VII

Summary

The preceding review of the characteristics of GNP revisions is only in a limited sense a study of errors in estimating GNP. First, errors created by conceptual, definitional, and coverage limitations were neglected. Recent work by the Ruggles [53] suggests the magnitude of such errors could be quite large and roughly five to seven times the average size of GNP revisions. Second, the revisions may be only a small component of the errors in measuring GNP, given the particular definitions and scope of the constructs in the present accounts. The crude estimates given in Chapter V suggest the revisions could vary from 8 to 15 per cent of the initial measurement error.

Initial figures for a given quarter are typically revised one month after their publication and again approximately one, two, and three years later as additional data continue to come in. The estimates are further subject to one or more major benchmark revisions such as the one which occurred in August 1965.

The revisions provide an example of one type of measurement error—that resulting from lags in the availability of primary data. The study's emphasis on this one type of error in one set of statistics inherently risks obscuring an important fact: frequent revisions of a given body of data are by no means an indication that it is less reliable than a series that is rarely or never revised. Even though the revisions permit a parade of the inadequacies of the provisional estimates, it would be unwarranted and foolhardy to conclude that these estimates are without value or that they are necessarily less dependable than other series of comparable scope. Indeed, the frequent revisions of GNP estimates should serve as

[53] Ruggles, *The Design of Economic Accounts.*

steady reminders that nearly *all* economic statistics contain measurement errors.

Estimates of GNP are built up from detailed component estimates. The comprehensive data underlying many of the components are available only at infrequent intervals and long after the fact. These data are used to construct benchmark estimates. To provide continuous up-to-date series, the movements of a related series are used to interpolate the benchmarks between and to extrapolate them beyond benchmark years. There are then four major sources of error in the provisional estimates: (1) errors in the benchmark estimates; (2) measurement errors in the related series; (3) errors arising from an inexact or misspecified relation between the two variables; and (4) errors arising from extrapolations of past benchmark values.

The revisions were shown to be primarily a measure of the extrapolation errors. The largest revisions were found to be in the GNP components which show considerable variability and weak serial correlation and which would therefore be the most difficult to extrapolate accurately.

The provisional estimates, then, can be viewed as predictions, based on partial information of the values of GNP and its components, and the analysis of their accuracy emphasized their resemblance to forecasts. The questions considered were: the size of the error relative to other forecast and extrapolation errors, how rapidly it is reduced, and whether the accuracy of the estimates has improved over the years. A summary of the findings follows.

Accuracy of the Provisional Estimates

Although they share many of the shortcomings, the provisional GNP estimates for a year just ended are substantially more accurate than business forecasts of GNP for a year ahead. This is true both of total GNP and its major components for the 1953–62 period. The provisional figures are, however, not much more accurate than an average of forecasters' estimates of current annual levels—even though the forecasters publish their estimates some three to four months earlier than the official data.

The forecasts used in these comparisons are from Zarnowitz' sample of several hundred business forecasts which were collected for the NBER short-term forecasting study. Both the forecasts in this sample and the

official figures tend to underestimate annual levels of GNP and three of the four major sectors (total consumption, gross private domestic investment, and net exports). Levels of the fourth sector, government expenditures on goods and services, were overestimated on the average.

In addition to comparisons with business forecasts, the accuracy of the provisional estimates of quarterly levels and changes was compared with that of mechanical extrapolations for the 1947–61 period. The provisional figures for levels of aggregates such as GNP, personal consumption expenditures, and gross private domestic investment are considerably more accurate than simple projections, but some of the detailed components do not pass this minimal requirement. For example, initial estimate of the levels of quarterly expenditures of consumer nondurables, producers' durable equipment, new construction, net exports, and of federal government expenditures on goods and services are only about as accurate, and in some cases less accurate, than simple projections.

For many purposes, however, changes are more important than levels. The initial figures for quarterly changes in aggregates, as well as in detailed components, are much more accurate relative to projections than are the initial data for levels. They were, on the average, 40 per cent more accurate than simple projections of "no change" and 10 per cent more accurate than more sophisticated extrapolations.

Success of Revisions and Gains in Accuracy

The sequence of revisions, to be judged successful, should make each set of revised estimates more accurate predictions of the final (1965) figures than are the preceding sets, and as a rule they do. This was shown both in terms of the number of revisions that reduce error and in terms of the magnitude of error reduced.

Successive revisions of the estimates of quarterly change were classified according to whether the revision increased or decreased the previous error. In other words, they were classified according to whether the revision brought the estimate closer to the 1965 figures. Although not all of the revisions were successful, the majority were. About 60 per cent of all of the revisions of all of the components reduced error.

Least successful were the revisions of the advance estimates which occur after only one month. Only about 50 per cent of these revisions reduced error, suggesting that they may not be worth making. It appears

that there would be but a small sacrifice in accuracy if revisions of the advance estimates were not made until the first annual July revisions.

In terms of the magnitude of error reduced, major benchmark revisions are clearly the most important. About 60 per cent of the error arising from incomplete primary data remains in the figures until a benchmark revision occurs. Prior to the benchmark revisions, about 25 to 30 per cent of the initial error is eliminated by the revisions occurring approximately two years after the initial figures are published.

Errors in the provisional estimates of quarterly changes in GNP and its components throughout the 1955–61 period were considerably smaller than they were during 1947–54. Extrapolations, however, showed a similar reduction in error. When the reduction in extrapolation error is used as a yardstick, not quite half of the series show greater gains in accuracy. Of these, the greatest improvements were in estimates of producers' durable equipment, change in business inventories, and net exports of goods and services.

Bias in the Initial Estimates of Change in GNP

Although the provisional estimates of quarterly GNP levels show smaller over-all errors than do simple projections throughout the postwar period, a larger proportion of their error consists of bias. Bias, in this context, means a persistent tendency to overestimate, or to underestimate. It is well known that the early figures underestimate levels on the average. Less widely recognized is an element of bias in the initial estimates of quarterly changes. They tend to understate increases and overstate decreases.

In addition, there is a suggestion of bias in the estimates of longer term changes. The initial figures have tended to overestimate cyclical and underestimate trend movements in GNP throughout the postwar period. The cyclical errors were primarily the result of overestimating changes in inventory investment while underestimating changes in personal consumption expenditures was the main source of the trend errors.

During periods of business cycle contraction, the two kinds of error reinforce each other and cause the initial estimates to exaggerate substantially the severity of peak to trough decline in GNP. The errors tend to offset each other during periods of expansion. Throughout the postwar period the quarters of expansion have greatly outnumbered

the quarters of business cycle contraction. Thus an average of the first estimates of quarter-to-quarter change in GNP throughout the period would differ little from the average quarterly change in the revised estimates. This has apparently created the widespread, but mistaken, belief that the bias in the initial GNP figures is primarily one of levels and that there are no systematic errors in the early estimates of change.

Expenditures Compared with Income Estimates of GNP

Revisions of the estimates of GNP based on both expenditures and income data were reviewed in order to determine which set yields the more reliable early figures. Occasionally, it is suggested that, despite their shortcomings, the early income figures may be more accurate.

The estimates of GNP based on income are revised less than the expenditures estimates. However, the early income estimates gave only slightly more accurate predictions of the final (i.e., 1965) expenditures figures than the corresponding set of early expenditures estimates. Differences in the primary data which would favor the accuracy of the early income estimates are apparently offset by the lack of early data on profits.

The initial income estimates gave a slightly more accurate indication of the magnitude of decline in GNP during the 1953–54 and 1957–58 contractions than the initial expenditures estimates. The two estimates differ considerably on the amount of decline during 1960–61: the income figures revised in 1965 show a 5.2 billion dollar decrease while the product estimates show a drop of only 1.4 billion in current dollar GNP. Initially they both indicated a decline of about 5.5 billion.

Both estimates have generally agreed on the dates of major turns in GNP, except for the trough in 1954. The expenditures data as revised in 1965 show a trough occurring in the second quarter of 1954 while the income estimates show one in the fourth quarter of 1953. The date of this trough in the product figures has been revised by as much as three quarters (from IV 1953 to III 1954); it was changed only one quarter (IV 1953 to I 1954) in the income estimates.

There has been much less revision in the dates of other major turns. The initial product figures showed the 1949 low point one quarter too early; the income estimates showed the 1960 peak one quarter too late. Until the major revision of 1965 both estimates showed a trough in the

first quarter of 1961. The low point now appears in the fourth quarter of 1960.

Consequences for Users of Preliminary Data

The initial figures overestimated the decline in GNP during each of the four postwar contractions. The strength of the increase during the first year of the following expansion was understated in 1950 and in 1954–55, estimated correctly in 1958–59, and overstated in 1961 by the early figures. Thus, throughout the postwar period, economists using movements in GNP as an indicator of the severity of cyclical contractions and of the strength of the following recoveries could have been misled by the figures available at the time.

In addition to underlying analyses of current business conditions, the preliminary data serve as a basis for forecasts. Although there is a wide variety of forecasting techniques, a common thread runs among them. Nearly all forecasts are evaluations of current conditions projected into the future by means of historically observed relationships, whether derived on a formal basis (as in econometric models) or an informal one. Shortcomings in the underlying data are thus transferred to the forecasts.

Though a detailed analysis of the effect of using preliminary rather than revised (1965) GNP data on forecasting accuracy has been made elsewhere, one of the principal findings bears repeating.[54] The use of preliminary data impaired the accuracy of the forecasts examined by a substantial amount: accuracy of naive models was reduced by nearly 30 per cent, while that of business forecasts from the Zarnowitz sample is estimated to have been reduced by an average of about 40 per cent.

[54] R. Cole, "Data Errors and Forecasting Accuracy," in Mincer, ed., *Economic Forecasts and Expectations.*