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Pages 1-31

Fuel Economy Rebound Effect for U.S. Household Vehicles

by David L. Greene (Center for Transportation Analysis, Oak Ridge National Laboratory), James Kahn (Department of Economics, University of Tennessee), and Robert Gibson (Systems Development Institute, University of Tennessee)

Abstract

This paper presents an econometric estimation of the "rebound effect" for household vehicle travel in the United States based on analysis of survey data collected by the Energy Information Administration (EIA) at approximately three-year intervals over a 15-year period. The rebound effect measures the tendency to "take back" potential energy savings from fuel economy improvements as increased travel. Vehicle use models were estimated for one-, two-, three-, four-, and five-vehicle households. The results confirm recent estimates based on national or state-level data: a long-run "take back" of about 20 percent of potential energy savings. Consumer responses to changes in fuel economy or fuel price per gallon appear to be equal and opposite in sign. Recognizing the interdependencies among miles of travel, fuel economy and price is key to obtaining meaningful results.

Pages 32-61

Productivity Trends in India's Energy Intensive Industries

by Joyashree Roy (Department of Economics, Jadavpur University), Jayant Sathaye, Alan Sanstad (Lawrence Berkeley National Laboratory), Puran Mongia (Dehli School of Economics) and Katja Schumacher (Lawrence Berkeley National Laboratory)

Abstract

This paper reports on an analysis of productivity growth and input trends in six energy intensive sectors of the Indian economy, using growth accounting and econometric methods. The econometric work estimates rates and factor price biases of technological change using a translog production model with an explicit relationship defined for technological change. Estimates of own-price responses indicate that

raising energy prices would be an effective carbon abatement policy for India. At the same time, our results suggest that, as with previous findings on the U.S. economy, such policies in India could have negative long-run effects on productivity in these sectors. Inter-input substitution possibilities are relatively weak, so that such policies might have negative short- and medium-term effects on sectoral growth. Our study provides information relevant for the analysis of costs and benefits of carbon abatement policies applied to India and thus contributes to the emerging body of modeling and analysis of global climate policy.

Pages 63-91

Why Has the Energy-Output Ratio Fallen in China?

by Richard F. Garbaccio (Kennedy School of Government, Harvard University; and U.S. Environmental Protection Agency), Mun S. Ho (Kennedy School of Government, Harvard University) and Dale Jorgenson (Department of Economics, Harvard University)

Abstract

In China, between 1978 and 1995, energy use per unit of GDP fell by 55 percent. There has been considerable debate about the major factors responsible for this dramatic decline in the energy-output ratio. In this paper we use the two most recent input-output tables to decompose the reduction in energy use into technical change and various types of structural change, including changes in the quantity and composition of imports and exports. In performing our analysis we are forced to deal with a number of problems with the relevant Chinese data and introduce some simple adjustments to improve the consistency of the input-output tables. Our mail conclusion is that between 1987 and 1992, technical change within sectors accounted for most of the fall in the energy-output ratio. Structural change actually increased the use of energy. An increase in the import of some energy-intensive products also contributed to the decline in energy intensity.

Pages 93-121

Energy Intensity and Carbon Emission Responses to Technological Change: The U.S. Outlook

by Andy S. Kydes (Office of Integrated Analysis and Forecasting, Energy Information Administration, U.S. Department of Energy)

Abstract

Technological progress, energy use, energy intensity, and carbon mitigation are tightly intertwined concepts within the worldwide climate change debate. The state-of-the-art National Energy Modeling System (NEMS) is used to examine, for the United States: (a) the potential role of technological progress on energy supply, consumption, and prices in U.S. energy markets and their impact on carbon emissions; (b) how “success” on one side of the supply or demand equation may reduce the potential benefits of technological progress on the other side; and (c) the sensitivity of energy intensity in the U.S. to technological change and adoption. Some of the key findings of the analysis include: (a) technological progress alone (without significant and effective new policies) is insufficient to achieve reduction of carbon emissions at or near 1990 levels by 2010; (b) successful R&D programs that improve the availability and market acceptance of cost-efficient transportation technologies, coupled with successful oil and gas supply R&D programs, could have a significant impact on reducing U.S. dependence on imported oil; (c) the annual rate of decline of energy intensity (primary energy used per dollar of GDP) between 1996 and 2015 appears to be bounded by 1.25 percent when real energy prices are relatively stable or gradually rising, even when more advanced technologies are made available to the market.

Pages 123-138

Vehicle Choice in an Aging Population: Some Insights from a Stated Preference Survey for California

by Chris Kavalec (Demand Analysis Office, California Energy Commission)

Abstract

This paper investigates the potential effects that an aging "baby boomer" generation will have on gasoline use through their vehicle choice decisions. The study uses stated preference data for both conventional and alternative fuel vehicles, and measures the impact of age of survey respondent on the perceived value of vehicle characteristics such as fuel economy, performance, and body style (e.g., car vs. truck). The results suggest the possibility that average fleet fuel economy may improve in the next few years, if survey preferences translate to actual purchase behavior. No clear implications can be drawn regarding the demand for alternative fuel vehicles.

Pages 139-145

A Note: Will Tomorrow's Energy Efficiency Indices Prove Useful in Economic Studies?"

by Jay Zarnikau (Director of Strategic Pricing and Planning, Planergy, Inc., Austin, Texas)

Abstract

Recent attempts to construct national energy efficiency indices begin with the construction of "Btu aggregates" which are developed by adding together different energy resources based on their heating potential values or the heating values of the primary energy resources used to produce the energy resources which are ultimately consumed. The resulting indices may be of limited use in economic studies, where it is often important to consider the relative economic value of various component resources and their substitutability in response to relative price changes. In such applications, Btu aggregates will tend to suggest greater achievements in energy efficiency during periods of electrification than would an approach which aggregates different energy resources based on their market values.

Pages 147-155

Decomposition of Aggregate CO_2 Emissions in the OECD, 1960-1995

by J. W. Sun (Finland Research Institute for Energy and Environmental Economics, Turku School of Economics)

Abstract

This paper analyzes the change of aggregate CO_2 emissions in the OECD from 1960 to 1995 based on a complete decomposition approach. The study indicates that developed countries have achieved a considerable decrease in their CO_2 emissions mainly due to improved energy efficiency and fuel switching. However, some member countries of the OECD have found it difficult to achieve the environmental targets set at Rio de Janeiro in 1992, and should reconsider their energy policies in light of information given at the UN Climate Change Conference in Kyoto.

Pages 157-171

BOOK REVIEWS

Elements of the Swiss Market for Electricity
by Massimo Filippini (Book review by Patrick Soderholm)

Deregulation of Electric Utilities
edited by Georges Zaccour (Book review by Frank Felder)

The Economic Appraisal of Natural Gas Projects
by Willem J.H. Van Groenendaal (Book review by Graham A. Davis)

Energy and the Making of Modern California