

centers on long-run or secular relationships more than on short-run, cyclical movements.

With this objective in view, characteristics of the desired function, describing production relationships in the economy can be reduced to these:

(1) It should incorporate measures of as many of the identifiable productive resources as is possible in light of availability of data, especially—

- (a) labor;
- (b) tangible capital: plant, equipment, etc.;
- (c) the state of technology and its changes; and
- (d) other intangibles such as research, health, education, etc.

(2) It should incorporate a procedure for separating changes associated with cyclical and other short-run fluctuations from changes reflecting secular influences.

(3) Provision should be made to separate changes in output due to shifts in the production function itself in response to changes in techniques, etc., from changes in output reflecting increases in the supply of the productive services of labor and capital.

(4) A procedure is needed for allowing for influences on aggregate output and on the productivity of inputs arising solely out of shifts in demand between goods and services with varying requirements for productive resources—i.e., between those with higher or lower requirements for capital, and higher or lower requirements for labor.

(5) If possible, specific provision should be made to measure the influence of changes in quality of inputs and outputs on the production function.

(6) Since the absolute magnitudes of the measures of inputs and outputs for the economy as a whole will depend on the particular price structure used to price inputs and outputs and on various conventions of mensuration, these absolute levels will be of little significance. Primary attention must center on changes between time periods—year to year—and on relative proportions between measures in each period. Therefore the form of the function should be chosen so as to operate in terms of rates of change.

(7) If possible, the functional form chosen should be linear or involve only linear transformation so as to take advantage of the high speed computing possibilities of electronic data processing equipment. This is of special importance in view of the high intercorrelations between the inputs which made it necessary, as will be seen below, to run successive approximations to locate the preferred fit of the formula to the statistical record of past economic performance.

(8) Last, but not least, the formula should be framed to reduce the high intercorrelations as far as feasible, especially between the inputs, or in statistical terms, the independent variables in the function.

In light of these criteria, the search for an aggregate production function, started with a theoretical form that was a variation of, and elaboration upon, the now classic Cobb-Douglas function which is linear in the logarithms. In its original form it was applied to manufacturing, first to U.S. data, covering various series of years and regions, then to time series for other countries, and then to cross-section data for large numbers of manufacturing industries for each of several years, here and abroad. In form, the function was:

$$P = bL^k C^{1-k}$$