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Pages 1-28

Energy Prices, Capital Formation, and Potential GNP

by David F. Burgess (Department of Economics, University of Western Ontario, London, Ontario, Canada)

Introduction

A common theme of the rapidly developing literature on energy-economy interaction is that higher energy prices - initiated by external events such as OPEC - will permanently reduce the growth potential of net energy-importing economies even if full-employment conditions are maintained. According to this literature, in the absence of government measures to encourage saving and investment any initial adverse effect on the economy's real income at full employment (hereafter referred to as potential GNP) resulting from the need to pay a higher real price for imported energy will be compounded by secondary effects that reduce the rate of capital formation. This secondary or reverse feedback effect through capital may be the largest component of the overall impact on potential GNP.

Pages 29-33

The Price of Oil and Conflict in OPEC

Ali M. Reza (Gulf Oil Corporation, Pittsburg, PA, USA)

Introduction

The price-setting behavior of the oil-exporting nations is influenced by the various elasticities of demand for and supply of oil, and the long-run optimal price trajectory is also influenced by the rate of interest and reserves (see, for example, Pindyck, 1978, and Reza, 1981). Since it is generally agreed that the long-term price elasticity exceeds the short term elasticity (in absolute value), measuring the latter can give a clearer picture of the former. The short-term price elasticity of demand for OPEC oil is also of interest because short-term financial constraints have apparently led at least some members of OPEC to weigh the short-run outcome of their pricing decisions more heavily. The issue addressed here is the magnitude of the short-run price elasticity of the demand for oil supplied by the OPEC core (Saudi Arabia, Kuwait, the United Arab Emirates, and Qatar) and of OPEC as a group.

Pages 35-52

An Energy Demand and Generalized Fuel Choice Model for the Primary Metals Industry

LuAnn McClerman Duffus (Department of Economics, University of Illinois) and Wen S. Chern (Department of Textiles and Consumer Economics, University of Maryland, USA)

Introduction

The primary metals industry is defined by the Bureau of the Census as the Standard Industrial Classification (SIC) 33. In terms of both absolute amount of energy use and energy intensiveness, SIC-33 is large relative to other industries. This paper estimates essential energy demand relationships for this important sector. Although there are basically four energy sources used in the primary metals industry (fuel oil, natural gas, coal, and electricity), the response to changes in own price and cross price is dampened as a consequence of technology, plant vintage, and historical growth in the industry. Forecasts of future energy demand hinge on these price elasticities and on assumptions about future energy prices.

Pages 53-70

Summer Time and Electricity Conservation: The Israeli Case

by Haim Shore (Tel Aviv, Israel)

Summer Time (ST) refers to the practice of advancing the clock during the summer (commonly by one hour) in order to adjust it to changes of sunrise and sunset times at that period. Conventionally, ST is expected to accomplish three objectives: To reduce electricity consumption during dark evening hours. To reduce use of air conditioning systems during the morning. This effect, the result of an additional cool hour, is partially offset by an increased consumption of electricity for lighting during very early morning hours. To increase productivity (particularly in the industrial sectors that are not air-conditioned) following an additional cool hour in the morning. While ST has been adopted in the United States, the Soviet Union (since 1981), and most Western European countries, it has become the focus of public controversy in Israel. This debate has political undertones, for political religious parties claim ST is a hardship for early morning prayers. Preliminary studies were made by the Israel Electric Corporation to establish, by means of statistical analysis, some reliable estimates of the electricity conservation that may be attributable to ST. No statistically significant daily conservation was found, however. This paper attempts to explain this unexpected finding.

Pages 71-91

Deregulating the Generation of Electricity Through the Creation of Spot Markets for Bulk Power

by Roger E. Bohn (Graduate School of Business Administration, Harvard University), Bennett W. Golub (Sloan School of Management, MIT), Richard D. Tabors, and Fred C. Schweppe (Laboratory or Electromagnetic and Electronic Systems, MIT, Cambridge, MA, USA)

Introduction

Many observers are dissatisfied with the current condition of privately owned electric utilities in the United States. Numerous proposals have been made for change, including suggestions to deregulate all or part of the industry. Those who favor deregulation argue that electric power systems, and especially electric generation, may no longer be natural monopolies. Furthermore, under the present regulatory regime, many utilities are refraining from investing, which is not in the best interests of their customers. Others, however, worry that quality and reliability of service would decline under deregulation. They point to the high fixed costs of present generating technologies, and argue that the industry might undergo wide profit swings during cycles of over- and under-capacity. One common argument maintains that large, new power plants would not be built under deregulation. Finally, the opposition argues that a deregulated system could not effectively coordinate the myriad decisions necessitated by multiple generating plants.

Pages 93-108

Fair Value Versus Original Cost Rate Base Valuation During Inflation

by Walter J. Primeaux, Jr. (University of Illinois at Urbana-Champaign), Edward L. Bubnys (Illinois State University), and Robert H. Rasche Michigan State University, USA)

Introduction

Valuation of public utility property for rate-making purposes has been controversial since the beginning of public regulation. Despite much academic research and practical experience, there is no consensus of academicians or practitioners concerning the appropriate value of physical property used for providing service to customers. In public utility rate malting, the value of this physical property, net of depreciation, is called the rate base. An important question is how well regulatory processes adjust the rate base for price level changes during periods of inflation. Statutes of the individual states determine how public utility property will be valued for rate-making purposes. Three basic methods are employed. Original cost jurisdictions set the rate base at the value of the property when it was first installed in a public utility application; the fair value method attempts to adjust the base to a level that more correctly reflects its current value; and the reproduction cost approach tries to establish a value that would permit reproduction of the property.

Because the reproduction cost approach is not now being used by any state, this study focuses on the original cost and fair value methods.

Pages 109-118

Capital-Energy Substitution in the Long Run

Joel Gibbons (American National Bank, Chicago, IL, USA)

Introduction

Econometric modeling of production relationships, especially those of manufacturing industries, entered a period of intense activity with the dramatic energy price shocks of the past ten years. This work has called attention to possibilities for substitution between energy and other factors, but it has not yet led to consensus on all the important issues. One open issue has to do with the relative substitutability of fixed capital for energy, compared with the substitutability of other factors for energy. One set of studies, generally those based on international cross-section data, finds capital and energy to be Hicksian substitutes. Other studies, based on time series data, find them to be Hicksian complements. The disagreement between these estimates of substitution parameters is not simply a technical issue. The different estimates have qualitatively different implications for the future, if energy costs remain at their present levels or continue to rise. The interdependence among factors of production means that a prolonged trend of increasing cost of one factor has an impact on the earnings of all factors, as well as on the structure of production. If energy prices continue to rise in real terms, the relative substitutability of capital for energy becomes a very significant quantity.

Pages 119-131

Residential Electricity Demand Modeling in the Australian Capital Territory: Preliminary Results

by W. A. Donnelly (Centre for Resource and Environmental Studies, Australian National University, Canberra, Australia)

Introduction

The demand for electricity has recently become a topic of major interest in Australia, where very little empirical analysis has been done (see Hawkins, 1975; Saddler et al., 1980; Department of National Development and Energy, 1981; Brian and Schuyers, 1981; and Donnelly and Saddler, 1982). Two of the policy issues being raised concern the appropriate pricing strategies that should be adopted by supplying authorities and the need for additional generating capacity. An understanding of the relative importance of the factors influencing electricity demand is required to aid public policy making, particularly since substantial investment is now being considered. Since the pattern of electricity

demand and its response to changing conditions varies among the sectors of the economy-residential, commercial, industrial, and government-these sectors can be most effectively analyzed separately. The Australian Capital Territory (ACT), with only minimal industrial demand, has the highest proportion of residential consumers of all the Australian capital cities (approximately 54 percent of sales).

Pages 133-137

Cogeneration in the People's Republic of China

by Qu Yu (Power Engineering Division, Xian Jiaotung University, China)

Cogeneration refers to the combined generation of heat and electric power. A common application is district heating. Cogeneration's advantage stems from savings in investment and operating expenditures, and frequently also from greater reliability. It is geographically more restricted than large electricity networks since heat losses limit its distance from the generating station. Its optimal applications are therefore in load-intensive regions. For the entire electric grid to be considered, the increase in energy consumption due to condensing operation of the cogeneration turbo-set equals the decrease in consumption due to its cogeneration operation. As the appendix to this paper demonstrates, this relationship can be used as a basis for determining whether a proposed steam extraction unit for cogeneration is economical. Total capacity of steam extraction turbo units for cogeneration in the People's Republic of China (including units above 6 mW) was 4600 mW in 1980. This represented 11 percent of all steam turbo units. A reasonable current estimate is 5000 mW. The heat supply from central station power plants (>6 mW) for cogeneration in 1980 was 73,480 teracalories, about 11 percent of total national heating demand. Some 85 percent of this was for process heat and the balance for space heat. In Beijing, some 7 percent of space heat for building blocks is supplied by central cogeneration plants.

Pages 139-149

Are Federal Energy Tax Credits Effective? A Western United States Survey

by Edwin H. Carpenter (Department of Agricultural Economics, University of Arizona) and S. Theodore Chester, Jr. (Statistical Support Group, College of Agriculture, University of Arizona, Tucson, AZ, USA)

The residential energy credit provided by the federal Energy Tax Act (1977) cannot be carried beyond December 31, 1987, and the Reagan administration has indicated a disinclination to support an extension of its provisions, in either its current or an altered form. Its likely demise indicates nothing about the Act's effectiveness in getting homeowners to invest in energy conservation or solar devices. Rather, it is a reflection of the Reagan philosophy of letting market conditions determine energy conservation decisions. Since the administration is not explicitly passing judgment on the success or

failure of residential tax credits, important questions regarding their efficacy remain to be answered. This paper will attempt to shed light on this question. It will examine data derived from a random sample of Western United States homeowners to determine awareness and use of the federal energy tax credit; the role of climate and dwelling type; and the influence of selected socioeconomic factors on the use of energy tax credits. Most important, it will seek to determine the extent to which conservation decisions were contingent on the availability of the tax credits, i.e., what proportion of investments were made wholly or predominantly because of their special tax inducements and what proportion would have been made in any case.

Pages 151-154

Residential Electricity Demand: A Suggested Appliance Stock Equation

by Christopher Garbacz (Department of Economics, University of Missouri-Rolla, MO, USA)

A large amount of work in residential electricity demand has relied on logit estimation of a disaggregated appliance stock. (See the seminal work by McFadden et al., 1977.) While this approach may be suitable for certain types of models with certain goals in mind, a simple formulation of an appliance stock equation may sometimes be appropriate. For example, if the goal is to estimate seasonal patterns in elasticities employing a national micro-data set (as in the National Interim Energy Consumption Survey 1978-1979; see U.S. Department of Energy, 1980), then it may be appropriate to develop an appliance stock equation to predict the size of an appliance stock index (approximating a continuous variable). The present appliance stock equation is part of a three-equation model that is estimated in log-linear form via 2SLS.