pattern.

Emissions of SO_2, NO_x and CO_2 in Transition Economies: Emission Inventories and Divisia Index Analysis

by Laurent Viguier (Institute d'Économie et de Politique de l'Énergie, Université Pierre Mendès France)

Abstract

This paper analyses SO_2, NO_x and CO_2 emissions in three Eastern countries (Hungary, Poland and Russia) and in three OECD countries (France, the United Kingdom and the United States) for 1971-1994. The energy balances method is used to evaluate the emissions from major economic sectors. The emphasis is on explaining high levels of per capita emissions in transition economies. The analysis of the environment-economic growth relationship shows high emission intensities compared to OECD countries. A Divisia index approach is used to decompose the change in emission intensities into the effects of four components: emission factors, fuel mix, economic structure, and energy intensity. The main contribution to high emission intensities in transition economies is from the persistence of high energy intensities.

Some New Ethanol Technology: Cost Competition and Adoption Effects in the Petroleum Market

by Paul Gallagher (Iowa State University) and Donald Johnson (Grain Processing Corporation, Muscatine, Iowa)

Abstract

This study examines the adoption prospects and market effects for fuels made from agricultural materials. New ethanol processing methods may eventually enable ethanol production from cellulose materials. A cost analysis suggests that corn residue-based production could be competitive with petroleum-based gasoline because land-cost recovery is unnecessary. A supply analysis for U.S. corn residue accounts for potential livestock use and environmental factors. Some simulations are based on a petroleum market model, the residue supply estimate, and adoption of the new ethanol processing technology; results suggest a petroleum price reduction. The benefit-cost analysis for this technology accounts for the oligopoly-offsetting effect of additional supplies and the option value for loss reductions in the event of an embargo. Substantial underestimates of the technology benefit will occur unless the chance of embargo and oligopoly pricing are taken into account.

Exploring Energy Technology Substitution for Reducing Atmospheric Carbon Emissions

by Karl E. Knapp (Department of Engineering-Economic Systems and Operations Research, Stanford University)

Abstract

This paper presents a simple method for incorporating the time required for new technology to penetrate the market and subsequently substitute for an old one when evaluating the ability of new energy technology to impact global climate change. The methodology is applied to the two largest sources of energy-related carbon dioxide: electricity generation and motor vehicles. Carbon-free road transportation is hypothesized to substitute for petroleum-fueled vehicles and carbon-free electric power generation for fossil-fueled electricity based on empirical analogs for substitution dynamics parameters, beginning in the year 2000. The examples imply that near-term significant reductions to 1990 carbon emissions levels via technology substitution are unlikely. The time scale relevant for realizing reductions in carbon emissions is several times the expected lifetime of the products that new technology is intended to replace.

Demand for Ground Transportation Fuel and Pricing Policy in Asian Tigers: A Comparative Study of Korea and Taiwan

by Sara Banaszak (East-West Center Program on Resources), Ujjayant Chakravorty (Emory University and East-West Center Program on Resources), PingSun Leung (University of Hawaii at Manoa)

Abstract

This paper examines the demand for gasoline and diesel in the ground transportation sectors of South Korea and Taiwan, comparing the effects of their different pricing policies and stages of economic growth. To account for substitutability between the two fuels, the model proposed here uses a system of equations estimated simultaneously with time-series data from 1973-1992. Results yield demand elasticities that confirm previous research showing that oil product demand is generally price inelastic, while income elasticities (reflecting a longer period of economic growth than previous studies in the Asian region) are lower than those previously reported. The estimated demand functions are then used

to generate forecasts for both countries and in particular, for an assumed reduction in a 180% tax on gasoline in Korea. Forecasted increases in demand by the year 2010 range from 40 to 180%, while the tax analysis suggests that Korea's pricing policy has reduced total demand and promoted the use of diesel over gasoline.