Book Reviews

Mohan Munasinghe, *Energy Analysis and Policy: Selected Works* (London: Butterworths, 1990), xx + 315 pages. No index.

This book is a collection of 14 previously published (or, at least, previously circulated) papers by one of the most prolific writers in energy economics today. (A second volume of papers by Professor Munasinghe, entitled *Electric Power Economics*, was released at the same time, but is not reviewed here.) Efforts have been made to link the different papers/chapters through the use of parenthetical references and a few introductory sentences. *Energy Analysis and Policy* testifies to the author's abiding interest in and deep understanding of energy-related issues in oil-importing developing countries: all of the papers are aimed at providing a sounder base for energy decision-making in the Third World.

At the core of these papers is one basic integrative idea: if one wishes to look at real-world issues, then one must take into account the fact that the real world is much messier than the smooth, twice-differentiable world of economic theory. In other words, we don't live in a first-best world, and there is no use pretending that we do. This has two consequences of importance two us. First, markets and market forces are important, but they won't do everything for you, which creates a "role" for governments. The approach to energy policy-making proposed by Professor Munasinghe is an adaptation of the planning approach to economic development. The government is seen as a key player in determining objectives, setting the rules, and subsidising or taxing as necessary.

A second consequence of the abandonment of the first-best assumption is that piecemeal policy advice becomes a rather tricky business. There are very few clear-cut results that can be useful in guiding policy. To counter this, Professor Munasinghe proposes an integrated macro/micro-economic approach to assist in the development and the evaluation of government policy. The energy sector is represented as an integral part of the economy, so that a complete analysis of the effects of any policy initiative in that sector must include a thorough accounting of its effects in other sectors of the economy.

The exclusive focus on oil-importing developing countries gives the book a theme, but this comes at a cost. For example, in chapter 3 ("Energy Pricing: An Integrated Framework") and elsewhere in the book, the author argues that departures from marginal cost pricing are likely to be desirable (especially for electricity and natural gas, because of the near impossibility of arbitrage by consumers in these markets) in order to allow the government to achieve broader objectives (*e.g.*, an improved income distribution). A number

of developed countries have experimented with that type of policy in the past, and the results have been somewhat less than wonderful. In Canada, for example, extended periods of price controls and below-marginal-cost pricing for all major energy types have resulted in that country being one of the most energy-intensive industrial nation with one of the worst energy-conservation record. The basic problem with arguing in favour of relying on prices to attain broader economic goals is that they are not likely to be an efficient (or effective) policy instrument in this context. This is true both because of the inherent signalling problems created by departures from marginal cost pricing (*e.g.*, loss of incentives to minimise costs, creation of perceived "property rights" in the controlled or subsidized prices) and the fact that there are likely to be much more effective policy instruments available to realize these broader goals. I would have been quite interested in finding out why the author feels that this costly lesson learned by developed countries is of less importance for developing countries.

The book is at its best in places like chapter 12 ("Bioenergy Management Policy"), where an important problem (the link between fuelwood consumption and deforestation) is examined, and a concrete policy proposal (the introduction of more fuel efficient cookstoves) is put forth. The analysis is well motivated and masterfully executed, so that when the conclusion that a program to encourage the widespread use of the more efficient technology is reached, the reader understands why the recommendation is made.

I found chapter 7 ("National Energy Policy Implementation: Energy Conservation in Sri Lanka") to be the least interesting. It conveys little information, other than the magnitude of the savings expected to be realized as a result of the adoption by Sri Lanka of a comprehensive energy policy package designed in large part by the author. Since these measures were in fact adopted during the 1982-86 period, the paper could have been made more interesting if an appendix had sought to verify whether the forecast savings of hundreds of millions of rupees were, in fact, realized.

As is frequently the case in collections of previously published material, some of the information is out of date. The most recent data in the body of chapter 13 ("Rural-Industrial Energy and Fossil Fuel Issues: The Case of Thailand") are for 1979. An "epilogue" at the end of the chapter updates some of the information...to 1981. How important are these issues almost a decade later? On a similar note, there are a few inconsistencies across chapters. In chapter 3 (pages 35-36), for example, the author explains how important it is to model the two-way linkages that exist between energy and the rest of the economy. In the application of this approach (chapter 4, "Practical Application of Integrated National Energy Planning (INEP) Using Microcomputers"), the author assumes that the growth rate of GDP is exogenous in all cases examined (page 81). The book is also, at times,

repetitive. For example, the expression: "Physical controls are more effective in the short-run when there are unforeseen shortages of energy. All methods of physically limiting consumption..." can be found on pages 21, 32 and 100; a slight variation of it can also be found on page 4.

One of the strongest attributes of this book is that it is clearly written, in language that will be accessible to the non-specialist. Those interested in getting a better understanding of energy policy issues in oil-importing developing countries will most likely find this book quite useful. Those seeking a general treatment of the role of public policy in the energy sector, however, will not likely find what they are looking for in this book. In particular, the consequences of uncertainty are virtually ignored, as are the linkages between energy and the environment.

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Robert Bacon, M. Chadwich, J. Dargay, D. Long and R. Mabro, *Demand, Prices and the Refining Industry: A Case-Study of the European Oil Products Market* (Oxford: Oxford University Press, 1990), 253 pages.

This study is a collection of essays examining the restructuring of the European petroleum refining industry. The authors have put together a well written, interesting, and informative study that should capture the interest of many analysts. In appealing to both generalists and specialists, however, the analytical rigor of this book is diluted. This problem should not be viewed in terms of mathematical formalism, which is nicely kept to a bare minimum, but in terms of model specification. The economic foundations for the empirical models are not adequately explored. The absence of a bibliography is perhaps the most visible indicator of this problem.

The introductory chapter is a long executive summary that discusses some of the basic features of refined product markets, such as short-run rigidities and the highly diverse yet competitive pricing system. In the following chapters, the various contributors analyze demand, industry structure, pricing, relative product prices and taxation.

A good overview of oil's role in total energy consumption is presented. Citing the difficulties in using dynamic production models, the author uses single equation partial adjustment demand models disaggregated by sector and by country. Model specifications that permit inter-fuel

substitution were found to be unsatisfactory -- perhaps, as the author notes, due to the single equation approach and to the omission of relevant factors, such as accessibility to natural gas. Multi-equation substitution models with partial adjustment mechanisms, however, could have been used.[1]

The structural analysis of the refining industry uses detailed data on refinery location, technical characteristics and ownership. The absence of any paradigm, however, leaves the reader with many facts but not the story of how they all fit together. The main message is that lower demand for refined products and lower residual fuel consumption forced capacity reductions and redesign.

Discrete choice models then are used to predict refinery closures on the basis of regional characteristics, transportation access and refinery types. The author finds that a refiner's chances for survival improve with better configurations, more specialized products and better market access. Presumably these characteristics are correlated with marginal cost. The oligopolistic "stand-off" that was identified in the introduction as a barrier to exit, however, was not modeled. Even without empirical support, the theoretical basis for this hypothesis is not discussed.

Relationships between refinery yield, capacity, and output for the industry are examined next. Production possibility curves for various refinery configurations are developed. These curves, however, are plotted with gross product worth against crude through-put and, hence, are not really production possibility frontiers. In fact, a two dimensional depiction of petroleum production possibilities may be misleading given the multi-product nature of refining.[2]

The kink between product and crude prices is examined with a distributed lag model of gross product worth (GPW). The results indicate that product prices closely track crude costs both on the way up and down. Inventory and demand ratios are used in the following chapter to explain the corresponding relative product prices. Under a more general multiproduct formulation, product prices would depend upon input prices, as well as stocks and demand, for all products, not just a select few.

Since taxes drive a large wedge between refiner and consumer prices, the last chapter focuses on the role of taxation. The author models the response of fuel taxes as a function of the previous year's price and finds a

1. See J. P. Chavas and K. Segerson (1986), "Singularity and Autoregressive Disturbances in Logit Models," *Journal of Business and Economic Statistics* 4: 161-169 and T. J. Considine (1989), "Estimating the Demand for Energy and Natural Resource Inputs: Trade-Offs in Global Properties," *Applied Economics 21: 931-945.*

2. See J. M. Griffin (1977), "The Econometrics of Joint Production," *The Review of Economics and Statistics* 59: 389-397.

positive relationship using data up to 1985, but notes a possible asymmetry starting in 1986.

Despite problems with the empirical models, this study substantially improves our understanding of the refining industry in Europe. The book also demonstrates the need to improve our theoretical and empirical understanding of short-run markets for the world's most important commodity.

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Douglas R. Bohi, *Energy Price Shocks and Macroeconomic Performance* (Washington: Resources for the Future, 1989), 94 pages.

Bohi's study is a major contribution which helps to close the distressing gap in the literature on oil shocks. Energy economists have previously proceeded to make macroeconomic proposals without paying much attention to writings on macroeconomics. The macroeconomists have similarly not been adequately informed about oil problems. Bohi has closed this gap. He honestly recognizes that the evidence is inconclusive. However, he feels that given the lack of strong theoretical or practical bases, stronger evidence is needed to justify imposition of expensive programs.

Bohi was once a proponent of the macroeconomic instability justification for intervention in the oil market. He claims here that his effort to substantiate the argument convinced him that the evidence is too weak to support his prior beliefs. Therefore, he now believes import taxes should be imposed only on optimal tariff grounds. Moreover, the absence of macroeconomic effects "dilutes (if not eliminates) the economic justification for government investment in petroleum reserves" (p. 86).

The bulk of the study is devoted to reviewing and extending the analysis of macroeconomic behaviour during the oil shocks of 1973-4 and 1979-80. Comparisons are made among the U.S.A., U.K., Japan and West Germany. Chapter 2 provides basic data. Behaviour of gross national product and other major economic indicators in each country over different time periods is presented and discussed. Then the behaviour, during the two oil shocks, of output, employment and investment in different sectors of manufacturing is considered. While the behaviour of the broader aggregates shows a strong association with energy price shocks, the diverse pattern of

response of different industries in different countries makes him suspicious of a simple causal relationship.

His next chapter presents and employs a simple model of the impact of energy prices on the economy. He concludes the energy price changes were too small to directly produce the observed changes in overall economic activity. He then examines the relationship between energy intensity among manufacturing industries and the change in output and employment during the oil shocks. The correlations proved insignificant and often the opposite of what was expected.

He moves on, in chapter 4, to present a framework for analyzing the effects of energy price changes on productivity, and then reviews prior estimates of the actual impacts. Again, no clear effects emerge. He then turns to the concern, long prevalent among macroeconomists, that wage rigidity aggravates the impacts of shocks to the economy. Again, he concludes the actual pattern cannot be explained by energy prices. The worst impacts do not occur where wages are most rigid. Similarly , capital obsolescence or changing demand structure does not produce a major impact.

Having exhausted the unconventional explanations, he turns to the traditional one of observing monetary policy. He finds that the behaviour of their economies is consistent with traditional predictions about monetary policy. The one case in which a recession was avoided (Japan in 1979-80) was the one in which monetary policy was least restrictive.

Bohi has packed much material into a short space. Those with opposite views can fault him for not providing a more extensive analysis. His position seems to be that the type of intervention advocated can only be justified by clear, sweeping evidence. We are back to a long-standing implicit argument about what is the critical concern in economic debates. While some might argue that the danger of market failures deserves priority, Bohi has enlisted on the side of those who believe dirigisme should not be adopted without convincing evidence.

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R.F. Hirsch, *Technology and Transformation in the American Electric Utility Industry* (Cambridge University Press, 1989), 273 pages.

Hirsch, a historian, presents a fascinating tale of the initial regulation of, and developments in, the electric utility industry up to about 1975. He argues that so long as the industry exhibited declining real costs of service, a honeymoon continued among the producer, consumers and regulators. But this changed after 1965. The companies changed leadership from engineers to lawyers and financial experts. Consumers rebelled against raising costs, and regulators found the job to be increasingly adversarial. All this makes excellent reading until you look closely at the snake in the garden according to Hirsch. That snake he calls "Technological Stasis." He defines "Technological Stasis" in the following manner. "Stasis is the cessation of technological advances in an industrial process technology. Incremental improvements no longer are made, and technology appears to have reached its limits" (page 2).

This proposition is the problem with this book. Stasis is measured by one factor in the technology of delivering electrical power to consumers. Thermal-efficiency, the heat rate, is the only factor examined by Hirsch. There are only three time-series graphs showing data. They are: 1) maximum steam pressures, and temperature of turbines, 2) capacity and numbers of turbine generators ordered, and 3) largest fossil-fuelled steam electric turbine generators in use. These are all the data offered in his argument.

Many other factors impinge upon the cost of delivered power. Efficiency in power distribution, in management, and in boiler design are but a few obvious ones. The regulatory costs themselves are also ignored.

In short, a utility analyst will find the story fascinating, but the plot flawed. I cannot recommend Hirsch to a serious scholar.

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Thomas H. Lee, Ben C. Ball, Jr. and Richard D. Tabors, *Energy Aftermath* (Boston: Harvard Business School Press, 1990), 274 pages.

This is a useful book. The authors offer many insights into U.S. energy policy, both public and private. They speak from many years of experience in top management in corporations such as Gulf Oil and General

Electric, from their association with research organizations such as IIASA and EPRI, and from current positions as faculty at MIT. The discussion is directed at nonspecialists. Those who are well acquainted with the field of energy policy will find much of the material is familiar. It should, however, prove especially useful to engineers, some energy managers, and government officials starting from a modest knowledge base. Its many examples should make it desirable as a supplementary text.

Though highly critical of past and current U.S. energy policies, the books is reasonably well-balanced. The authors seem to have no special axe to grind. They do have a few pet projects, e.g., very high regard for gas turbine technology, especially in combined-cycle applications, and a few pet peeves, e.g., a strong scepticism about energy forecasts and large-sized power generating units. Still, they support their positions on these and other topics very well, though perhaps not vigorously enough.

The books helps dispel myths, though again its insights are likely to appear more fresh to the general reader than the serious analyst. The authors rightfully point out, for example, that energy independence for its own sake is not a worthwhile goal. We are not rapidly running out of energy resources (even in the case of fossil fuels), and energy substitution has not been driven by resource depletion but by technology.

The authors offer very good articulation of a new energy paradigm. They suggest that we have entered a "New Energy Era" and must change the predominant value system currently being applied to energy policy. They champion an emphasis on Integrated Energy Systems, which they suggest will be much more consistent and efficient in addressing this important facet of our lives. Unlike many of the energy experts of the past, the authors are very sensitive to conservation and environmental concerns.

The book is divided into eight chapters. The first presents an overview of the energy context in the U.S. and the world. Chapter 2 is an excellent, although brief, assessment of changes in the energy situation and mistakes in energy policy from 1945 to 1989. The authors' analysis is based on solid economic principles, combined with engineering and management considerations.

Chapters 3 and 4 summarize government and corporate blunders, respectively. The authors use as prime examples the way the government handled the synthetic fuels program and dealt with nuclear power. At the corporate level, the authors cite their own research uncovering mistaken assessments of important design and operating features, such as economies of scale and capacity factors, both having special relevance to the case of electric utilities. They also refer to resistance to new technologies, such as vehicle emission controls, until they were proven by foreign competition. They also point out the blindness of those in several industries to the potential dangers of tetraethyl lead and PCBs, as well as examples of mismanaged technologies.

In Chapter 5, in assessing what went wrong, the authors emphasize several broad concepts that should have been recognized by managers. These include understanding the dynamics of technology. They also fault the research community for basing their models on simplistic assumptions, which were then prone to misuse by managers.

In Chapter 6 the authors summarize lessons learned. They offer the consolation that much of human progress is based on trial and error and imply that we have made enough of the latter to be in a position to make much progress. They emphasize the pivotal role of forecasts and strategic planning and cite the need for greater objectivity and broader view of the situations. Since most estimates of the future are unlikely to be correct, the authors encourage formulations that are robust, such as sensitivity analyses. They also summarize their deflation of some of the myths mentioned earlier and offer some additional ones, such as their claim that in the past we have over-emphasized science and de-emphasized engineering. Inadequate attention to the performance and application of the latter has been responsible for many of the energy problems we have inherited today.

Chapter 7 provides a more in-depth discussion of the IES concept, which "takes existing technologies and looks for better ways to put the pieces together." The chapter focuses on an IES assessment performed at MIT. IES options, such as High Temperature Gas-Cooled Nuclear Reactors and Gas-Turbine Combined Cycles, were found to have strong cost advantages over conventional alternatives. Following their advice, the authors discussed the sensitivity of the results to several crucial assumptions and noted that the relative cost advantage of these favourites might then be eroded. The authors also considered why IES technologies are not used if they are so good, their answer being impediments in business and government to the horizontal integration of energy technologies.

Finally, in Chapter 8, the authors summarize some of the main points of their work, with an emphasis on the interplay between energy policy and uncertainty. They note both the futility of planning and the need to try to plan for contingencies. The effort helps avoid the costs of the dislocations, market adjustments, and misdirected policies stemming from panic reactions to "surprises" in the external environment of the energy arena. The authors emphasize that the IES approach, by its flexibility, offers reasonably good protection in this regard. Given the connection between energy and global change, the authors suggest that the lessons noted in their book are especially relevant to some of the more prominent new policy issues of the coming decades.

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