Reducing the Economic Impacts of Oil Supply Interruptions: An International Perspective

by Henry S. Rowen (Graduate School of Business) and John P. Weyant (Energy Modeling Forum, Stanford University, Stanford, Calif.)

Introduction

Several circumstances could lead to deep and extended interruptions of the world's supply of oil during the 1980s. The range of potential interruptions includes those on the scale experienced in 1973-74 and 1979-80 but is not limited to them. Much deeper and longer interruptions may occur or be threatened. Three interruption cases are explored in this article: cuts of 3, 9, and 18 million barrels per day (mbd) in oil exports from the Persian Gulf. The first corresponds approximately to actual experience, as in the recent decline of Iranian exports; the second might be caused by the interruption of the oil supply from Saudi Arabia, or might be the result of an extended conflict involving Iran, Iraq, and Kuwait. Other combinations of disasters producing this shortage are also possible. The largest case, an 18-mbd interruption, of long duration, would almost certainly be associated with Soviet action to deny access to Persian Gulf oil. Although this event is arguably far less likely than the others, recent developments demonstrate the need to plan seriously for this contingency. In this article, some calculations of the worldwide economic costs of the three generic oil supply interruptions set the stage for an assessment of the interruption cost-reducing potential of oil stockpiles and emergency tariffs. The analysis stresses the importance of the linkage of the world's economies through the world oil market and the effects of higher world oil prices on the economic output of each importing nation. An assessment of the potential for international cooperation in oil emergency planning highlights the discussion of the policy options.

Changes in Regional Economic Capacity Due to Projected Energy Price Changes

by D. J. Bjornstad (Regional Economics Group, Economic Analysis Section, Energy Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee)

Introduction
Though it is commonly recognized that changing energy prices will alter economic relationships among regions, there is a paucity of evidence upon which to predict the likely magnitude of these impacts. Much subnational energy-related research has concerned itself with the technical and behavioral parameters that describe quantities of energy demanded and supplied. Findings from these studies generally indicate how firms will reduce quantities of energy demand when faced with energy price increases, but they shed little light on how such increases may affect output levels. In an attempt to clarify the relationship between energy and regional development, William Miernyk has published a series of articles that support the hypothesis that rising energy prices lead to real income transfers between states producing energy products for export and states that import energy products, and ultimately to relative shifts of per capita income growth in favor of producing states. Giarrantani and Socher have provided evidence that in addition to this shift in real income, which leads to corresponding shifts in regional markets for goods and services, rising energy prices are differentially advantageous to the transport of raw materials relative to finished goods, and also that they lead manufacturing enterprise to locate nearer to markets. In sum, it may be argued that several forces are at work to increase the attractiveness of energy-producing regions relative to nonproducing ones.

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The Short-Run Residential Demand for Natural Gas


Introduction

Effective and efficient energy conservation policy requires accurate and comprehensive estimates of residential energy demand parameters. These parameter estimates are among the most important inputs into informed policy decisions. In turn, accurate estimation of energy demand parameters requires realistic modeling of the consumer's demand behavior, detailed information on energy consumption, and careful treatment of any econometric problems created by the model and data base. In this article we seek to confront these requirements in analyzing the short-run residential demand for natural gas, using data from the 1972-73 Consumer Expenditure Survey (CES). We define the short run as the period within which the household's stock of gas-using appliances and demographic profile are fixed and substitution of one energy source for another is impossible. Knowing each household's stock configuration, expenditures on natural gas, and geographic location, we are able to assign to each consumer unit the precise rate schedule it faced at the time of consumption. With the resulting data, we are able to deal explicitly with a number of important issues in residential energy demand, as well as econometric problems created by multipart pricing schemes. The article is organized as follows. In Section II we discuss the treatment of multi-level rate structures in estimating
natural gas parameters. In Section III we present the theoretical framework within which the short-run demand for natural gas is analyzed. In Section IV we discuss the data used in the analysis, and in Section V we present the empirical specification. Parameter estimates are presented in Section VI, and some concluding remarks follow in Section VII.

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Determinants of Energy Use in Institutional Buildings: A Minnesota Example

by Eric Hirst (Energy Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee)

Introduction

Energy use data are usually disaggregated by major end-use sector: residential, commercial, industrial, transportation. Generally speaking, data are weakest for the commercial sector, perhaps because this sector is often defined as a residual (i.e., that portion of the economy not included in the other sectors). However, energy use in commercial buildings accounts for about 15 percent of total U.S. energy use and is growing more rapidly than energy use in other sectors. For example, commercial energy use amounted to almost 10 QBlu (10 EJ) in 1979; the average growth rate in commercial sector energy use was 1 percent per year between 1973 and 1979, compared with a growth rate of 0.3 percent per year for total U.S. energy use. Recent federal and state conservation programs, however, are beginning to provide detailed disaggregate data for portions of the commercial sector. The most important of these is the Institutional Conservation Program, created by Title III of the November 1978 National Energy Conservation Policy Act. The act authorized almost $1 billion of federal funds to be matched 50:50 with local funds for four activities: 1. Preliminary energy audits (collection of basic information on buildings and their energy use). 2. Energy audits (on-site walk-through [mini-] audits to identify energy-saving operation and maintenance changes). 3. Technical assistance (detailed engineering [maxi-] audits to identify energy conservation retrofit items). 4. Energy conservation measures (implementation of recommendations from the technical assistance phase). Information from the Preliminary Energy Audit (PEA) on the characteristics of buildings and their energy consumption is used in making decisions about later program steps, that is, the conduct of a mini-audit, a maxi-audit, or both. Therefore, it is important that information collected in this initial phase be accurate, timely, and properly analyzed. This article summarizes and analyzes PEA data collected from 1860 public buildings in Minnesota.

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Will President Reagan's Energy Policy Lead Households to Conserve?

by Eric S. Brown (Wisconsin Power & Light Company, P.O. Box 192, Madison, Wisconsin)
When energy was cheap and easily available, consumers paid little attention to their energy use and bills, so after the supply disruptions of the 1970s, they were poorly equipped to deal with the changes they faced in energy prices and availability. During the 1970s, the federal government undertook various programs of education and assistance, including dissemination of printed information, establishment of energy standards for federally financed homes, and tax credits for use of alternative energy sources. In recent months, the federal government's role in energy has been changing dramatically, with the Reagan administration's increasing reliance on market forces to solve energy problems. This reduced government role may leave unsolved certain problems in household energy management, and the government may be overlooking certain beneficial roles it could play that are compatible with reliance on market forces. The new policy of the Reagan administration has two principal tenets: (a) that market forces can be relied on to promote appropriate energy use behavior (i.e., that rising energy prices will stimulate conservation); and (b) that government efforts to ameliorate the energy crisis should focus on stimulating the production of conventional fossil fuels and on expanding nuclear power. This administration has already taken specific actions designed to: (a) cut or curb most federal programs aimed at conserving energy (New York Times, March 27, 1981); (b) discard proposals for mandatory energy efficiency standards on most home appliances (New York Times, February 19, 1981); (c) eliminate rules requiring utilities to offer energy conservation audits on homes (Business Week, April 27, 1981); and (d) eliminate programs, except for federal tax credits, that stimulate the use of alternative energy sources (New York Times, March 27, 1981).

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What Role Can Utilities Play in Energy Conservation Programs?

by Irwin M. Stelzer (National Economic Research Associates, 5 World Trade Center, New York, New York)

Consideration of market imperfections leads to a number of general policy conclusions. First, we should try to ameliorate the relevant market imperfections directly, to the extent that this is technically and politically possible. Second, where market imperfections cannot be dealt with directly, we should search for countervailing public policies that try to compensate for the distortions created by the market imperfections: we should try to cure one distortion by imposing another that provides countervailing incentives. There is no reason to believe that electric utilities are in a particularly favorable position for doing either of these things. While there may be some things that electric utilities can do to improve the situation, in most cases there are superior policy instruments, usually available only to government, that are likely to be much more effective. There are a number of facts that should be noted here that bear on this conclusion and the more detailed discussion below. First, we are concerned with energy utilization and conservation, not just electricity utilization. Second, less than 10 percent of end-use energy consumption (households and industry) is accounted for by electricity, the rest being accounted for primarily by petroleum and natural gas.
OPEC and the Rest of the World Trade Equilibrium - A Clarifying Note

by Gideon Fishelson (Foerder Institute for Economic Research, Faculty of Social Sciences, Tel Aviv University, Ramat Aviv, Israel)

Despite internal disagreements and conflicts of interest within OPEC, most economists would agree that in the next decade OPEC will maintain its monopoly power in the crude oil markets. To simplify the analysis, let us assume that OPEC is the only crude oil producer. Hence, OPEC can either set the price of oil or the quantity to be exported to the rest of the world. OPEC itself is assumed not to consume any of its oil (or that its internal oil consumption does not affect its export of oil nor the consumption capabilities of other commodities). These other commodities are imported from the rest of the world. OPEC is assumed to maintain a balanced balance of payments. Thus, all the proceeds of the oil are spent on importing commodities. The rest of the world does not produce oil. The domestic variable factor of production is labor (in the shortrun, capital and land are fixed). The payment to the labor input is the residual of the total product after paying for the imported oil. In the following sections, we examine the world equilibrium and its sensitivity to OPEC's pricing policies for the case of unitary elasticity of substitution between oil and labor in production. Dynamics is introduced by allowing for population growth, neutral technological progress, and a continuous increase of the (real) price of oil. Since the analysis is very specific (Cobb-Douglas), the results once obtained appear obvious; yet they provide implications for more elaborate cases, e.g., when investment is an independent decision variable, or there are energy substitutes for crude oil. These cases are not dealt with in this study.

Economic Implications of Mandated Efficiency Standards for Household Appliances: An Extension

by Michael Einhorn (Bell Laboratories, Holmdel, New Jersey 07783)

In a recent article in The Energy Journal, Dr. J. Daniel Khazzoom (1980) illustrated how forecasts of energy demand that incorporate appliance or machine efficiency improvements can be downward biased if the demand for effective work (equal to the efficiency rating times energy purchased) is assumed to be completely price-inelastic. Improvements in efficiency lower the price of effective work (which is equal to the price of energy divided by the appliance efficiency rating) and will therefore induce users to utilize the appliance more and increase the demand for effective work. The increased demand for effective work will partially offset, and may actually reverse, the apparent reduction in energy usage to be effected by the efficiency improvement. The magnitude of the effect that efficiency improvements may have on the demand for effective work, and hence on
energy consumption, depends on the own-price elasticity of effective work. This note will extend Dr. Khazzoom's discussion to consider the effect of higher energy prices on the optimal efficiency ratings of the appliances and machines that the user owns. It is often asserted that higher energy prices will induce energy users to purchase more efficient appliances and machines.

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Comment on "Economic Implications of Mandated Efficiency Standards for Household Appliances"

by Stanley M. Besen (The Rand Corporation, 2100 M Street, N. W. Washington, D.C.) and Leland L. Johnson (The Rand Corporation, 1700 Main Street, Santa Monica, Calif.)

In an earlier issue of The Energy Journal, J. Daniel Khazzoom (1980) argues that the reduction in energy consumption resulting from imposition of mandatory energy efficiency standards on household durable goods, such as appliances and automobiles, will be overestimated if increased utilization rates resulting from reduced operating costs are not taken into account. He proceeds to argue that the upward pressure on the demand for energy caused by higher utilization "Will partly offset, and may more than offset, the energy saving that results from improved appliance efficiency. Khazzoom is correct in concluding that energy savings will be overestimated if the feedback of higher efficiency standards on utilization is ignored. But his analysis, leading to the conclusion that imposing efficiency standards may generate increased energy use, is not. The error lies in Khazzoom's failure to distinguish between the effects on energy consumption arising from (a) voluntary actions by consumers in response to higher energy prices or to erogenous technological change, and (b) consumer behavior reflecting the enforcement of mandated energy efficiency standards. This failure arises, in turn, from Khazzoom's assumption that the costs of owning and operating more energy-efficient durable goods may be less than those of less energy-efficient ones. In contrast, we maintain that the reduction in the range of choice to consumers caused by imposition of standards necessarily results in higher overall cost (frequently due to higher capital cost) to consumers. This increase in cost must reduce the energy consumption of those goods on which standards are imposed.

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Response to Besen and Johnson's Comment on "Economic implications of Mandated Efficiency Standards for Household Appliances"

by J. Daniel Khazzoom (Department of Economics, University of California, Berkeley, Calif.) and Sanford Miller (California Public Utilities Commission, San Francisco, Calif.)

It is hard to undertake as structured an analysis of Besen and Johnson's Comment as we would like. Parts of their Comment are not coherent (for example, the relationship between Figures 1 and 2; the circular reasoning behind Figure 1; the discussion of the switch to less
efficient appliances; the confusion between the impact of efficiency on appliance utilization as opposed to appliance ownership; the confusion of mandated standards with usage constraint; and the mixup of econometric evidence with illustrative data, etc.). But the problem one has the greatest difficulty with is the tautological nature of the results in the Comment. The authors define the problem in such a way that certain results follow, and then proceed to derive those results formally. In light of the above, we will here respond mainly to the general thrust of the Comment, rather than attempting to respond point by point.

Pages 125-128

Risk Analysis of Alternative Energy Sources


In the January 1981 issue of The Energy Journal, Miller Spangler ably surveys the conundrums encountered by risk analysts examining alternative energy sources. This note addresses two of the issues raised in that paper: public perception of the relative risks associated with nuclear versus conventional power generation, and criteria for evaluating the methodologies of risk analyses themselves.

Pages 129-134

Reply to "Risk Analysis of Alternative Energy Sources"

by Miller B. Spangler (Special Assistant for Policy Analysis, Division of Safety Technology, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, D.C.)

Daniel Kazmer's comment on my article "Risks and Psychic Costs of Alternative Energy Sources for Generating Electricity" discussed two key subjects treated in my article: (1) public perception of the relative risks associated with nuclear versus conventional power generation, and (2) criteria for evaluating the methodologies of risk analyses themselves. Regarding the former, he seeks to translate into language comprehensible to the experts the general public's inarticulate views on such issues as expansion of nuclear power. The focal concepts in this effort are expressed in two sets of graphs in which he postulates comparative functional relationships for accidents involving nuclear and conventional electricity-generating plants. The first set of relationships depicts risk of death or serious injury versus the number of people (plant personnel and public) affected, and the second, direct and indirect loss versus direct destruction. There are, of course, serious gaps between the perceptions of the public and technical experts concerning technological risks, and between their ways of making risk acceptance or rejection decisions.