

the industrial base for military power and to establish a separate regional market for the CEMA countries. However, for various familiar reasons the suitability of the Soviet model elsewhere is limited.

Although the application of more advanced techniques to the comparative analysis of growth is to be welcomed, various aspects of Gregory's work may be questioned. By "socialist" he means "centrally planned," and thus Yugoslav market socialism is excluded from his study. The performance of Eastern Europe is compared with that of a large group of Western countries, including the United States and Japan, whereas a comparison with Western Europe (in addition or instead) would be desirable. Also, Gregory follows a common but disputed practice by imputing a return to capital in socialist countries at uniform arbitrary rates for all branches of industry in all socialist countries in all years.

Gregory's study will be of interest only to those trained in econometric techniques, and chiefly for its demonstration of the application of these techniques rather than for new substantive findings.

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MATHEMATICS AND COMPUTERS IN SOVIET ECONOMIC PLANNING. Edited by *John P. Hardt, Marvin Hoffenberg, Norman Kaplan, and Herbert S. Levine*. Yale Russian and East European Studies, 5. New Haven and London: Yale University Press, 1967. xxii, 298 pp. \$7.50.

EKONOMICHESKAIA SEMIOTIKA. Edited by *N. P. Fedorenko*. Moscow: "Nauka," 1970. 243 pp. 89 kopeks.

The need for informed, timely, and well-coordinated decisions increases faster than the Soviet economic system's ability to generate and communicate them. The renaissance of Soviet mathematical economics since the mid-fifties may be viewed in this context of the economy's unsatisfied demand for optimal planning. The well-designed symposium held at the University of Rochester in 1965 on "Mathematics and Computers in Soviet Economic Planning" suggests that, as of the mid-sixties, Soviet mathematical economists had hardly begun to cope with that challenge. The authors examine the state of the art in such areas as input-output analysis (surveyed by Vladimir G. Treml), linear programming (Benjamin Ward), and the construction of multiperiod optimizing models (John M. Montias). Richard D. Judy discusses the early development of Soviet economic cybernetics, and Herbert S. Levine, in a brief introduction, projects the issues at stake against the background of traditional planning methods. These new departures on the Soviet economic scene are lucidly presented and, as a rule, soberly appraised. The authors tend to be skeptical about the more immediate prospects for an application of optimal mathematical models in Soviet national planning, partly because, in Edward Ames's words, "Soviet mathematical economics [has] developed along 'ivory tower' rather than useful lines" (p. 246). Viewed from the vantage point of 1971, that healthy skepticism was well taken. Some highly original and even seminal work has been done since by Soviet model builders (to mention only E. Z. Maiminas), but practical applications lag far behind.

One of the reasons is that if Soviet model builders inhabit ivory towers, the practitioners of economic planning and management seem at times to operate in a

Tower of Babel. They employ a bewildering variety of economic languages, codes, and classifications, and (as the authors of *Ekonomicheskaiia semiotika* are quick to point out) the meaning of a term or a message may differ widely depending on which agency uses it. The resulting semantic noise causes economic waste, but its source is a problem in semiotics, the theory of systems of signs which has been known since John Locke. It was left to Soviet mathematical economists, during the last five years, to outline the new and exciting discipline, or rather interdisciplinary approach, of *economic semiotics*: the study of signs through which participants in the economic process, both humans and computers, communicate. This new approach to an old problem combines the tools and concepts of such diverse fields as economics, cybernetics, mathematical linguistics, and, of course, information theory.

Economic semiotics is concerned not merely with the amount of information carried by a message in a planned economy but, mainly, with its meaningfulness and usefulness to the recipient. The actual usefulness of a message to the decision-maker depends, among other things, on the amount of related knowledge he has already accumulated in his specialized vocabulary ("a thesaurus"), and on its timeliness (information is a highly perishable commodity!), its importance (how necessary it is for decisions to be taken by the recipient), its reliability, and, last but not least, its cost. V. M. Zherebin would then appraise the value of information contained in an economic indicator (e.g., a factory's rate of profits) as a weighted sum of these various characteristics (p. 62). M. V. Kharkhardin would measure it according to how much it contributes to the attainment of the economic system's objective function (p. 133). Most authors have a Gestalt view of information—it makes sense only within the context of a given economic system: "the concept of information is inseparable from that of a system" (p. 14). System analysis leads semiotics into its most vital tasks—the construction of the most efficient economic languages and the optimal systems of classifying, encoding, and decoding economic indicators. Shastova, for example, has an interesting discussion of the relative advantages of constructing a uniform system of industrial classification versus a number of subsystems, each industry branch being equipped with a language of its own and communicating with other branches via translators (pp. 166 ff.).

"The ability of a system to 'understand' and generate information, to appraise its importance and usefulness for the purpose of achieving certain objectives . . . is analogous to the functioning of simple and conditioned reflexes in a living organism" (p. 133). The development of economic semiotics itself is a healthy reflex to the current difficulties of central planning. While moving on a high level of generality and abstraction, Soviet scholars may eventually make possible a real breakthrough in the practice of economic planning and management, by revolutionizing the system of information flows and acquiring a deeper understanding of the costs and benefits involved.

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BASIC INDUSTRIAL RESOURCES OF THE USSR. By *Theodore Shabad*.  
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The Soviet Union has steadfastly concentrated its efforts on the expansion of industrial capacity, especially for producers' goods. Underlying this effort has been