

ECONOMIC ANALYSIS OF THE SPACE SHUTTLE SYSTEM

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Volume III

CHAPTER 7.0

THE POTENTIAL OF SPACE BUDGET AND THE IMPACT OF SPACE EXPENDITURE

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macro-econometric model and micro-activity analysis approaches can be expected to provide useful information for rational long-range planning of space exploration.

In an effort to determine the two-way relationship between national economy and space activity, both the macro-econometric model and the micro-activity analysis approaches have been employed. The terms "macro" and "micro" have been used here merely to indicate whether an analysis is being conducted at the national level or the industry level. We believe that while the influence of national economic conditions upon the level of space expenditure may be clearly discernable in a macro-econometric model, the spending impact of space expenditures on national economic conditions cannot be easily taken into account in such a model. The spending impact of space expenditures on various sectors of the economy, however, can be investigated by an alternative-activity analysis (or input-output analysis). For this reason, both the macro-econometric model and micro-activity analysis approaches have been applied.

A macro-econometric model has been formulated for the purpose of projecting both the national economy in general and space expenditure in particular. The possible influence of economic conditions on the level of space budget has been emphasized. Furthermore, we have also attempted to show how future economic conditions may be affected by different fiscal and monetary policies. By investigating the possible relationship between the level of space budget and economic conditions which to some extent may be affected by governmental fiscal and monetary policies, we hope to demonstrate that a suitably formulated macro-econometric model can be very useful for investment decision and long-range planning for various agencies of the Federal government, such as NASA.

The macro-econometric model employed in the present report is a dynamic system of twenty-eight equations, which include eight equations for the government sector dealing with both receipts and expenditures. In addition, the system of equations includes not only the relationships of production, consumption, and investment activities, but also the relationships of wage and interest determination and personal income, as well as corporate profit.

The econometric model with parameters estimated from annual observations of 1929-41 and 1947-64 was evaluated by comparing several alternative simulations with observed values for the period 1965-70 and was found to be reasonably satisfactory. In particular, the simulation results of the government sector were found to be significantly superior to those of the trend extrapolation of a more conventional single-equation model. Following the evaluation of the model, several alternative simulations were made for the period 1971-80. Both short-term and long-term projections as well as the implications of alternative-fiscal and monetary policies appear to be quite reasonable.

Finally, the alternative simulations for the period 1971-80, representing expansionary, neutral, and restrictive policies, respectively, were then used to project the future space expenditures. In order to achieve this purpose, we demonstrated that the level of current space expenditures may be explained not only by the level of past space expenditures, but also by the level of government spending in general, and other economic conditions such as the rate of inflation. Based on such an additional empirical relationship obtained from the annual observations of 1958-69, together with alternative simulations of the econometric model, several alternative projections of the level of space expenditures were provided for the period 1971-80. It is found that under the expansionary policy with relatively high rates of inflation, the projected level of space expenditures is in general lower than that of the alternative restrictive policy. According to the neutral policy, the level of space expenditures is projected to rise gradually from \$3.3 billion in 1971 to \$4.1 billion in 1980 (in terms of 1970 constant dollars). According to the expansionary and restrictive policies, the level of space expenditure is projected to rise from \$3.5 and \$3.2 billion in 1971 to \$3.7 and \$4.6 billion, respectively, in 1980 (again, in terms of 1970 constant dollars).

The purpose of our micro-activity analysis is to investigate the spending impact of space expenditures on various industries or groups of industries. Specifically, we attempted to evaluate the impact of the realloca-