

## SOVMOD I: A MACROECONOMIC MODEL OF THE SOVIET UNION.

By Donald W. Green and Christopher I. Higgins. Preface by Richard P. Foster. Foreword by Lawrence R. Klein and Herbert S. Levine. New York: Academic Press, Harcourt Brace Jovanovich, 1977. xxii, 312 pp. Tables. Appendixes. \$22.50. £15.95.

In *Foresight and Understanding*, historian Stephen Toulmin contrasts the development of astronomy in Babylon and Greece as examples of a science of prediction without theory in Babylon and a science of theory without prediction in Greece. The Babylonians were masters at predicting the times and dates of astronomical events by analyzing each of the celestial motions into a set of independent variables whose changes could be predicted. They succeeded in applying their calculation to the movement of the planets and to lunar eclipses and tried, with less success, to apply the method to earthquakes and plagues of locusts. But, says Toulmin, they appear to have had no theory to explain why their methodology worked well for eclipses and poorly for plagues. Both the successes and failures of their forecasting techniques were unexplained.

Using Toulmin's categories, it seems to me that Donald Green and Christopher Higgins's recently published macroeconomic model of the Soviet Union, *Sovmod I*, is a fine example of neo-Babylonian science. It is a substantial piece of empirical research that uncovers dozens of regularities in the performance of the Soviet economy—some obvious, some puzzling, and some, quite possibly, spurious. But, like Babylonian astronomy, neither the successes nor the failures of Green and Higgins's estimates are in any way related to an underlying theoretical structure. Instead, their results represent a new and interesting set of data about a planned economy that itself needs to be explained by some adequate theory. The specification and estimation of *Sovmod* by Green and Higgins and their coresearchers at Wharton Econometric Forecasting Associates is a valuable contribution to the craft of large-scale modeling. But underlying postulates about what it is that planners do have yet to be stated.

*Sovmod I* describes the first version of the Green and Higgins model. (Green has summarized a more recent variant, *Sovmod III*, in the September 1977 issue of the *Journal of Comparative Economics*.) *Sovmod I* contains eighty-four stochastic equations, thirty-four identities, and seventy-four exogenous variables including twenty-nine dummy variables. (*Sovmod III* contains nearly three hundred equations, one hundred eighty-nine stochastic equations, one hundred six identities, and one hundred sixty-four exogenous variables.) The basic structure of the model is presented in chapter 2; sample period error statistics and short-run and long-run projections are described in chapters 3 and 4; and the investment and consumption sectors are modeled in detail in chapters 5 and 6. All of the equations for each sector are listed in appendixes.

The equations are organized into a set of sectoral models linked together by a framework of production and income equations. These equations, supplemented by a price-level equation introduced later, are the real and nominal variables that are central to the model.

The central equations are a set of sectoral production functions expressing real output as a function of labor, capital stock, and (for agriculture) a weather variable. Production functions are Cobb-Douglas without a trend or time variable. The value of the labor coefficient is constrained because of multicollinearity. Agricultural output is estimated in two stages: first, capacity output is estimated from a two-input production function without land; then, the difference between capacity and actual output is estimated by an equation containing weather terms and the ratio of labor to sown acreage. The production system is closed with an equation allocating national income among end uses—investment, military expenditure, trade, inventory change, and con-

sumption. In the basic version, investment and defense expenditure are specified exogenously, and consumption is determined as a residual. In alternative variants, consumption is also estimated as a function of household income and production and as the sum of separate supply-determined categories. All equations are estimated on percentage change in the variables, a form which may reduce serial correlation in the variables, but still indicates some autocorrelation in many of the equations.

Labor inputs to the production function are estimated from data on aggregate population. A migration equation partitions population into rural and urban residents. Urban labor participation rates are determined by real wages. The structure of urban employment is estimated from past employment, a time trend, and the five-year plan dummy variable. Agricultural employment is estimated from lagged real and potential output variables.

Capital stock data are estimated by summing up past investment less depreciation. Sectoral investment is estimated in several variants, the preferred form of which expresses investment as a function of government budgetary allocations for investment finance, lagged output, nonpersonnel defense expenditures, and the five-year plan dummy variable. (Sovmod III adds a gross profits variable to the investment equation, which is interpreted as measuring excess-demand for wage goods, an interpretation that I find peculiar.) The capital goods sector is further broken down into domestic and imported capital, with separate output elasticities estimated for domestic and imported capital inputs in the production functions. Estimates of production inputs appear to be reduced-form equations summarizing demand-side and supply-side variables, but the way in which the estimating equations are derived from underlying structures is a mystery to the reader and possibly to the authors as well.

In part because of the absence of money stock data and because of the low quality of Soviet official price indices, the determination of money price and wage levels is the weakest part of Sovmod I. Real wage is determined by the average real product of labor. Money price level is determined by the difference between the level of money wages and real output—that is, the level of money wages and prices is given exogenously and is not determined within the model. A number of identities that might be used for balancing production and consumption in value terms are not used. One is the balance of government revenue and expenditure in the government budget. Another is the value of national income by end use and by source of origin which could account for the variation in gross profit in value added.

Foreign trade accounts are presented for four categories of goods (disaggregated into individual commodities in Sovmod III) traded to four groups of trading partners. Soviet exports to the West are determined by world trade activity and past hard-currency balances. Soviet nongrain imports from the West depend on Soviet economic activity, world prices, and hard-currency liquidity. Grain imports depend on foreign production and prices and current and past Soviet harvests. However, except for machinery imports which appear in the industrial production functions, the trade sector appears to have little feedback into the rest of the model.

Chapters 3 and 4 present the error statistics of the equations, simulation, the estimation of alternative scenarios for the sample period, and short-run and long-run projections based on the model. The root-mean-squared percentage errors of the equations are small compared with the real data, but these values have been reduced by the liberal use of dummy variables to explain much of the variation. A better test would be whether the model provides better estimates than naive forecasts—predicting each variable from its own past pattern either with or without autocorrelation. Such tests need to be made in future studies.

In sum, Sovmod is a rich source of new information about the Soviet economy, and we are much in debt to its authors. The Sovmod data bank will be a valuable research tool if it is made available to scholars of the Soviet economy. I expect the authors to continue to use it for predicting Soviet responses to various future con-

tingencies. In addition, the most important use of Sovmod could become the testing of alternative theories about the operation of the economic institutions of a centrally planned economy.

At present, our theories about what planners do and how a centrally planned economy operates are relatively weak (by theory, I refer to a set of assumptions or postulates that describe the behavior of decisionmakers). In many cases, we cannot specify where decision-making authority lies or how it is divided among economic units. Where we can identify decisionmakers, we cannot always specify what dimensions of a problem are effectively constrained and what dimensions may be subject to control by the decisionmaker.

We need to give more attention to the construction of sets of postulates about the behavior of planners and to the specification of logically valid empirical predictions that might test our assertions. At this point, the results of Sovmod I may suggest such postulates, but they do little to test any theory of the operation of the planned economy.

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SOVIET FOREIGN TRADE: PURPOSE AND PERFORMANCE. By *William Nelson Turpin*. Lexington, Mass. and Toronto: Lexington Books, D. C. Heath, 1977. xiv, 173 pp. Tables. \$15.00.

Originally the author's doctoral dissertation, the book under review is a study of Soviet foreign trade planning activities concerning trade with developed capitalist countries. The first part of Mr. Turpin's book surveys Western and Soviet views concerning Soviet foreign trade planning, the middle section considers the planning system itself, and the latter part of the work delves into policy issues presented to the United States by the Soviet monopoly of foreign trade.

Most of the book examines the literature on various aspects of Soviet foreign trade planning. The review of the sources is not definitive, but on some topics (such as whether or not Soviet foreign trade policy is autarkic) the author has done an adequate job of mining the existing literature in both the United States and Western Europe. The best sections in this regard are chapters 2 and 3. The difficulty here, unfortunately, arises from excessive reliance on quotations where paraphrasing would have proven far superior.

The review of the literature on other topics is not terribly useful. For example, chapter 5, which discusses the organization of Soviet foreign trade planning, is only nine pages in length and rather haphazard in its approach. In the first place, even though the inquiry is limited to Soviet trade with developed capitalist countries, one must nonetheless consider how Soviet planners divide trade in particular products (oil of nonferrous metals, for example) between CMEA and other countries. It is not at all obvious, particularly on the export side, how that decision is made. It is a very important issue for those interested in East-West trade, and Mr. Turpin ignores it. In general, the author's discussion of the foreign trade planning process is surprisingly weak, almost lazy, in light of his apparent (but perhaps limited) familiarity with the sources. He does not, for example, consider, except in passing, how the Ministry of Foreign Trade is organized and how the planning process operates.

Mr. Turpin's attempts to add his own contributions to the literature on foreign trade are few and uninspired. For example, in chapter 4, he sets out to test for autarkic policies in Soviet foreign trade. He begins with a sloppy statement of the hypothesis ("the Soviet Union exports in order to pay for needed imports"). Then, after a discourse (all of which should be in an appendix) on the import-to-GNP