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THE QUARTERLY NATIONAL INCOME AND PRODUCT ACCOUNTS OF THE UNITED STATES 1942–62[1]

by George Jaszi

'Si Dieu n'existait pas, il faudrait l'inventer.'
Voltaire

SUMMARY

THE purpose of this paper is to describe and evaluate the quarterly national income and product accounts of the United States (to be referred to henceforth as N.I.P.). The historical development of these accounts is reviewed first. Next, a summary of the statistical methodology underlying them is provided. An analysis of the errors to which they have been subject follows. An attempt is then made to define the area of their usefulness. Finally, suggestions for their improvement are formulated.

The most general conclusions are as follows:

1. The quarterly N.I.P. estimates were developed in close response to an urgent need for them in economic analysis and policy formulation. Their development was a gradual process covering about two decades in which experience gained at one stage suggested improvements and extensions for the next.

2. The quarterly figures are based on abundant data sources. To be sure, the information is not as comprehensive as that available for the preparation of the annual estimates, but we are dealing only with differences in degree – there is no sharp contrast.

3. The series are subject to a considerable margin of error. There is bias in some of them – the initial estimates tend to be too low; and quite apart from bias they differ from the revised figures.

4. The margin of error attaching to the statistics disqualifies them from serving as precision instruments, but they are indispensable as a systematic framework for the order-of-magnitude

[1] This paper was written for the 1963 meetings of the International Association for Research in Income and Wealth. Mr. Charles W. Walton gave substantial assistance in the preparation of the section dealing with the analysis of statistical error. The computations were carried through by Mrs. Ann H. Cravens.

analysis of the major forces determining the short-run movements of the economy. At present, the outstanding handicap in such analysis is not statistical error, but the inadequacy of economic theories and of our ability to test them.

5. The opportunities for mechanizing estimating techniques are assessed; the work on seasonals is discussed in this context; and a thorough investigation is proposed of the problems involved in the synchronization of the various components of the accounts. In addition, proposals for improving the data available for the estimation of specific income and product flows are formulated. Quarterly estimates of the physical volume of national output by industry, and quarterly accounts showing the financial transactions that mediate between saving and tangible investment are considered the two high-priority major extensions of the present accounts. Other, less basic, extensions of these accounts are also proposed.

HISTORICAL DEVELOPMENT

The United States N.I.P. accounts can be characterized as a set of interrelated statements which provide information on the production of the economy and how that production is distributed to final users for purposes of consumption and investment.

To contrast them with other branches of social accounting, they may be defined negatively as a system that does not provide information (*a*) on the distribution of production among intermediate users, (*b*) on the financial processes that link saving and tangible investment, or (*c*) on holdings of assets and liabilities. These are the domains, respectively, of input-output, flow-of-funds, and wealth accounting.

Origin in 1942

The first venture of the Department of Commerce into the realm of less than annual income and product estimates dates back to 1938, when publication of a monthly series closely similar to the present personal income series was begun. This aggregate and its components were very useful in current business analysis, but they fell short of the specifications for a N.I.P. accounting system just formulated.

The first quarterly N.I.P. data that met these specifications were issued in the *Survey of Current Business*, the monthly

periodical of the Bureau of Foreign and Domestic Commerce, for August 1942. They followed the first publication in May of that year of a set of annual tables which provided the setting for the quarterly tables.

Preparation of the annual and quarterly N.I.P. data at this particular time was in direct response to the requirements of the war effort. Up to this juncture, national output had been measured exclusively in terms of income flows in the official estimates. To be useful for economic analysis and policy formulation during the war, an alternative measurement of it in terms of product flows was needed. This measure was provided in the form of the gross national product; and the G.N.P., national income, and some other pre-existing pieces quickly jelled into a coherent system of accounts. This was a thrilling process, which to a large extent took place without advance planning on the part of the main architects.

The 1942 information consisted of a set of four tables. The first of these presented output gross of capital consumption as the sum of various types of final sales plus inventory change. This was a close cousin of the G.N.P. now in use. The second showed output on a net basis as the sum of types of income. This was a somewhat more distant relative of the present national income total – the outstanding difference being the measurement of corporate profits on an after-tax basis, rather than on a before-tax basis as now. The third table gave the derivation from national income of what we now call disposable personal income, and the division of disposable income between consumption and saving. The fourth table presented the relation between G.N.P. and national income. With the exception of those in the last table, all figures were provided seasonally adjusted at annual rate as well as in the form of unadjusted quarterly totals. (See Table IA. The unadjusted data are shown so that the whole interrelated system can be presented.)

TABLE I

First United States quarterly national income and product estimates
First quarter 1939
(Billions of dollars)

A. Original tabular presentation

Gross national product or expenditure	*20·0*
Less: Government expenditures for goods and services	3·6
Federal Government	1·6
War	·3
Other Federal Government	1·3
State and local government	2·0
Equals: Output available for private use	16·4
Less: Private gross capital formation	2·2
Construction	·7
Producers' durable equipment	1·2
Net change in business inventories	·1
Net export of goods and services	·2
Domestic output of monetary gold and silver	·0
Equals: Consumers' goods and services	14·2
Durable goods	1·5
Non-durable goods and services	12·7
Total national income	*16·6*
Salaries and wages	10·6
Other labour income	1·0
Total compensation of employees	11·6
Entrepreneurial income and net rents	3·1
Interest and dividends	2·0
Corporate savings	—·1
National income	*16.6*
Add: Transfer payments	·6
Less: Corporate savings	—·1
Employment taxes	·5
Personal taxes	·7
Federal	·3
State and local	·4
Equals: Disposable income of individuals	16·1
Less: Consumers' expenditures	14·2
Equals: Net savings of individuals	1·9
National income	*16·6*
Business taxes	2·1
Depreciation and depletion charges	1·6
Other business reserves	·2
Capital outlays charged to current expense	·2
Inventory revaluation adjustment	—·1
Adjustment for discrepancies	—·6
Gross national product or expenditure	*20·0*

Source: *Survey of Current Business*, August 1942, United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D.C.

B. Translation into framework of 5-accounts system

National income and product account

Compensation of employees, other labour income, entrepreneurial income and net rents, interest and dividends	16·7	Government expenditures for goods and services	3·6
Business taxes	2·1	Private construction, producers' durable equipment, and net change in business inventories	2·0
Corporate savings, depreciation and depletion charges, other business reserves, capital outlays charged to current expense, inventory valuation adjustment, and adjustment for discrepancies	1·2	Net export of goods and services, and domestic output of monetary gold and silver	·2
		Consumer goods and services	14·2
Charges against gross national product	20·0	Gross national product or expenditure	20·0

Personal income and expenditure account

Personal taxes	·7	Compensation of employees, etc.	16·7
Consumer goods and services	14·2	Less: Employment taxes	·5
Net savings	1·9	Plus: Transfer payments	·6
Personal outlay and saving	16·8	Personal income	16·8

Government receipts and expenditure account

Government expenditures for goods and services	3·6	Business taxes	2·1
Transfer payments	·6	Personal taxes	·7
Surplus	—·9	Employment taxes	·5
Government expenditures and surplus	3·3	Government receipts	3·3

Rest-of-the-world account

Net export of goods and services, etc.	·2	Net foreign investment (by U.S.)	·2
Payment to U.S.	·2	Receipts from U.S.	·2

Saving and investment account

Private construction, etc.	2·0	Net personal savings	1·9
Net foreign investment (by U.S.)	·2	Corporate savings, etc.	1·2
		Government surplus	—·9
Gross private investment	2·2	Gross saving	2·2

This set of tables can be reshaped easily into a system of accounts consisting of (*a*) a national income and product, (*b*) a personal income and expenditure, (*c*) a Government, (*d*) a foreign, and (*e*) a consolidated saving-investment account. (See Table IB.) This is, of course, the basic structure underlying the present estimates. Thus, developments since May 1942 can be characterized as consisting of refinements and definitions and of presentation, the provision of additional detail, and improvements in estimating techniques.[1]

Rudimentary constant-dollar G.N.P. figures accompanied the initial estimates. These were extremely rough – particularly because of the overwhelming conceptual and statistical difficulties involved in measuring the expansion in the volume of military purchases – and were discontinued after a while. As will be noted later, they made their reappearance in 1958, this time on a permanent basis.

The 1942 series were available about two months after the end of the last quarter they covered, but no regular publication schedule was maintained until 1947.

1947 revisions

In addition to this work on the quarterly estimates, a major effort was devoted during the war and the early postwar years to a basic overhaul of the U.S. annual N.I.P. estimates. The results were published in 1947.[2] The estimating methodology was improved significantly – direct estimates of personal consumption expenditures were prepared for the first time, and all other series were worked over thoroughly to incorporate new data sources and to improve the estimating techniques. The notion of an economic accounting system – implicit in the 1942 publications – was made explicit, and numerous changes in the definitions and classifications of the component income and

[1] I anticipated this, with some nostalgia, in 1950. 'I do not think that we can expect soon again the thrill which we experienced in the early forties when the elements of the old national income statistics grouped themselves into what was an essentially new view of the economy. We are probably destined to refine and to elaborate for some time . . .' 'National Income: Status and Prospects as Seen by an Estimator,' in *Journal of the American Statistical Association*, September 1951, p. 352.

[2] The new set-up was presented first in the *1947 National Income Supplement* to the *Survey of Current Business*, U.S. Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D.C., 1948. A full discussion of the concepts and methodology underlying the new data appeared in *National Income*, 1951 Edition, a supplement to the *Survey of Current Business*, U.S. Department of Commerce, Office of Business Economics, Washington, D.C.

product flows were introduced. A vast amount of additional information was presented on an annual basis.

The quarterly tables were less influenced by these changes than were the annual ones. To be sure, they were made to reflect the new definitions and classifications, and they benefited from the statistical improvements. But the amount of information shown was not significantly expanded. And, interestingly, the presentation was not changed essentially from the four-table set-up reproduced in Table I A. (The full complement of tables was raised from seven to eight, a seasonally adjusted counterpart being added to the fourth table setting out the relation between national income and G.N.P.)

Specifically, the quarterly tables were not modified in the light of the six-account system which became the framework for the annual data. This system included, in addition to the five accounts shown in Table I B, another one covering the business sector. It had substantial pedagogic advantages because it clarified the view of the institutional structure of the economy. However, it proved somewhat messy and cumbersome as a framework for the statistical presentation of the analytically most important income and product flows, and was abandoned in 1958 in favour of the five-account system which, as we have already demonstrated, underlay the quarterly estimates from the outset.

The 1947–58 period

The quarterly N.I.P. tables – 1947 version – were recalculated back to 1939, and put on a regular publication basis. The estimates for the first quarter of each year were published in May; those for the succeeding quarters followed in August, November and February, except that the estimates of corporate profits were trailing by about two months, because of a lag in the reporting of the underlying primary data.

In the next decade there was no significant change in the published quarterly reporting, except that in 1954 two tables were added – one seasonally adjusted and one unadjusted – which contained additional detail on the composition of consumer expenditures. The full set of tables in use immediately before the changes that were made in 1958 is reproduced in Appendix 1 by reference to seasonally adjusted estimates for the fourth quarter of 1957.

Although this period was uneventful on the surface, two

important developments with respect to the quarterly statistics occurred. These were the direct outcome of the increasingly intensive use made of the data by Government, business, and others.

In the first place, summary advance estimates of the N.I.P. accounts were made on the basis of partial information. (The format is shown in Appendix 2.) I have not reconstructed the precise history of these estimates. However, over the years the following pattern emerged. The first set of advance estimates was prepared in the middle of the last month of the quarter to which it referred, on the basis of partial information relating to one or two months of the quarter. These estimates were used internally and made available to other interested Government agencies, but were not released to the public, because of their tentative character.

A second set of summary estimates based upon somewhat more adequate data was prepared in the middle of the month following the last quarter which the estimates covered. This set came to be published under the aegis of the Council of Economic Advisers, in its monthly *Economic Indicators*. Thus, two advance summary estimates of the N.I.P. accounts were prepared regularly, before the publication of somewhat more detailed and firmer figures in the *Survey of Current Business*.

The demand, mainly of the Council, for estimates more up to date than those published in the *Survey* was most insistent. However, a choice was open between the kind of quarterly advance estimates just described and monthly estimates of the same items. The latter would have been preferred by at least some of the users.

A strong argument was made to the effect that most, if not all, the data used in connection with the quarterly estimates were available monthly also, and that accordingly summary monthly N.I.P. accounts should be prepared. In our view, however, this line of reasoning did not take into consideration the very erratic monthly movement of some of the component series, and the timing problem, to be discussed in greater detail later in this paper, which makes the proper synchronization of the data even on a quarterly basis quite difficult. Also, the problem of adjusting the series for seasonal variations would have been aggravated. We felt that the data were not sufficiently refined to provide monthly series that would hang together and

tell an intelligible story in terms of interrelated income and product flows.

The second major development in the 1947–58 period was the preparation of an increasing volume of N.I.P. information on a quarterly basis. This information was initially for use only within the Government, but was made available to the public in connection with the extensive revamping of the N.I.P. accounts in 1958.[1]

1958 revisions

In 1958 the N.I.P. accounts underwent one of the periodic statistical revisions that are made to incorporate census and other benchmark information that becomes available on a less frequent than annual schedule. This was made the occasion of a major expansion of the accounts.[2]

Only one important definitional change was made. Up to 1958 Government grants to foreign nations were included in the Government purchases component of the G.N.P.; after 1958 cash grants were classified as a new category of transfer payments and, accordingly, excluded from the G.N.P. This involved a corresponding redefinition of the foreign component of the G.N.P.: Cash grants, formerly classified as an import of goods and services, were excluded from this category, with the result that the total no longer equalled 'net foreign investment' (see Table I), but the net export of goods and services which give rise to *quid pro quo* transactions between U.S. and foreign nationals. This change was prompted by the increased importance of foreign assistance in the postwar period. While it did not satisfy the requirements of some analysis which would want to dispense with the distinction between cash grants, grants in kind, and even loans, it seemed to us the one most appropriate within the framework of the N.I.P. accounts.

The only other conceptual change that was made in 1958 has already been referred to: A five-account system was substituted

[1] See *U.S. Income and Output*, a supplement to the *Survey of Current Business*, U.S. Department of Commerce, Office of Business Economics, Washington, D.C., 1958.

[2] The proceedings and recommendations of the National Accounts Review Committee set up by the U.S. Bureau of the Budget provided another impetus to make improvements in the N.I.P. accounts at this time. See U.S. Congress, Joint Economic Committee: *The National Economic Accounts of the United States*, Hearings before the Subcommittee on Economic Statistics, 85th Congress, First Session, October 29 and 30, 1957, Washington, D.C., U.S. Government Printing Office, 1957.

for the six-account system as the organizational framework of the estimates.

The major feature of the 1958 overhaul was a substantial expansion of the statistical information. This affected the annual as well as the quarterly estimates; only the developments affecting the latter are germane to this review. These may be summarized as follows:

1. The current-dollar table on G.N.P. and its product components was supplemented by a corresponding table (seasonally adjusted) in terms of constant dollars. Annual constant-dollar data covering the years since 1929 were first made available on a continuing basis in 1951. These were a substantial aid in the analysis of postwar economic developments in which price increases loomed large. The quarterly constant-dollar data, which were calculated for the entire postwar period, facilitated historical analysis as well as the diagnosis of current business conditions – although the need for them in the latter connection became somewhat less acute after 1957 as inflationary trends were greatly mitigated.

2. The synopsis of Government receipts and expenditures which, as we have seen, was implicit in the quarterly tables from the very beginning, was made explicit in 1958. More important, a breakdown between Federal and State and local government receipts and expenditures was provided. This was useful because for most purposes Federal and State and local governments had to be studied separately. The Government tables were presented seasonally adjusted as well as unadjusted.

3. Quarterly transactions with the rest-of-the-world were shown seasonally adjusted and unadjusted. This was more than a rearrangement of transactions already contained in the previous set of tables. In view of the new treatment of cash Government grants as transfers, these new tables were necessary for a complete accounting of income and product flows.

4. A consolidated saving-investment account was explicitly presented.

5. In addition to the existing breakdown of national income by type of income, this aggregate was shown on a seasonally adjusted basis as originating in about a dozen industrial divisions comprising the economy. This table is useful in tracing the industrial repercussions of changes in final demand during the business cycle.

6. National income was shown on a seasonally adjusted basis also by broad legal form of organization – corporate and non-corporate – and the corporate form was broken down by type of income.

In conjunction with information on final demand and on the industrial composition of national income, this table was helpful in throwing light on a very important characteristic of U.S. postwar business cycles: the stability of consumer demand in the face of substantial fluctuations in other segments of the economy. By using these separate pieces of information jointly, it was possible to trace an important chain of events that contributed to this stability: Cyclical fluctuations were seen to have their major initial impact on industries producing and distributing durable goods; these industries were organized largely in corporate form; the sharpest impact of changes in corporate output was on corporate profits rather than on wages; and corporations maintained dividend payments in the face of substantial profit fluctuations.

7. A seasonally adjusted quarterly breakdown of corporate profits by major industry groups was shown.

8. No basic changes were made in the tables tracing the relation between G.N.P., national income, and personal income, and in the table showing personal income and its disposition. The personal-income table was expanded to carry some of the detail formerly confined to the national-income-by-type-of-income table, because it could be kept more current than the latter, whose compilation was delayed by the lag in the corporate profits data. Additional detail relating to labour incomes and transfer payments, not hitherto shown on a quarterly basis, was also presented in the personal-income table.

9. Since 1958 there has been only one change in the quarterly reporting. In 1961 we began to publish quarterly a table, until then available only annually, showing the breakdown of G.N.P. by durable and non-durable goods, construction, and services, with the goods components classified by final purchases and inventory change. This table is available seasonally adjusted in current and in constant dollars.

The full set of seasonally adjusted quarterly tables are shown in the *Survey of Current Business*.[1]

In one respect the 1958 changes resulted in a retrenchment of

[1] See, for example, *Survey of Current Business*, February 1962, pp. 12–14.

the quarterly estimates. The publication of income series unadjusted for seasonal variations was discontinued, except in the case of corporate profits. The quarterly unadjusted series relating to the product flow continue to be maintained and are published twice a year, in February and in July. They are available on request, however. We receive one or two requests during the year. The reasons that have led to the dropping of the quarterly unadjusted income series are explained in the discussion of statistical methodology in the report *U.S. Income and Output.*[1] Their prospective status regarding reinstatement is taken up in connection with the agenda for future work in the last section of this paper.

Some conclusions

The development of the quarterly N.I.P. estimates was not the result of the spontaneous cerebration of eager estimators anxious to expand their domain. Rather it was a response to user-demand.

This demand is quite insistent in the United States. The U.S. economy can be characterized as industrial technologically, and as 'mixed' from an institutional point of view. Aggregate business activity, and its components are subject to sharp short-run fluctuations, although fortunately recessions have been mild in the postwar period.

Economic policy in the United States is very active. I refer primarily to the policies of the Federal Government aimed at ensuring high and rising levels of productive activity. But I have in mind also the remarkable alertness with which other major groups formulate their economic decisions by reference to their assessment of the economic outlook. The most prominent case here is the formulation of production, price, employment, and investment policies by business. The economic decision-making of State and local governments and of labour organizations are other outstanding examples.

Clearly, for this type of economic behaviour quarterly information on economic developments is most desirable. In fact, there is pressure for additional monthly and – believe it or not – even weekly data. Inasmuch as the N.I.P. accounts have become

[1] See *U.S. Income and Output*, a supplement to the *Survey of Current Business*, U.S. Department of Commerce, Office of Business Economics, Washington, D.C., November 1958, pp. 95–105,

recognized increasingly as the most satisfactory framework for the analysis of overall business conditions, the typical economic problems and attitudes have resulted in an ever-growing demand for adequate short-term income and product data.

This eminently practical demand is supplemented by that of universities and other institutions, much of whose economic research has been fed by the expanding stream of quarterly N.I.P. information, and would have to grind to a halt if that stream were to dry up.

The N.I.P. accounts are, of course, not the only source of current economic information. A vast number of other series, ranging from information on the labour force, employment, and unemployment on the one hand to carloadings on the other – to pass from the sublime to the almost ridiculous – are also demanded and furnished. But these cannot serve as substitutes for the N.I.P. accounts which have remained at the centre of interest as a framework for economic analysis.

METHODOLOGY

For a description of the methodology of the quarterly estimates, the reader may refer to *U.S. Income and Output*.[1] Accordingly, the text discussion can be limited to a more summary statement. It focuses on a comparison of the data underlying the quarterly estimates with those available for the preparation of the annual series. Such a focus is appropriate, because we are engaged in an evaluation of the quarterly estimates, taking the usefulness of the annual figures for granted.

The statistical foundation of the quarterly estimates can best be reviewed by reference to the several components of the product and income flow. We shall take up the components of G.N.P., national income, personal income, and personal disposable income in sequence, and then comment on the major items making up the difference between national income and G.N.P.

Personal consumption expenditures – goods

For the estimation of the goods component of consumption about the same data are available on a current quarterly as on

[1] See preceding reference.

an annual basis – mainly sample information on retail sales. Like all generalizations, this one is subject to some qualifications, but these are not important.[1]

Personal consumption expenditures – services

For services the quarterly data are much less adequate than those underlying the annual estimates. This is so for two reasons. First, and more important, a great deal of information becomes available on an annual basis only. Second, some quarterly information is not ready in time for incorporation into the current quarterly estimates.

Gross private domestic investment – new construction

The data underlying the quarterly estimates of new construction put in place are substantially the same as those used in the preparation of the annual estimates. Nevertheless, the quarterly series are weaker. This is so because the estimates are to a substantial extent based on the application of fixed timing patterns to such indicators as building permits or contract awards; the shortcomings of this procedure have a more serious effect on the quarterly than on the annual figures.

Gross private domestic investment – producers' durable equipment

At present the quarterly estimates of producers' durable equipment rely largely on the same data as the annual series – the quarterly Plant and Equipment Survey. However, the Survey does not become available in time for the current quarterly estimates. Accordingly, these are based on planned expenditures reported to the Survey rather than on actual expenditures. This is the major weakness of the quarterly as compared with the annual series.

[1] By 'quarterly estimates' we mean those published in the *Survey of Current Business*, rather than the advance estimates we provide to the Council of Economic Advisers.

In connection with the annual estimates we shall be referring to data sources that are available regularly each year, and not to information that becomes available only every five or ten years—such as census information—or at other long and often irregular intervals.

In the following comments no specific reference is made to the fact that when the data sources differ the initial quarterly estimates are adjusted to the levels indicated by the annual data. The technique most frequently employed to effect this adjustment was devised by V. Lewis Bassie in the 1930s and subsequently described in his book, *Economic Forecasting*, New York, 1958, pp. 653–61.

Gross private domestic investment – change in business inventories

Quarterly sources for the inventory component are less adequate than those at hand for the preparation of the annual estimates, for several reasons. First, up-to-date quarterly information on non-farm business inventories is collected only for manufacturing and trade. Quarterly information on the 'all other' group is too late for incorporation into the current estimates. Second, the quarterly farm inventory component represents a smooth interpolation between annual figures. The quarterly estimates of inventory change during the current year are therefore dependent on anticipated inventory changes and subject to revision when actual annual figures are substituted. Third, given the present methodology, some inventories in transit are probably omitted from the estimates. This affects the annual estimates also, but as a source of error is more important for the quarterly estimates. Fourth, the initial samples for retail trade are subsequently augmented to yield somewhat firmer interim annual estimates. The final annual estimates of the inventory change for all industry groups are based upon tax-return data. These become available with a delay of about 18 months.

Net exports of goods and services

The net export component of the quarterly estimates is based largely upon the same source material as the annual series. However, because of the time schedule, one month of the merchandise trade data is lacking when the quarterly estimates are made; this often introduces errors into the initial quarterly figures. Another limitation to which both quarterly and annual estimates are subject, but which has a more serious effect on the quarterly series, stems from discrepancies between the timing with which exports and imports are recorded and the timing of inventory movements.

Government purchases of goods and services

Essentially the same data are used quarterly as annually for the estimation of Federal purchases, but there are some fairly important exceptions to this statement – referring mainly to information on financial transactions that must be excluded from reported Government expenditures in order to arrive at pur-

chases of goods and services. Also, some of the quarterly information does not appear early enough to be incorporated into the current estimates. Finally, the data from which the estimates are derived are on a cash basis and must be converted to an accrual basis to synchronize with the other segments of the accounts. Information to introduce this timing adjustment is inadequate and this has a more serious effect on the quarterly than on the annual series.

The quarterly estimates of State and local purchases are based on information relating to payrolls and construction activity. The annual estimates are derived from reports on total expenditures which are adjusted to eliminate expenditures other than for goods and services.

Employee compensation

The initial quarterly wage and salary figures are based upon rather solid information – mainly sample surveys of employing establishments. The data for the annual estimates – largely a by-product of the administration of the unemployment insurance system – rank first or second among the sources underlying the major components of the income and product flow.

The data for supplementary labour income consisting of employer contributions for social insurance are available on a current quarterly basis. Information on other supplementary labour income, which consists mainly of employer contributions to private pension funds, is available only annually; the current quarterly figures are extrapolations of past trends, in general.

Entrepreneurial income – non-farm

The quarterly series are based mainly upon sales and production data; representative and up-to-date information on current profit margins is lacking. Comprehensive data on an annual basis on net income are available from tax returns with the 18 months' lag noted earlier.

Entrepreneurial income – farm

The quarterly estimates are based upon comprehensive information on gross receipts. At the time the annual estimates are made this information is usually revised to some extent. But the main additional data that are incorporated into the estimates

at this time relate to farm expenses and inventories; these are not available quarterly in a usable form.

Corporate profits and inventory valuation adjustment

Substantial data for manufacturing, transportation, public utilities and finance underlie the quarterly estimates. Information on trade profits is spotty. For construction and services, we must rely, as in the case of entrepreneurial income, mainly on gross sales or production data. For trade, construction, and services interim annual information based on samples of published company reports is obtained subsequently. For all industry divisions comprehensive annual information, based upon tax returns, becomes available, but only with the lag already referred to.

Rental income of persons and net interest

Very little information is available on these items quarterly. By and large the estimates are smooth extrapolations of past trends and foreseeable changes in them. The final annual series are based to a large extent on tax-return data, although many other sources are also utilized.

Personal and disposable personal income

Most of the components of personal income have been covered in connection with the description of the national income estimates. Quarterly transfer payments – one of the major components not yet discussed – are based upon almost as comprehensive data as the very solid annual estimates. Sample information on dividends is available on a current basis. The annual estimates are derived from tax-return information with the noted lag.

Information on the major components of Federal personal taxes is the same quarterly as annually. With some significant exceptions, the current quarterly estimates of State and local personal taxes are based on the extrapolation of past patterns, pending the availability of the comprehensive data that underlie the annual estimates.

Relation between national income and G.N.P.

Quarterly information on depreciation charges, the main component of capital consumption allowances, is available for

manufacturing on a sample basis. For other industries the quarterly estimates are based mainly on the extrapolation of past trends and foreseeable changes in them. The annual estimates are ultimately derived from comprehensive tax-return data.

Current quarterly information similar to the annual data is available for most of the major Federal components of indirect business tax liability. State and local indirect business taxes are estimated quarterly by reference to relevant indicators – such as sales for sales and excise taxes – or past trends. The annual estimates are based on direct, comprehensive information.

Conclusions

The broad conclusion suggested by the study of the methodology is that it is based upon abundant data sources. The data available for making the current quarterly estimates do, of course, fall short in quantity and quality of those available for the annual series. However, the difference is one of degree – there is no sharp contrast.

In judging the adequacy of the quarterly data it is necessary to keep in mind that in important respects the estimation of quarterly income and product flows is a more difficult task than the estimation of the annual figures. The elimination of seasonal movements is specific to the quarterly estimates; and the synchronization of the various entries in the accounts constitutes in general a more serious problem. Even if the basic data sources available for the preparation of the two sets of estimates were identical, the quarterly series would be less accurate than their annual counterparts.

Seasonal adjustments and the problems of synchronization are taken up in later sections of this paper.

QUANTITATIVE ANALYSIS OF ERROR

In the first part of this section, a method for the quantitative analysis of the reliability of the quarterly N.I.P. estimates is set forth, and the estimates for the period 1947–61 are analysed with its aid.[1] Subsequently, the method is modified and supple-

[1] The method was first developed by Raymond Nassimbene and Benjamin T. Teeter, in *Revisions of First Estimates of Quarter-to-Quarter Movement in Selected National Income Series 1947–1958* (*Seasonally Adjusted Data*), Statistical Evaluation Reports, Report No. 2, Office of Statistical Standards, Bureau of the Budget, Executive Office of the President, Washington 25, D.C., February 1960.

mented by alternative tests, in an attempt to arrive at a more balanced evaluation.

Explanation of method

In studying the reliability of a time series, one may investigate both its level and the quarter-to-quarter changes which it indicates. Inasmuch as the series are used primarily in their change aspect, and the work involved in testing their reliability is quite staggering, the present analysis focuses on the estimates of quarterly change.[1]

Next, it is apparent that both from the standpoint of analysing individual series and from that of comparing various series with respect to their reliability, we are primarily interested in per cent rather than absolute changes, and accordingly the calculations below are in percentage terms.[2]

The initial quarterly estimates of the components of the N.I.P. accounts undergo a series of revisions. Accordingly, we could study the error that attaches to each set. To limit the work, we shall concentrate on the error in the initial estimates of quarterly change; the question whether subsequent interim revisions are better or worse than the initial estimates is of lower priority, and will not be taken up.

It is not feasible to calculate the error attaching to N.I.P. estimates by the methods by which sampling errors are determined. This is so because sampling error is not the only or the most important source of error in the primary data, and because the complex methods by which the estimates of the components of the income and product flow are derived from the primary data make the calculation of sampling errors impossible in any event.

Instead, in the method that will be followed, the last available estimate is taken as the standard of truth, and the deviation of the initial estimate from the last available estimate is taken as the measure of error. The implications of this procedure are

[1] Interrelationships between series may also be studied. See the discussion below.

[2] In the case of inventory change, net exports, and the inventory valuation adjustment, which assume negative values, the absolute changes are studied.

Absolute change may be more relevant for other purposes. For instance, if we wish to set priorities for data improvement, as we shall try to do in a later section of this paper, we shall be thinking implicitly in terms of absolute movement and the accuracy with which this absolute movement is measured, since this is the most important summary characteristic of a given series from the standpoint of assessing its importance in the analysis of aggregate economic activity.

discussed below in connection with the overall evaluation of the method.

Three aspects of error are quantified. In the first place, we measure bias – the extent to which the initial estimates tended to be too high or too low on the average. Second, we measure dispersion – the extent to which the initial estimates differed, on the average, from the final estimates.[1] Finally, we measure the number of times the initial estimates missed the direction of the change.

Specifically, the first of these measures, bias, is calculated for any given component of the N.I.P. accounts by deducting from the initial measure of percentage change the 'final' measure of percentage change and averaging the results for the quarters covered. To obtain relative bias this average is divided by the final measure of average percentage change and multiplied by 100.

For instance, suppose the initial estimates of the per cent change in G.N.P. over three quarters were 7 per cent, 1 per cent, and 3 per cent, and that the corresponding 'final' estimates were 4 per cent, 1 per cent, and 6 per cent. The average bias would be $\frac{2}{3}$ per cent in this example, or about 22 per cent when divided by the final average per cent change to put it on a relative basis. (See Table II.)

The measure of dispersion is calculated by averaging, without regard to sign, the differences between the initial and final estimates of percentage changes; and the corresponding relative measure is obtained by dividing this by the average of final estimates of percentage changes without regard to sign, and multiplying by 100. In our example these two measures would be $2\frac{2}{3}$ per cent and about 73 per cent, respectively.[2]

[1] Estimates may have no bias and yet have dispersion. For instance, the initial estimate may fall short of the final estimate by 2 per cent in one case and exceed it by 2 per cent in the other. The average bias is zero in this case but the average dispersion is 2 per cent. However, our measure of dispersion is such that we cannot have bias without dispersion as we measure it. See next footnote.

[2] This measure of dispersion is not identical with the mean deviation of the percentage changes except in the case in which the bias of the series is zero. In cases in which the bias of a series differs from zero, our measure is for our purposes more useful than the mean deviation. In effect, it measures the average differences between the final and initial estimates, whether due to bias or to dispersion, around the true mean.

In the following example the second column shows the true (i.e. revised) estimate of percentage change, the third and fourth columns show unbiased and biased first estimates, and the fifth and sixth the corresponding differences between the first and the true estimates. The mean deviation of both of the

TABLE II

Illustrative calculation of error measures
(per cent)*

Period	Estimates of quarterly change		Bias		Dispersion		Directional misses		
	Initial	'Final'	Absolute	Relative	Absolute	Relative	Number	Relative number	Relative size of change
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
I	7	4	3		3				
II	1	−1	2		2		1		
III	3	6	−3		3				
Average	$\frac{11}{3}$	$\left\{\begin{array}{l}\frac{9}{3}\\ \frac{11}{3}\end{array}\right.$	$\frac{2}{3}$	$\frac{200}{9}$	$\frac{8}{3}$	$\frac{800}{11}$		$\frac{100}{3}$	$\frac{300}{11}$

* Except column (8).

Source: U.S. Department of Commerce, Office of Business Economics.

The calculation of the number of times the direction of the change is missed is supplemented by a calculation in which this number is expressed as a per cent of the total number of cases. Last, the final average percentage change without regard to sign in the quarters in which the direction of the change was missed is expressed as per cent of the corresponding average change in all quarters. This indicates whether the quarters in which the direction of the change was missed were quarters of small or large change as compared with the average of quarterly changes.

In terms of our example, the number of times direction was missed is one, the relative number is $33\frac{1}{3}$ per cent, and the ratio of percentage change in quarters in which the direction was missed to average per cent change in all quarters is 1 divided by $\frac{11}{3}$, or about 27 in percentage form.

Evaluation of method

The first, and most obvious, shortcoming of the method is the selection (with modifications that will be noted later) of the last published estimate as the standard by which the initial estimate is judged. In actuality, the last estimate is not really a true measure of the event: It is never 'final', but always subject to further revisions; and in strict logic we do not even know whether it represents an improvement over the initial figures. Also, the fact that a first estimate is not revised is not necessarily an indication of its high quality; it may merely reflect the circumstance that no new information bearing upon the initial estimate has become available. Thus, the error measures that have been developed work, strictly speaking, only negatively. Substantial differences between the initial and final estimates point to the unreliability of a series, but smallness of revisions is not a conclusive proof that a series is good.

This point of logic should not be overstressed, however. If one eliminates series that are based on inadequate data that are not improved subsequently, the rating of the remaining series,

differences is 4. This does not bring out that the second (biased) estimate is worse than the (unbiased) estimate. The measure of dispersion set forth in the text—4 for the unbiased estimate and 5 for the biased estimate—does bring out the difference between the quality of the two.

Period	True estimate	First estimate		Differences	
		Unbiased	Biased	Unbiased	Biased
I	3	9	12	6	9
II	0	0	3	0	3
III	−3	−9	−6	−6	−3

based upon the method outlined, is very similar to a rating based on an evaluation of the statistical methodology underlying the series.

Another shortcoming of the method is that it often produces erratic or oversensitive results. This is most obvious in the calculation of relative bias. If the average percentage change of a series is small, the relative percentage bias may assume astronomical proportions which cannot in any practical way be regarded as helpful indicators of its (lack of) reliability.

Take a situation in which the initial estimate of G.N.P. indicated an increase from $500 to $501, and the subsequent and, let us assume, true estimate revised the latter figure to $500½. In this situation I would say that the initial estimate had shown with remarkable accuracy that there had been no significant change in aggregate production. Yet the relative percentage error suggested by the method would be 100 per cent.

Similarly, the measure does not discriminate adequately between the reliability of various series. Assume, for instance, that a component of G.N.P. rose from $50 billion to $60 billion according to the first estimate, but only to $55 billion according to the final and true one. According to the method, the relative percentage error of this series would also be 100 per cent; I would think that the error in it is much more serious than in the illustrative G.N.P. series just cited.

More fundamentally, this method of error quantification emanates from the use of N.I.P. statistics as measures of the up-or-down movement of isolated series, rather than as framework for the causal analysis of the strategic forces at work in the economy. As I shall explain later, it is the latter kind of use that maximizes the potentialities of N.I.P. statistics, and I cannot feel satisfied with a technique for measuring their reliability that relates most directly to a type of use that I consider less fruitful at best and inappropriate if carried too far. Nevertheless, I shall present the results of the method in detail, because it represents about the most stringent test one could apply.[1] As already indicated, I shall subsequently modify it,

[1] These error calculations also imply that the raw figures of quarterly percentage changes will be embodied in economic reasoning without further analysis. But sophisticated users of the quarterly series do not take any observed movement in a series as necessarily meaningful. For instance, in business cycle analysis aimed at the location of cyclical turning points explicit account is taken of the irregular component in the various series before actual downturns are taken as evidence of cyclical turns. The irregular component is isolated using the best

and supplement it by alternative approaches which seem helpful in assessing the usefulness of quarterly N.I.P. accounts.

Selection of periods and series

We tested the quarterly series prepared within the framework of the N.I.P. accounts as established in 1947; the earlier quarterly estimates were not considered. The first initial estimates tested were those of the first-to-second quarter change of 1947; the last initial estimates were those referring to the third-to-fourth quarter of 1961.

All initial estimates of quarterly change were compared with the corresponding estimates as published in *U.S. Income and Output* as brought up to date in the July 1962 *Survey of Current Business*. (The July issues of the *Survey* contain the regular annual revisions of the N.I.P. accounts.) In addition, the initial estimates for 1947–52 were compared with the estimates as they stood in July 1953; those for 1953–56 with the corresponding estimates as they stood in July 1957; and those for 1957–61 with the estimates of July 1962. This was done to trace possible time trends in the quality of the estimates.[1]

In principle, all series were tested that were published in a continuous form throughout the postwar period. Some exceptions to this principle were made. On the one hand, the Government purchases and foreign components of G.N.P., which had

statistical tools available, and it is only when movements persist which cannot be explained by irregular vagaries that it is assumed that cyclical turns have indeed occurred. Seen in this light, errors in estimation can be regarded as additional factors which contribute to the overall irregularity. It would be interesting to investigate whether the contribution made by errors of estimation is a significant component of the overall irregularity.

[1] Each of the three standards that were used represent the last set of estimates prior to benchmark revisions of the annual estimates that are carried through mainly to incorporate census and other data that become available at long or irregular intervals. To take the last available estimate as the standard by which to judge subperiods would stack the calculations in favour of showing progressive improvement, because the estimates referring to the earlier post-war period underwent more revisions than those for later parts of it. In particular, unlike the 1947–57 figures, those for 1958–61 have not as yet undergone a benchmark revision. The application of separate standards to the subperiods introduces a degree of ambiguity into the comparison of the subperiod results with those obtained for the period as a whole. Also the manner of splitting the post-war period has the disadvantage of having the initial estimates for 1953 judged by the estimates for that year that held in 1957 and the initial estimates for 1957 by those for that year that held in 1962. In other words, in these two cases initial estimates are judged by standards that incorporate a subsequent benchmark revision. Also the three subperiods are not of equal length, and this, too, may affect the results somewhat. But I have not been able to think of a neater device for analyzing the subperiods, and do not believe that the above blemishes are important.

undergone a definitional change in 1958, were reconstructed for the entire period on the basis of the new definition, in order to make them suitable to the test. On the other hand, a few series, even though they had been published on a continuous basis, were omitted. This included the breakdown of payrolls into private, military, and civilian government; business transfer payments, the surplus of Government enterprises net of subsidies, and the excess of wage accruals over disbursements. The last three of these are insignificant and subject to idiosyncrasies that make them unsuited to the test.

The major results of the error study are presented below. The detailed tabulations in Appendix 3 contain additional material with the aid of which the analysis can be pursued further.

Gross national product

Table III summarizes the error measures for G.N.P. and its components, adjusted for seasonal variation, for the period 1947–61 as a whole. It shows, for instance, that for the total G.N.P. the initial estimates of quarterly change tended to be somewhat too low. The average understatement was ·17 per cent. As can be seen from Appendix 3, this is the difference between the final estimate of average quarterly change, which was 1·50 per cent, and the initial estimate, which was 1·33 per cent. In terms of the final estimate, the average understatement was 11 per cent.

The average difference, without regard to sign, between final and initial percentage change was ·68 per cent. We divide by 1·92 per cent, which is the final estimate of average percentage change, again without regard to sign (see Appendix 3), and observe that the initial estimate of relative quarterly change differed on the average by 35 per cent from its final counterpart.

Finally, the table shows with reference to total G.N.P. that the initial estimates missed the direction of the change in 8 per cent of the cases. As the more detailed tabulation indicates, the absolute number of cases in which direction was missed was five. This tabulation also shows that these quarters were typically quarters of below average percentage change: The absolute average percentage change in the quarters in which direction was missed was 53 per cent of the absolute average of all quarterly percentage changes.

TABLE III

Measures of error in seasonally adjusted gross national product and its components, 1947–61
Quarter compared with previous quarter
(per cent)*

	Bias	Relative bias	Dispersion	Relative dispersion	Directional misses (relative number)
Gross national product	−·17	−11	·68	35	8
Personal consumption expenditures	−·26	−20	·51	32	2
Durable goods	−·95	−51	1·91	41	14
Non-durable goods	−·18	−19	·65	52	8
Services	−·24	−13	·40	22	—
Gross private domestic investment	·07	4	4·17	54	14
New construction	−·58	−27	1·96	63	14
Producers' durable equipment	·94	107	2·86	69	12
Change in business inventories	−·25	−278	2·19	71	19
Net exports of goods and services	−·09	113	·75	79	22
Government purchases of goods and services	−·09	−4	1·75	50	12
Federal	−·06	−2	2·64	54	19
State and local	−·20	−8	1·12	43	3

* Except bias and dispersion for change in business inventories and net exports which are in billions of dollars, seasonally adjusted at annual rates.
Source: U.S. Department of Commerce, Office of Business Economics.

The table furnishes the same type of information for the several components of the seasonally adjusted G.N.P. Using relative bias and relative dispersion, the most stringent measures, along with the relative number of directional misses, the major patterns that emerge are as follows:

1. As usual in this type of work, which relies on offsetting error, the guardian angel of national income estimators, the revisions tend to be smaller in the aggregates and broad components than in the more detailed subcomponents.

2. In terms of broad components, personal consumption is the main source of the 11 per cent downward bias in the initial G.N.P. estimates. Gross private domestic investment and Government purchases showed little bias over the postwar period as a whole.

3. Each of the three components of consumption had a downward bias. The bias was largest for durables and smallest for services, with non-durable goods in an intermediate position. For investment the small bias in the total was due to offsetting biases in the several components. The small bias for Government was shared by the Federal and State and local components.

4. The average relative dispersion of the initial estimates around the final estimates was somewhat less for consumption than for the G.N.P. total: 32 per cent as compared with 35 per cent. It was significantly higher for the other major G.N.P. components: 54 per cent for investment, 50 per cent for Government purchases, and 79 per cent for net exports.

5. In terms of the dispersion of subcomponents, it can be seen that consumer goods did worse, and services better than the consumption total; that dispersion for all subcomponents of investment exceeded that of the total; and that Federal purchases did a little worse and State and local purchases a little better than the combination of the two.

6. The per cent of directional misses was lower for consumption than for any of the other broad components of G.N.P. – 2 per cent as compared with 14 per cent for investment, 22 per cent for net exports, and 12 per cent for Government.

7. Within consumption, the proportion of misses for durable and non-durable goods exceeded the average. However, expenditures for services did not record a single miss. This is not surprising in view of the fact that this is a relatively stable series with a strong upward trend.

The proportions missed for the several subcomponents of investment are similar to that for the total. Finally, the proportion of times direction was missed for State and local government was much less than the proportion for Federal Government. Again the explanation lies in the fact that the former series was subject to a strong uptrend.

The income series

Table IV shows summary error measures for the major income series and for personal saving, all adjusted for seasonal variation. Attention should again be drawn to the fact that these numbers, while helpful and suggestive, cannot be relied upon mechanically. The 825 relative per cent bias calculated for the farm income series is surely not a reasonable indicator of its limitations. Rather it is to be looked upon as a mechanical result thrown up by the method which required the division of a ·66 average percentage difference between the initial and final estimates of percentage change by a very low estimate of final average percentage change, —·8 per cent. The limitation of this type of calculation is visible to the naked eye in extreme cases such as this one, but it should be kept in mind that it might affect other cases also, though with less obtrusive results. For instance, the high error coefficients attaching to rental income summarize a series which shows only minor quarterly changes; minor revisions in these minor changes are blown up into large error coefficients by the method.

1. The major income measures – national income, personal income, and disposable income – each make a more favourable showing than the G.N.P. Their downward bias is significantly lower: 6, 8, and 6 per cent, respectively, as compared with 11 per cent for G.N.P.; and dispersion for national and personal income is also lower: 26 and 28 per cent as compared with 35 per cent. The dispersion for disposable personal income is about the same as that for G.N.P. As regards the per cent of cases in which direction was missed, the situation is somewhat of a draw. National income, personal income, and disposable income get scores of 3, 8, and 10 per cent, respectively, as compared with 8 per cent for G.N.P.

2. It appears that the higher quality of the income series is traceable mainly to the large employee compensation component. This has a downward bias of 7 per cent and a dispersion

TABLE IV

Measures of error in seasonally adjusted income series and personal saving, 1947–61
Quarter compared with previous quarter
(per cent)

	Bias	Relative bias	Dispersion	Relative dispersion	Directional misses (relative number)
National income	−·09	−6	·52	26	3
Compensation of employees	−·11	−7	·45	25	7
Proprietors' income	·16	30	2·15	93	28
Business and professional	−·03	−3	1·28	77	15
Farm	·66	825	5·73	101	25
Rental income of persons	−·63	−52	1·56	103	15
Corporate profits and I.V.A.	−·30	−16	3·65	58	20
Net interest	−1·21	−39	1·71	55	2
Personal income	−·11	−8	·46	28	8
Disposable personal income	−·08	−6	·56	36	10
Personal saving	−7·87	−51	20·47	66	31

Source: U.S. Department of Commerce, Office of Business Economics.

of 25 per cent, and a proportion of directional misses of 7 per cent. The other income components do significantly worse. Their bias is generally much larger than that of employee compensation or aggregate income, and also tends to be higher than that of the G.N.P. components – although this latter conclusion is somewhat dependent on the weights one attaches to the several measures. As to relative dispersion, the situation is more clear-cut. Income series other than employee compensation have a much worse record than employee compensation or the income totals, and also than G.N.P. and a preponderance of its components. As to directional misses, the income components other than employee compensation also tend to be inferior.

Seasonal adjustment

No reference has been made so far to the error coefficients calculated for the series not adjusted for seasonal variation, which are shown in Appendix 3. The measures of relative percentage bias and relative percentage dispersion attaching to these series are in general much lower than those attaching to their adjusted counterparts. However, in the interpretation of this result, it is important to diagnose the causes of the difference. The measures of absolute percentage bias tend to be no lower for the unadjusted than for the adjusted series, and the measures of absolute percentage dispersion are generally much higher. The superior performance of the unadjusted series as regards relative percentage bias and dispersion is due entirely to the fact that in deriving these relative percentage measures the absolute percentage measures are divided by denominators that are much larger in the case of the unadjusted series than in the case of the adjusted series. Seasonal adjustment reduces the quarterly percentage changes of the revised and unrevised estimates, but does not affect the order of magnitude of the differences between these two sets of changes.

Time trends

Error measures of the type calculated for 1947–61 as a whole were prepared also for three subintervals in order to determine whether significant changes have occurred in the reliability of the estimates during the postwar period.

The division of the whole period into three subintervals reduces the number of observations upon which the summary

measures of error are based and therefore tends to increase the number of instances in which the method produces sports. It becomes more difficult, therefore, to derive valid conclusions from the calculations.

Table V presents the summary measures of error for the subintervals of the postwar period for G.N.P., national income, personal income, and disposable personal income. As can be seen from the table, the estimates for the final interval, 1957–61, tend to be better than for the prior two subintervals with respect to bias and dispersion, though they are inferior as to directional misses for personal and disposable income.

If this type of comparison is extended to the subcomponents of G.N.P. and income, the pattern of improvement suggested by the major aggregates continues to be traceable in certain of them but in less regular form.

Personal consumption shows a pattern of improvement similar to that suggested for G.N.P. as a whole, and a similar though less regular pattern persists in the three subgroups of consumption. For Government purchases also we can trace some tendency for improvement similar to that indicated for the G.N.P. total, although in this case the pattern is much clearer for the State and local than for the Federal component. As regards the national income, the pattern of improvement visible for the total can be traced also in employee compensation.

But here the clear evidence of improvement ends. A benevolent interpreter might refer to a reduced dispersion of the investment component of G.N.P. and to a reduction in the directional misses it exhibited; but he would find little comfort in the behaviour of its bias. He might detect some improvement in entrepreneurial income, and he might also welcome the reduction in the dispersion of the corporate profit series; but he would have to note that the bias of the latter has apparently worsened over the postwar period. As regards rental income and net interest no trend towards improvement is visible. In fact, one might argue that the quality of the rent estimates has deteriorated, although I would not attach too much significance to this conclusion.

Alternative views of the quarterly comparisons

The method that has been followed so far has provided a microscopic view of the errors attaching to the quarterly esti-

TABLE V

Subperiod measures of error in major seasonally adjusted product and income aggregates
Quarter compared with previous quarter.
(per cent)

	Bias	Relative bias	Dispersion	Relative dispersion	Directional misses (relative number)
Gross national product					
1947–52	—·29	—14	·84	34	9
1953–56	—·21	—19	·52	36	12
1957–61	—·03	—3	·31	18	—
National income					
1947–52	—·11	—5	·73	27	4
1953–56	—·08	—8	·35	24	12
1957–61	—·06	—5	·29	17	—
Personal income					
1947–52	—·08	—5	·60	28	13
1953–56	—·11	—10	·29	23	—
1957–61	—·07	—6	·28	23	10
Disposable personal income					
1947–52	—·04	—2	·70	32	13
1953–56	—·10	—9	·37	31	—
1957–61	—·04	—4	·38	34	15

Source: U.S. Department of Commerce, Office of Business Economics.

mates. However, there are alternative approaches; these provide a view of the situation as seen with the human eye from a greater distance, as it were. While it cannot be proved that these alternative views are superior, it can be maintained that they are necessary to a balanced survey of the situation.

One such approach is via a study of the charts (see end of text)[1] that compare the initial and revised estimates of percentage change in the components of the quarterly N.I.P. accounts. The impression that is gained here is one of considerable

TABLE VI

Correlation between initial and revised estimates of seasonally adjusted quarter-to-quarter percentage changes in gross national product and income series and personal saving, 1947–61

	Correlation coefficient	Square of the correlation coefficient corrected for the number of degrees of freedom
Gross national product	·88	·76
Personal consumption expenditures	·91	.83
Durable goods	·92	·85
Non-durable goods	·74	·54
Services	·45	·19
Gross private domestic investment	·83	·69
New construction	·79	·62
Producers' durable equipment	·73	·53
Change in business inventories	·80	·63
Net exports of goods and services	·71	·49
Government purchases of goods and services	·84	·71
Federal	·87	·75
State and local	·58	·33
National income	·93	·87
Compensation of employees	.91	·83
Proprietors' income	·50	·24
Business and professional	·64	·40
Farm	·41	·16
Rental income of persons	·10	·00
Corporate profits and I.V.A.	·77	·59
Net interest	·09	·00
Personal income	·89	·79
Disposable personal income	·85	·72
Personal saving	·64	·40

Source: U.S. Department of Commerce, Office of Business Economics.

[1] In the original draft the charts contained all components listed in Table VI. To save space a number of these have been deleted.

conformity between the initial and final results. I think that there will be substantial agreement as to this proposition when applied to the better components of the accounts. Needless to say, opinions will begin to differ as we descend on the quality scale; and hardly anyone will find satisfaction in the behaviour of the worst elements.

Table VI embodies another approach. It presents the correlation coefficients between the initial and final estimates of percentage change in the major components of the quarterly N.I.P. accounts. As can be seen, this approach provides a view that is very similar to that conveyed by the charts. Two interesting exceptions may be noted: Consumer services and State and local government purchases get a very low ranking in Table VI – much lower than was to be expected in the light of the earlier tests through which these two series were put. This anomaly seems to be due to the fact that the quarterly per cent changes in these estimates tend to be constant; in terms of a scatter diagram they would show a fairly tight circular cluster rather than a tight cluster along a line.

Quarter-to-previous-year and year-to-previous-year comparisons

In addition to the quarter-to-quarter comparisons which we have analysed, the quarterly N.I.P. accounts are frequently used for two other purposes: first, to answer the question of how we stand currently in relation to the past year; and, second, the question of how the most recent year compares with the year preceding it. In connection with the second question, the sum of the estimates for the four quarters is used as a preliminary measure of the annual performance.

While perhaps not quite as important as the use of the data in strictly quarterly comparisons, these supplementary uses of the estimates deserve to be noted. In Tables VII and VIII error coefficients analogous to those developed so far have been calculated to throw light on the use of the data in connection with the first question. Tables IX and X present error coefficients that are relevant to the second question. Somewhat more detailed calculations are shown in Appendices 4 and 5.

TABLE VII

Measures of error in seasonally adjusted gross national product and its components, 1947–61
Quarter compared with previous year
(per cent)*

	Bias	Relative bias	Dispersion	Relative dispersion	Directional misses (relative number)
Gross national product	−·76	−12	1·08	16	3
Personal consumption expenditures	−·68	−12	·93	16	5
Durable goods	−1·72	−23	2·59	24	3
Non-durable goods	−·05	−1	·75	17	—
Services	−1·14	−15	1·41	19	—
Gross private domestic investment	·52	7	4·44	27	3
New construction	−1·77	−18	2·75	26	14
Producers' durable equipment	2·60	37	5·21	39	7
Change in business inventories	−·32	−110	2·01	38	8
Net exports of goods and services	·04	67	·49	21	3
Government purchases of goods and services	−·41	−4	1·98	16	2
Federal	−·35	−3	2·87	16	3
State and local	−·90	−8	2·13	19	—

* Except bias and dispersion for change in business inventories and net exports of goods and services which are in billions of dollars, seasonally adjusted at annual rates.

Source: U.S. Department of Commerce, Office of Business Economics.

TABLE VIII

Measures of error in seasonally adjusted income series and personal saving, 1947–61
Quarter compared with previous year
(per cent)

	Bias	Relative bias	Dispersion	Relative dispersion	Directional misses (relative number)
National income	−·19	−3	1·03	15	2
Compensation of employees	−·42	−6	·90	13	7
Proprietors' income	1·47	74	3·28	68	17
Business and professional	1·41	41	4·10	82	24
Farm	1·30	500	6·12	56	19
Rental income of persons	−2·25	−48	4·20	79	29
Corporate profits and I.V.A.	·71	9	3·84	25	8
Net interest	·36	3	9·69	73	—
Personal income	−·29	−5	1·08	18	5
Disposable personal income	−·12	−2	1·18	21	3
Personal saving	3·10	26	19·34	64	19

Source: U.S. Department of Commerce, Office of Business Economics.

TABLE IX

Measures of error in gross national product and its components, 1947–61
Year compared with previous year

(per cent)*

	Bias	Relative bias	Dispersion	Relative dispersion	Directional misses (relative number)
Gross national product	−·40	−6	·74	11	7
Personal consumption expenditures	−·49	−9	·77	13	—
Durable goods	−1·77	−24	2·21	22	—
Non-durable goods	·22	5	·68	15	—
Services	−1·02	−13	1·23	16	—
Gross private domestic investment	−·21	−3	2·64	17	—
New construction	−1·72	−17	2·09	20	7
Producers' durable equipment	1·94	27	4·40	35	—
Change in business inventories	−·39	−134	1·27	26	—
Net exports of goods and services	−·05	−83	·20	9	7
Government purchases of goods and services	−·20	−2	1·07	9	7
Federal	·01	—	1·54	9	—
State and local	−1·22	−11	2·29	21	—

* *Except bias and dispersion for change in business inventories and net exports* which are in billions of dollars, seasonally adjusted at annual rates.

Source: U.S. Department of Commerce, Office of Business Economics.

TABLE X

Measures of error in income series and personal saving, 1947–61
Year compared with previous year

(per cent)

	Bias	Relative bias	Dispersion	Relative dispersion	Directional misses (relative number)
National income	−·29	−5	·91	14	7
Compensation of employees	−·39	−6	·67	10	13
Proprietors' income	−1·40	71	2·52	55	27
Business and professional	1·45	42	4·30	91	27
Farm	1·42	546	3·98	41	7
Rental income of persons	−2·34	−49	4·15	78	27
Corporate profits and I.V.A.	−·43	−5	4·31	31	13
Net interest	−3·75	−28	4·77	36	—
Personal income	−·29	−5	·83	14	—
Disposable personal income	−·11	−2	·93	16	—
Personal saving	1·12	9	13·87	51	7

Source: U.S. Department of Commerce, Office of Business Economics.

As can be seen from these tables, the error coefficients attaching to these uses of the estimates are in general much smaller than those attaching to the quarter-to-quarter comparisons. A progressive improvement is apparent as we pass from the quarter-to-quarter to the quarter-to-year and to the year-to-year comparisons, although there are exceptions to this overall pattern which at first blush seem paradoxical. It can be shown that most of them can occur even if the span of time covered and the series used as 'first' estimates are identical in the three sets of comparisons. The fact that the values used as 'first' estimates are not necessarily the same in all three comparisons, and that the time period covered in the last one is not the same as in the first two, accounts for the remainder of the unexpected cases and reinforces the others.

Relations among series

Intensive use of the quarterly estimates involves the study of the interrelationships among the various components of the income and product flow. The techniques that have been used so far have not dealt with the margin of error that is introduced into the study of such interrelationships through statistical imperfections of the N.I.P. accounts, and it is not easy to devise techniques that will. The main point to keep in mind in this connection is that the study of interrelationship is generally based upon lengthy time series, and that in such series usually only the terminal observations reflect the imperfections of the first estimates.

To probe into this matter we made the following tests: (1) We made an estimate of the marginal propensity to consume by regressing personal consumption expenditures on disposable personal income for the quarters of 1947 through 1953, first by using the estimates for that period that were available at the beginning of 1954, and, second, by using the estimates for that period that were available as of July 1962. (2) Analogous calculations were made for the period 1947 through 1957. (3) A calculation similar to (1) was made for the relation between personal income and gross national product. (4) A calculation similar to (2) was made for the same relation. The results are shown in Table XI.

As can be seen from this table, the coefficients derived from the initial estimates are very close to those derived from those

TABLE XI

Regression coefficients: personal consumption expenditures on disposable personal income, and personal income on gross national product

	Based on quarterly estimates for 1947–53	1947–57
Consumption on income, from		
estimates available at end of period	·807	·883
estimates available as of July 1962	·807	·872
Income on G.N.P., from		
estimates available at end of period	·689	·752
estimates available as of July 1962	·720	·758

Source: U.S. Department of Commerce, Office of Business Economics.

in use now. In none of the cases are the differences statistically significant.

Needless to say, this is only a glimpse at a large subject. The two relationships that were tested are of a simple, unsophisticated type. More complex relationships may or may not be more sensitive to statistical error in the quarterly series. In at least some of the cases in which they might turn out to be more sensitive, the more substantial differences might not be statistically significant because of a larger standard error associated with them.

THE USEFULNESS OF THE ESTIMATES

The foregoing discussion leaves one with two major impressions: First, there is a continuing insistent demand for quarterly N.I.P. statistics. Second, the statistics appear to be subject to a substantial margin of error when judged by the more stringent tests. There are two explanations for this paradox. It might be argued, in the first place, that the users of the estimates are deceiving themselves, and that they are clamouring for something that is actually of no value to them. The second interpretation, which I find more reasonable and congenial, is that the statistics are genuinely useful in spite of their inaccuracies, and that the error coefficients that are produced by the more stringent tests are in some sense exaggerated and misleading.

Strictly speaking, of course, the tests do not state whether 27 per cent or 35 per cent average relative dispersions, for instance, are indicative of errors that are 'small' or 'large'. But I venture to say that it is the latter rather than the former impression that is created if one deals with these coefficients in a vacuum. However, if these coefficients happen to attach, as they do, to components of the N.I.P. accounts that have proved very useful in economic analysis, the proper interpretation is that 26 per cent and 35 per cent errors are 'small'.

In other words, one cannot really judge the extent of usefulness of a series simply by reference to the size of some error coefficient. It is almost the other way around. The extent of usefulness of a series must be known before one can really judge whether a given error coefficient is 'small' or 'large' in a relevant sense.

Further, to judge whether a statistical series is useful one has to specify the use one has in mind. This holds for any tool. A butter knife, for instance, is highly useful for spreading butter, but for shaving it is no good. Ultimately, therefore, we can evaluate the quarterly N.I.P. accounts only by reference to some specified type of use. An attempt is made in the following paragraphs to formulate in a broad sort of way the unique contribution of the quarterly N.I.P. accounts to economic analysis, in the light of actual experience.

Causal order-of-magnitude analysis

The main forte of the N.I.P. statistics is, I believe, that they provide a logical framework for the order-of-magnitude analysis of the major forces that determine the working of the economy in the short run. This statement can be elaborated as follows. First, the estimates are presented within the framework of a disciplined accounting system in which the various economic flows are shown in their relation to each other. The structure and classifications of the system have been designed so as to make possible a realistic description of the important features of the U.S. economy and hence tend to meet the requirements of competent economic analysis and policy formulation. No comparable logical framework for the study of the economic mechanism exists.

However, a logical framework is not sufficient, and this brings me to the second point. I believe that the entries into the system,

even though they lack precision, are usually solid enough to give a correct indication of the direction in which aggregate economic activity is moving and of whether the change is large or small. Of equal importance, they show the major factors that they are making for the change, and their relative importance. In other words, they provide the basis for what I have called an order-of-magnitude analysis of economic events. This is a type of analysis which, although it does fall short of precise quantification, is much more definite than a purely qualitative one.

Third – and implicit in the foregoing – is the view that the most important function of N.I.P. statistics is not the exact measurement of the ups and downs of aggregate income and production or their components, but the provision of empirical material for the study of the cause-and-effect relationships that determine the economic process.

My evaluation of the quarterly N.I.P. statistics can best be summarized by a reference to a passage in the London *Times* for 16 November 1894, which is quoted by Samuel Butler in his *Authoress of the Odyssey*: " 'There is no single fact to justify a conviction, said Mr. Cock: whereon the Solicitor General replied that he did not rely upon any single fact, but upon a chain of facts, which taken all together, left no possible means of escape.' (The prisoner was convicted.)"

This evaluation should not be taken to imply lack of concern with the present inaccuracies of the statistics or lack of interest in their future improvement. Quite to the contrary. These inaccuracies are a handicap in the use of the estimates, and improvements are highly desirable.

Deficiency of economic theory

However, another view is definitely implied. I cannot subscribe to the opinion that the margin of error to which the quarterly statistics are subject is the major – or indeed a major – limitation in their effective application. In my opinion the shoe pinches on another foot. The major handicap we have to deal with is the weakness of economic theory and of the techniques for testing alternative economic hypotheses. This is said not in denigration of the economists, statisticians, and econometricians who are engaged in this area of work. At best the economic system is a mechanism that is not matched in complexity by the systems that are investigated by other branches of science. At

worst – at least from the standpoint of analysis as distinct from that of human dignity – it may include an element of genuine indeterminancy, having to do with the freedom of will. Unlike in other branches of science, the opportunities for the experimental test of hypotheses are virtually non-existent. This puts further limitations on the possibility of discovering economic laws and regularities. Whatever the main handicaps, there can be no doubt that the formulation and testing of useful economic hypotheses is an enormously difficult task. In this light, it may not really be shocking to maintain that the main obstacles to the effective use of N.I.P. statistics emanate from this source, rather than from their lack of accuracy.

AGENDA FOR FUTURE WORK

Improvements in the primary data and additions to the quarterly N.I.P. information will be discussed in turn in this section. Before we comment on desirable improvements of specific series, three general areas in which additional work is indicated are singled out.

Mechanization

The availability of electronic computers has sparked sundry proposals for the mechanization of the estimating procedures by means of which the quarterly N.I.P. accounts are derived. The most ambitious of these proposals envisage the establishment of a computer programme in which the various primary data sources that are the raw materials of N.I.P. estimation constitute the inputs, and the output is the complete, full-fledged system of quarterly accounts.

In our view, this is not a practicable proposal for the foreseeable future, unless the flow of primary information is completely revamped; this, in turn, is not a realistic prospect.

As matters now stand, the N.I.P. series are derived from a great variety of data sources – hundreds of them – that are collected for purposes that are generally unrelated to N.I.P. estimation. These sources are not uniform over time, often contradict each other and always exhibit significant gaps. The definitions and classifications to which they answer do not conform to those underlying the national accounts. As a result, N.I.P. estimation at its best is a highly skilled craftsmanlike

operation which is not sufficiently streamlined, large-scale, and repetitive to benefit from the economies of wholesale mechanization.

This does not mean, of course, that individual steps in the estimation process cannot be mechanized. Quite the contrary, there are substantial opportunities in this direction. An outstanding example, discussed below, is adjustment for seasonal variations. But there are other operations of a more or less routine nature that also could be mechanized.

Furthermore, these opportunities can be broadened, if one is willing to relax standards that can be achieved only through the laborious and painful application of individual craftsmanship, and be satisfied with results that are not quite so good. Such a relaxation of standards would seem to be advisable simply from the standpoint of liberating the skills involved for other tasks. A welcome by-product of such a change in procedure would be a reduction of the judgemental element that enters into the estimates. While I believe that the application of experienced judgement generally improves the statistical results, the exercise of such judgement is a cause of suspicion to many of the users of the estimates, and an occupational hazard to the estimator operating under this cloud which he would be happy to avoid.

Seasonals

The advent of electronic computers has been most beneficial not only in improving the techniques of seasonal adjustment but also in reducing human drudgery. We have made greatly increased use of them in recent years, but the opportunities for mechanization have not as yet been fully utilized.

While a more extensive use of electronic computers for seasonal adjustment should be pressed, it should be recognized at the same time that they have not eliminated the need for human judgement whenever large and irregular seasonals that do not follow docile textbook patterns occur. With respect to these troublesome items constant vigilance will continue to be called for and – priorities permitting – an increased allocation of resources to this task.

Further research into the many unsolved problems of seasonal adjustment should also be undertaken; in this connection as well electronic computers have opened vistas that could not be contemplated before.

Needless to say, there is no assurance of a dramatic payoff, even if all suggestions made here are followed up. In particular, it is unlikely that the wide gap between the quality of the unadjusted and adjusted series which is indicated by a first reading of the quantitative analysis of error will be significantly narrowed, if we have given a valid explanation of the factors responsible for this gap. In all probability, we shall have to be satisfied with modest improvements.

Intimately related to the question of seasonals is the status of the unadjusted quarterly estimates. As mentioned in the text, and as explained in greater detail in *U.S. Income and Output*, the publication of unadjusted income series other than corporate profits was discontinued in 1958, essentially because the data sources were not sufficient for the preparation of genuinely unadjusted income series. For instance, the source data for the quarterly wage and salary estimates do not include year-end bonuses. These are covered in the annual data, and are spread among the quarters in the course of interpolating and extrapolating the annual estimates. Again, information on profit margins is not available for the estimation of quarterly non-farm entrepreneurial income; in many lines of business in which the non-corporate form of organization is prevalent – such as construction and trade – these margins are probably subject to substantial seasonal variation. In this instance also genuinely unadjusted estimates could not be prepared. To cite one more example, in the estimation of farm income the problem of seasonally adjusted versus unadjusted series is particularly acute, because the whole notion of farm production on a less than annual basis is probably tenuous even conceptually and certainly hard to implement statistically.

Needless to say, whenever unadjusted series cannot be prepared, it is not possible, strictly speaking, to produce seasonally adjusted estimates either. In these circumstances the latter will invariably involve the smoothing of random elements. However, the series called 'seasonally adjusted' are certainly much closer approximations to what would be genuine seasonally adjusted series than our so-called unadjusted series were to genuine series not adjusted for seasonal variation.

As I have already indicated, user-interest seems to be focused almost exclusively on the adjusted series.

Nevertheless, it is sound statistical practice to publish, if at

all feasible, unadjusted series whenever adjusted series are published, and undoubtedly there are some uses which require the former. Accordingly, it would be advisable to plan work directed at the preparation of unadjusted quarterly series, although it cannot receive very high priority.

Synchronization

The second general area in which work is called for relates to the timing with which the various transactions are recorded in the national economic accounts. Lack of proper synchronization affects the annual estimates as well as the quarterly estimates, but the effect is likely to be more serious on the latter.

The general issue is, of course, that all parties involved in a given economic transaction must in the national economic accounts report that transaction at the same time; or, if differences in timing are appropriate, these must be recorded systematically. If these conditions are not met, the accounts are thrown out of gear. Timing discrepancies are probably a significant source of error in the present quarterly N.I.P. accounts; and unless kept under control, they would be an even more serious threat if, as recommended later, the accounts were to be extended to encompass quarterly changes in financial assets and liabilities.

Take, for instance, a sale by one business to another. When the sale is made the item probably disappears from the inventory component of G.N.P., causing an excess of debits over credits in the national income and product accounts; this is offset by an excess of credits over debits in that account when the purchase is recorded in the books of the recipient. As far as the financial mirroring of the transaction is concerned, the picture is likely to be even more distorted. The financial assets and liabilities of the parties involved – the seller, the buyer, the bank of the seller and the bank of the buyer – are not apt to be properly synchronized until the cheque which the buyer has issued is returned to his bank and results in a reduction in his deposit account.

Not enough work has been done to disentangle the rather complex timing discrepancies that may be involved and in formulating a consistent procedure for dealing with them; and the primary data sources and estimating techniques to implement theoretical decisions are equally inadequate. Appendix 6

contains some notes in which I try to sort out the major accounting relationships. These notes are tentative and may miss the mark, but they may serve to stimulate the analysis of this rarely discussed subject.

The timing problems sketched out so far, and discussed in greater detail in the Appendix, would be present even if each economic unit maintained a set of accounts based on uniform accounting principles and reported its transactions for precisely identical spans of time. Needless to say, this is not the case and numerous additional inconsistencies of a cruder kind, as it were, are introduced for that reason.

To mention only a few sources of potential error: The estimates of private wages are based upon reports covering a week's operation each month, and even though every effort is made to infer from them payroll costs for the quarter as a whole there is really no assurance that these figures will be synchronized precisely with the corporate profits estimates which are based on quarterly reports. Again, Government expenditures are reported on a cash basis; to synchronize them with the business accounts of sales and inventories, they are put on an accrual basis with the aid of partial information. Obviously, this also may give rise to errors of synchronization. To cite yet another example, there may be considerable discrepancies between the timing that underlies sales of producers' durable equipment on which the inventory change component of the national income and product account is based, and the timing that underlies the reporting of these transactions as purchases in the Plant and Equipment Survey which underlies the estimate of the producers' durable component of the same account.

Most of the statistical reporting systems upon which the N.I.P. estimates rely have been set up for separate use instead of as part of an interrelated system, and accordingly the synchronization of these systems has not been a matter of special concern. Nor was a systematic attack upon the problem possible in these circumstances. With the advent of the national economic accounts, especially in a less than annual form, proper timing becomes a matter of utmost importance, and at the same time a framework for working out a solution is provided. There is, of course, no assurance that work in this area will yield prompt and substantial returns. It is also apparent that the cost of improvements will be heavy. The only chance of success lies in

a selective approach which tries to uncover and deal with the most acute problems.

Improvement of specific series

New construction, change in business inventories, and corporate profits. – These three series need strengthening most urgently on a quarterly basis. All of them fluctuate widely and are of strategic importance in the business cycle; this is the reason why they should be improved further even though they are by no means at the bottom of the list as far as the adequacy of their present statistical foundation is concerned.

The official construction statistics are now undergoing a basic overhaul on the part of the Census Bureau, which assumed responsibility for them a few years ago. From the standpoint of the quarterly N.I.P. accounts the first requirement is the development of techniques that will yield a better timing, although improved coverage and valuation are also desirable.

The business inventory data should be improved by strengthening the sample for trade. The manufacturing series are now being put on a new basis, and pending experience with the new series no recommendations can be made. Consideration should also be given to the establishment of an adequate and up-to-date quarterly reporting system for non-farm inventories outside manufacturing and trade. The total holdings of such inventories are not large, but quarterly changes in them have accounted for as much as $1 billion at annual rates. Such a reporting system would be relatively costly, but given the interest that attaches to inventory movements, the expenditure might be worth while.

Reported inventory change data are converted to a uniform valuation method appropriate to N.I.P. accounting – physical change valued at the prices of the period. The information available for making the inventory valuation adjustment is not satisfactory, especially on a quarterly basis; the effort involved in securing improvement would be very costly, but sooner or later it will have to be made.

The collection of quarterly corporate profit information should be extended to the industries not now covered. First on the list of priorities are wholesale and retail trade. It is not clear whether an attempt should be made to cover construction and services also. The amounts involved are small; it would be costly to collect valid information for these two industry divisions;

and in the latter quarterly fluctuations would probably be small.

As has already been mentioned, the collection of quarterly profits information is subject to a special lag. In the past this has made it impossible to prepare estimates of corporate profits at the same time as for all the other components of the quarterly accounts. This situation has been unfortunate, both because of the interest that attaches to corporate profits, and also because absence of corporate-profit data at the time at which the quarterly accounts are being put together makes it impossible to apply the major consistency test of comparing total debits and credits in the national income and product account. Recently, we have registered some success in speeding up the information for manufacturing, and hope that we may eventually have a valid estimate of this important component of total profits in time for use in connection with the initial quarterly publication of the N.I.P. accounts. It would be important to establish a similar time schedule for the other industries now covered or to be covered if they typically show large quarterly profit fluctuations.

Consumer services, entrepreneurial income, and State and local government purchases. – Next in order of priority I would suggest additional data collection bearing on these three series.

Currently quarterly information on services is most inadequate, and this has resulted in substantial errors in the level of the current estimates of this very large item. In the postwar period consumer services have been quite impervious to the business cycle, partly because they have had a strong upward trend, and the evidence we have indicates that quarterly fluctuations in the total are relatively small. Accordingly, I do not believe that the deficiencies of the present estimates have been a serious handicap to current business analysis so far. But this statement is subject to qualification – in the 1953–54 recession, for instance, the behaviour of these expenditures was seriously misjudged. In any event, it would be advisable to secure more current information on this $150 billion item instead of coasting along with present procedures, in the hope that they will not lead to greater trouble than they have so far. Some work along these lines is being undertaken by the Census Bureau, but it is not clear as yet how effective it will be in filling the present gap.

Up-to-date quarterly information on non-farm entrepreneurial income would undoubtedly be desirable. The present

methods of estimating the non-farm component of this item currently have been inadequate, and only the fact that this is a comparatively stable series has prevented errors more serious than those that have been made.

A reporting system designed to elicit up-to-date information on entrepreneurial earnings would be very costly and would run into many difficulties, because heterogeneous and small units with poor accounting systems would be typically involved. Probably the first step should be to initiate a system which would provide annual data – about one year earlier than the tax returns – and then to extend the system to include current quarterly reporting. Needless to say, all components of non-farm entrepreneurial income would not have to be covered from the beginning. The large and more volatile elements should be singled out first, and the others covered later, in the light of the experience gained and with due regard to reasonable priorities.

It is difficult to make proper recommendations for an improvement in the measurement of quarterly farm income. Even now a very substantial volume of resources is being utilized in the task, and some at least of the obstacles to further improvement seem to have strong conceptual elements. Probably further statistical work should be preceded by a careful review, within a conceptual framework not confined to the series itself but taking into consideration also the N.I.P. accounts as a whole, of what are proper goals in this field.

State and local government expenditures is the fourth and final component which I would consider in the second group of priorities. On the whole, we have not done badly in approximating the trend of these expenditures in the initial estimates, but our present procedures probably miss some of the actual quarter-to-quarter changes that occur. In view of the growing importance of this component of the G.N.P., the quarterly reporting system that is now being readied by the Census Bureau will be very welcome.

Other components. – For various reasons, I do not propose major current action programmes for the remaining components of the quarterly income and product flow.

The goods component of personal consumption is based upon solid data sources, and unless the forthcoming comparisons with census benchmarks reveal long-term biases, no major recommendations for improvement will be called for, at least

as far as total durable and non-durable goods are concerned. If some long-term bias should become apparent, its elimination belongs properly to the province of the annual estimates, with which this paper is not directly concerned. Changes in the reporting system that would permit a more reliable and detailed classification would, of course, be desirable.

The same comment applies to the present methods of estimating the producers' durable equipment component of G.N.P. Here also we are dealing with a comprehensive data source, the Plant and Equipment Survey, which as far as quarterly movements are concerned needs only improvement – in the coverage of certain industries, and in the precision of timing. If the comparisons of the Survey results with census and other sources that are now being made in connection with the benchmark revisions of the N.I.P. accounts should reveal serious discrepancies, recommendations would be directed principally at securing better annual estimates, rather than better estimates of quarterly movement.

No basic changes in measuring the quarterly net export component of the G.N.P. are called for, although one can think of many detailed improvements. As judged by the quarterly errors and omission item of the balance of payments, there is ample scope for improvements both in coverage and timing; but there is evidence that the errors lie more in the measurement of capital flows than in that of the current balance on goods and services, which directly enters the present N.I.P. accounts.

Federal purchases of goods and services are based on solid data sources; the main requirement here also is for further refinement, particularly in pinpointing the timing of Federal purchases.

The overall quality of quarterly payroll information is high. However, it might be possible to effect improvements in some of the industrial components – for instance, construction, trade, and services.

In spite of the fact that we have at present little genuine data to judge the quarterly movement of the rental and interest incomes, and have made sizeable errors in estimating their trend, I would, taking into account reasonable priorities, not make recommendations for new data collection for a combination of reasons: Changes in these income flows are small; more careful estimating techniques might result in some im-

provement even without the benefit of additional data sources; it would be difficult and costly to devise quarterly reporting systems; finally, it is unlikely that even substantial improvement in the measurement of these two flows would add greatly to the incisiveness of current business analysis.

With respect to the remaining series – those reconciling the major product and income aggregates – no important recommendations that should be incorporated in a general statement seem in order.

Time schedule

It will have become apparent from the description of methodology that the reliability of the quarterly accounts could be improved if a more delayed publication schedule were adopted: A somewhat better estimate of personal consumption expenditures for services could be obtained if the quarterly information that eventually becomes available could be taken into account. The estimate of producers' durable equipment would gain in accuracy if we waited for the final expenditure data instead of basing our initial estimates on anticipated expenditures. The business inventory component could be improved by incorporating the lagging quarterly information on non-farm inventories outside manufacturing and trade. Net exports of goods and services could be estimated better if the merchandise export and import data for the last month of each quarter were available. The estimates of the Federal purchases component of the G.N.P. would benefit from the information derived from the quarterly statements of certain Government corporations that come in with a substantial delay, and also from the information relating to receivables from and prepayments by the Federal Government which is required to put the Government expenditure figures on an accrual basis.

On the income side the advantages from postponing the publication of the initial estimates would be smaller, but not negligible. However, as noted earlier, better estimates of the N.I.P. accounts as a whole could be obtained if they were delayed until corporate profit information is available.

If the recommendations for data improvement made earlier in this section were implemented, this conflict between timeliness and accuracy would probably be intensified, at least in the short run. It is inconceivable that the substantial additional

information on inventories, profits, construction, services, entrepreneurial income, State and local governments, and the improvement and refinements specified for several of the other components of the income and product flow, could from the beginning be made available for use in the preparation of the quarterly estimates on the present schedule.

The question arises whether the publication of the quarterly series should be delayed by one, two, or perhaps even three months to gain the advantages of increased precision that would result from such a delay. I believe that the unanimous decision of the users of the data – and also of those involved in their production who have a practical sense – would be that a delay of this type would not be worth while. This is evidenced by the fact that we have been moving in the opposite direction largely in response to user-demand. We are now preparing preliminary figures on the quarterly income and product flow, based on the information of one or two months, even before the quarter is over.

While publication delay is not a realistic way of gaining accuracy, a change in the procedure of revising the estimates may ultimately be called for. At present, the first estimates of the quarterly accounts are revised routinely a month later in the light of additional information, and again another month later at the time the figures are first published under the aegis of the Office of Business Economics. After that, however, the figures are usually frozen until they are revised, in conjunction with the receipt of a substantial body of annual information, in the July issues of the *Survey of Current Business*. This policy of freezing the figure was adopted because it was felt that the gain in accuracy stemming from more frequent revisions would not outweigh the nuisance which such revisions cause. Also – and this is an important consideration – it often happens that revisions that are indicated by the gradual accumulation of additional data tend to cancel out, at least as far as the aggregates and broad components are concerned; the present policy of 'wait and see' prevents the making of changes that later on would be cancelled. While I believe that, given the present data situation, the current policy is correct, a different policy might be called for if the data situation changed. If we should reach a position in which more extensive quarterly data became available with a delay, we should give serious consideration to a

policy of making regular revisions in the back figures each time estimates for a new quarter are published.

Extensions of the quarterly accounts

The quarterly system of N.I.P. reporting was extended in a major way in 1958. As far as the current-dollar N.I.P. system as earlier defined is concerned – namely, as the well-known five-account system that does not show intermediate product flows, financial flows, and balance sheets – no further comparable extension is called for, though several improvements – some of them affecting the annual series as well – would be desirable.

Personal account. – Following the order of the accounts rather than priorities based on the urgency of the information, it would be desirable to articulate the personal account so as to distinguish better between the transactions of households proper and those of non-profit institutions and pension and welfare funds. This would not be an easy task, but it is not outside the realm of practical possibilities.

Greater detail on personal consumption would undoubtedly be welcome to many users, and there is also some demand for a segregation of imputed items on a quarterly basis. I am not convinced that a segregation of these items, which do not fluctuate from quarter to quarter, would be really as useful as is sometimes believed.

Another extension of the personal account, on which we are actually working now, is a quarterly breakdown of State income. This breakdown will provide the first opportunity for regional analysis of postwar business cycles in an income framework. Inasmuch as recent cycles in the United States have been mild and of short duration, the annual State income estimates average out most of the short-run fluctuations and are therefore quite unsuited for this purpose.

Government account. – In connection with the present Government account the main requirement is for added detail on the composition of Government purchases. Some cross-classification by function and object of expenditure would be desirable.

Not strictly a part of the N.I.P. accounts, but an essential supplementation of them would be the development of a series that traces the timing of Government procurement. At present Government purchases are recorded when the purchase is

delivered, but the influence of procurement on economic activity antedates the time of delivery. Inasmuch as Government procurement is a large and changing component of aggregate demand, it would be worth while to keep a record of it on several successive timing bases that are relevant to economic analysis. The first might be the time at which the contract was placed, although in principle one might start earlier – at the stage of Congressional appropriations for expenditures. The next relevant stage would be production by the business system for eventual delivery to the Government. This might be measured as sales to Government plus the change in inventories in goods destined for Government use. The main difficulty here is, of course, the identification of the latter item. If total production for Government were ascertained in this manner, the estimate would already contain the third and final major timing phase – sales or deliveries – which is the one now in use. In working out the exact form of the reporting system, the financial transactions associated with the goods flow would also be articulated.

Rest-of-the-world account. – The main requirement here is for detail on the components of exports and imports. Merchandise trade should be segregated from other items, and some breakdowns within each of these categories should be provided. We hope that the work of the Balance of Payments Review Committee, which has recently been organized by the Bureau of the Budget, will suggest improvement in concepts, definitions, and classifications, and also in the presentation of the series. Statistically, one of the major difficulties in the way of presenting greater detail is the adjustment of merchandise trade for seasonal variations.

Capital formation. – Finally, improvements are needed in the presentation of investment transactions. A breakdown of the change in business inventories by broad industry division – manufacturing, wholesale and retail trade, and all other – should be provided, with a durable and non-durable cross-classification, and with a breakdown of purchased materials, goods-in-process, and finished goods for durable and non-durable manufacturing. Virtually all the ingredients of this list are now available. But erratic movements and inaccuracies in the basic data, and problems of valuation and seasonal adjustment have so far made it impossible to provide this type of detailed information within the framework of the quarterly N.I.P. accounts.

For fixed business investment more detailed information would be desirable also – by industry and by type of equipment and structure. Data gaps in this instance are much larger than in the case of business inventories, and the provision of the additional detail will not be possible unless vastly improved systems for the collection of primary data are set up.

Real product by industry. – In addition to these improvements of the present five-account system, two major extensions have a high order of priority. First, real national product by industrial origin should be calculated quarterly. The statistical problems involved have not been explored and they are likely to be major. But the task should be attempted. It is true that in the past few years of comparative price stability the current-dollar estimates of national income by industry served as tolerable proxies for this vital information. But we cannot count on the continuation of this stability in the formulation of our statistical programme.

Financial accounts. – Secondly, quarterly statements showing the financial flows that mediate between saving and tangible investment are needed. This is a large order indeed, in spite of the pioneering work of the Federal Reserve Board. A great deal remains to be done in establishing concepts, definitions, and classifications that are integrated with the N.I.P. accounts, and the statistical problems – stemming from data gaps, seasonal movements, and the sensitivity of these kinds of estimates to timing – are staggering.

However, if financial flows are relevant to the working of the economy, it is essential that they be reported quarterly, because it is evident that they are subject to sharp short-run fluctuations. Whether a systematic recording and study of financial flows will ultimately add a great deal to our understanding of business fluctuations has not been finally established. But there is sufficient respectable affirmative opinion to warrant an extension of the accounts to cover them.

It is interesting to observe that the current interest in the United States in Federal Government finances, with particular reference to alternative budget presentations, is pushing us towards the systematic recording of financial flows. Transactions in financial assets and liabilities are omitted from the present Federal budget as it enters the N.I.P. accounts, because this budget is an appropriation rather than a saving-investment account, to use social accounting shorthand. Interest in the

omitted transactions in financial assets and liabilities, which are quite important in the U.S., has resulted in an insistent demand for the extension of the present reporting system to cover them within the framework of the quarterly N.I.P. accounts. A thorough implementation of this proposal entails the establishment of similar accounts for the other sectors of the economy as well.

APPENDIX 1

Quarterly national income and product estimates prior to 1958 revisions

Fourth quarter of 1957, seasonally adjusted at annual rates
(billions of dollars)

Gross national product or expenditure	
Gross national product	432·6
Personal consumption expenditures	282·4
Durable goods	34·4
Non-durable goods	140·8
Services	107·2
Gross private domestic investment	61·3
New construction	34·0
Residential (non-farm)	14·5
Other	19·5
Producers' durable equipment	30·0
Change in business inventories	−2·7
Non-farm only	−3·4
Net foreign investment	2·0
Government purchases of goods and services	87·0
Federal	49·7
National security	45·0
National defence	43·0
Other national security	2·0
Other	5·0
Less: Government sales	·4
State and local	37·3
National income by distributive shares	
National income	356·1
Compensation of employees	255·3
Wages and salaries	239·5
Private	199·1
Military	9·5
Government civilian	30·8
Supplements to wages and salaries	15·8

Proprietors' and rental income	51·3
Business and professional	28·6
Farm	12·2
Rental income of persons	10.4
Corporate profits and inventory valuation adjustment	36·3
Corporate profits before tax	37·5
Corporate profits tax liability	19·1
Corporate profits after tax	18·3
Inventory valuation adjustment	−1·2
Net interest	13·3
Addendum: Compensation of general Government employees	39·0
Personal income and its disposition	
Personal income	345·5
Less: Personal tax and non-tax payments	43·4
Federal	38·3
State and local	5·1
Equals: Disposable personal income	302·1
Less: Personal consumption expenditures	282·4
Equals: Personal saving	19·8
Relation of gross national product, national income and personal income	
Gross national product	432·6
Less: Capital consumption allowances	38·2
Indirect business tax and non-tax liability	37·4
Business transfer payments	1·3
Statistical discrepancy	1·1
Plus: Subsidies less current surplus of Government enterprises	1·4
Equals: National income	356·1
Less: Corporate profits and inventory valuation adjustment	36·3
Contributions for social insurance	14·5
Excess of wage accruals over disbursements	·0
Plus: Government transfer payments	21·2
Net interest paid by Government	6·1
Dividends	11·7
Business transfer payments	1·3
Equals: Personal income	345·5

Source: Survey of Current Business, May 1958, U.S. Department of Commerce, Office of Business Economics, Washington, D.C.

APPENDIX 2

Specimen format of summary advance estimates of G.N.P., income and related items

Gross national product and reconciliation with national income
seasonally adjusted quarterly totals at annual rates

(billions of dollars)

Gross national product or expenditure

Gross national product
- Personal consumption expenditures
  - Durable goods
  - Non-durable goods
  - Services
- Gross private domestic investment
  - New construction
    - Residential (non-farm)
    - Other
  - Producers' durable equipment
  - Change in business inventories
- Net export of goods and services
  - Exports
  - Imports
- Government purchases of goods and services
  - Federal
    - National defence
    - Other
    - Less: Government sales
  - State and local

Relation of gross national product to national income

Gross national product

Less: Capital consumption allowances
Indirect business tax and non-tax liability
Business transfer payments
Statistical discrepancy

Plus: Subsidies less current surplus of Government enterprises

Equals: National income

National income and related series
Seasonally adjusted quarterly totals at annual rates

(billions of dollars)

National income by distributive shares

National income
- Compensation of employees
  - Wages and salaries
    - Private
    - Government
  - Supplements to wages and salaries
- Proprietors' income
  - Business and professional
  - Farm

Rental income of persons

Corporate profits and inventory valuation adjustment
  Corporate profits before tax
  Inventory valuation adjustment

Net interest

Addendum: Compensation of general Government employees

Disposition of national income

National income

Less: Corporate profits and inventory valuation adjustment
  Contributions for social insurance
  Excess of wage accruals over disbursements

Plus: Government transfer payments to persons
  Net interest paid by Government
  Dividends
  Business transfer payments

Equals: Personal income

Less: Personal tax and non-tax payments
Equals: Disposable personal income
Less: Personal consumption expenditures
Equals: Personal saving

APPENDIX 3

Measures of error in components of U.S. quarterly national income and product accounts, 1947–61
Quarter compared with previous quarter
(per cent[1])

Component and period	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Seasonally adjusted series						
Gross national product											
1947–61	1·33	1·50	−·17	−11	1·93	1·92	·68	35	5	8	53
1947–52	1·83	2·12	−·29	−14	2·45	2·46	·84	34	2	9	14
1953–56	·89	1·10	−·21	−19	1·42	1·44	·52	36	2	12	19
1957–61	1·11	1·14	−·03	−3	1·75	1·68	·31	18	0	—	—
Personal consumption expenditures											
1947–61	1·07	1·33	−·26	−20	1·40	1·59	·51	32	1	2	38
1947–52	1·15	1·51	−·36	−24	1·78	1·98	·69	35	1	4	9
1953–56	1·03	1·20	−·17	−14	1·09	1·30	·28	22	1	6	64
1957–61	1·03	1·15	−·12	−10	1·19	1·20	·29	24	0	—	—
Durable goods											
1947–61	·90	1.85	−·95	−51	4·81	4·63	1·91	41	8	14	52
1947–52	·95	1·74	−·79	−45	6·40	5·76	2·22	38	3	13	53
1953–56	1·30	1·25	·05	4	4·03	3·79	1·30	34	1	6	47
1957–61	·51	1·34	−·83	−62	3·59	3·62	1·56	43	3	15	58
Non-durable goods											
1947–61	·77	·95	−·18	−19	1·27	1·25	·65	52	5	8	64
1947–52	·75	1·23	−·48	−39	1·77	1·75	1·15	66	4	17	62
1953–56	·72	·84	−·12	−14	·89	·97	·22	23	0	—	—
1957–61	·83	·83	0	—	1·00	·90	·28	31	1	5	14
Services											
1947–61	1·56	1·80	−·24	−13	1·56	1·80	·40	22	0	—	—
1947–52	1·51	2·03	−·52	−26	1·51	2·03	·68	33	0	—	—
1953–56	1·57	1·73	−·16	−9	1·57	1·73	·30	17	0	—	—
1957–61	1·63	1·64	−·01	−1	1·63	1·64	·26	16	0	—	—

Note: See footnotes at end of table.
For detailed explanation, see the text

Component and period	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Seasonally adjusted series						
Gross private domestic investment											
1947–61	2·13	2·06	·07	4	7·65	7·67	4·17	54	8	14	63
1947–52	3·27	3·92	−·65	−17	8·68	10·33	6·07	59	5	22	48
1953–56	1·61	2·17	−·56	−26	5·37	4·91	3·04	62	2	12	80
1957–61	1·24	·95	·29	30	8·30	7·33	2·22	30	0	—	—
New construction											
1947–61	1·54	2·12	−·58	−27	3·64	3·13	1·96	63	8	14	51
1947–52	2·03	3·01	−·98	−32	5·26	4·64	2·58	56	2	9	24
1953–56	1·71	2·06	−·35	−17	2·77	2·51	1·43	57	2	12	53
1957–61	·85	1·02	−·17	−17	2·48	1·33	·94	71	4	20	57
Producers' durable equipment											
1947–61	1·82	·88	·94	107	4·05	4·13	2·86	69	7	12	44
1947–52	2·86	2·19	·67	31	4·24	3·88	2·97	77	2	9	36
1953–56	1·75	1·86	−·11	6	3·54	3·88	1·40	36	2	12	11
1957–61	·70	−·08	·78	97	4·23	4·04	1·75	43	1	5	19
Change in business inventories[1]											
1947–61	−·16	·09	−·25	−278	3·66	3·10	2·19	71	11	19	56
1947–52	·10	·34	−·24	−71	3·65	3·88	2·24	58	5	22	49
1953–56	−·62	−·14	−·48	−343	2·82	2·43	1·45	60	2	12	103
1957–61	−·11	·10	−·21	−210	4·35	3·57	1·42	40	1	5	6
Net exports of goods and services[1]											
1947–61	·01	−·08	·09	113	1·05	·95	·75	79	13	22	73
1947–52	−·22	−·39	·17	44	1·43	1·38	·68	49	4	17	211
1953–56	·26	·27	−·01	−4	·57	·62	·54	87	6	37	69
1957–61	·08	−·02	·10	500	·98	1·02	·54	53	3	15	39
Government purchases of goods and services											
1947–61	2·41	2·50	−·09	−4	3·31	3·47	1·75	50	7	12	33
1947–52	4·93	4·86	·07	1	5·85	5·65	2·29	41	2	9	40
1953–56	−·20	·18	−·38	−211	1·67	1·97	1·20	61	3	19	38
1957–61	1·60	1·64	−·04	−2	1·70	1·84	·58	32	1	5	158

Component and period	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Seasonally adjusted series						
Federal											
1947–61	2·46	2·52	−·06	2	4·70	4·89	2·64	54	11	19	31
1947–52	6·22	6·15	·07	1	8·65	8·53	3·52	41	3	13	40
1953–56	−1·36	−·88	−·48	−55	2·71	2·88	1·66	58	2	12	73
1957–61	1·17	1·15	·02	2	1·72	1·66	·97	58	5	25	58
State and local											
1947–61	2·36	2·56	−·20	−8	2·47	2·58	1·12	43	2	3	109
1947–52	2·82	3·11	−·29	−9	2·99	3·20	1·43	45	1	4	91
1953–56	2·01	2·19	−·18	−8	2·16	2·34	·70	30	0	—	—
1957–61	2·10	2·14	−·04	−2	2·12	2·16	·62	29	0	—	—
National income											
1947–61	1·35	1·44	−·09	−6	1·95	1·98	·52	26	2	3	20
1947–52	1·90	2·01	−·11	−5	2·44	2·68	·73	27	1	4	14
1953–56	·96	1·04	−·08	−8	1·44	1·46	·35	24	2	12	46
1957–61	1·02	1·08	−·06	−5	1·81	1·72	·29	17	0	—	—
Compensation of employees											
1947–61	1·44	1·55	−·11	−7	1·75	1·82	·45	25	4	7	19
1947–52	1·96	2·12	−·16	−7	2·19	2·39	·57	24	2	9	21
1953–56	1·14	1·27	−·13	−10	1·46	1·52	·35	23	0	—	—
1957–61	1·09	1·11	−·02	−2	1·48	1·39	·29	21	2	10	30
Wages and salaries											
1947–61	1·42	1·50	−·08	−5	1·76	1·81	·45	25	2	3	39
1947–52	1·98	2·11	−·13	−6	2·23	2·45	·57	23	2	9	9
1953–56	1·11	1·22	−·11	−9	1·48	1·50	·40	27	1	6	3
1957–61	1·04	1·03	·01	1	1·43	1·34	·30	22	1	5	28
Supplements to wages and salaries											
1947–61	1·75	2·40	−·65	−27	2·36	2·75	1·32	48	3	5	67
1947–52	1·68	2·22	−·54	−24	2·47	3·07	1·50	49	0	—	—
1953–56	1·76	2·09	−·33	−16	2·23	2·21	·86	39	1	6	103
1957–61	1·81	2·16	−·35	−16	2·35	2·28	1·02	45	2	10	86

Component and period	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Seasonally adjusted series						
Proprietors' income											
1947–61	70	·54	·16	30	2·01	2·31	2·15	93	16	28	8
1947–52	1·11	·67	·44	66	2·82	3·25	2·34	72	5	22	53
1953–56	·22	·04	·18	450	1·68	1·22	1·63	134	3	19	193
1957–61	·60	·44	·16	36	1·33	1·35	1·02	75	5	25	48
Business and professional											
1947–61	1·04	1·07	—·03	—3	1·70	1·66	1·28	77	9	15	69
1947–52	1·46	1·38	·08	6	2·52	1·98	1·60	81	4	17	40
1953–56	·93	·44	·49	111	1·07	1·02	·83	81	2	12	36
1957–61	·66	·52	·14	27	1·25	1·44	·94	65	4	20	69
Farm											
1947–61	·58	—·08	·66	825	4·95	5·69	5·73	101	15	25	113
1947–52	1·70	—·29	1·99	686	5·05	6·07	6·02	99	10	43	66
1953–56	—1·06	—·72	—·34	—47	4·99	3·43	4·89	143	1	6	127
1957–61	·61	·84	—·23	—27	4·81	4·90	3·89	79	3	15	70
Rental income of persons											
1947–61	·58	1·21	—·63	—52	·97	1·52	1·56	103	9	15	134
1947–52	·98	1·77	—·79	—45	1·81	2·13	2·40	113	5	22	81
1953–56	·47	·18	·29	161	·59	·78	·92	118	2	12	185
1957–61	·20	·60	—·40	—67	·29	·73	1·31	179	3	15	188
Corporate profits and inventory valuation adjustment											
1947–61	1·58	1·88	—·30	—16	6·39	6·33	3·65	58	12	20	59
1947–52	3·24	3·46	—·22	—6	6·56	7·12	5·05	71	5	22	78
1953–56	1·00	·75	·25	33	5·45	5·39	2·33	43	2	12	49
1957–61	·13	1·27	—1·14	—90	6·93	6·84	1·99	29	3	15	64
Corporate profits before tax											
1947–61	1·67	1·37	·30	22	8·08	7·28	2·89	40	12	20	37
1947–52	2·41	1·87	·54	29	8·60	8·03	5·17	64	4	17	68
1953–56	1·75	1·52	·23	15	6·70	6·64	1·91	29	0	—	—
1957–61	·77	1·60	—·83	—52	8·59	7·58	2·64	35	3	15	45

Component and period	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Seasonally adjusted series						
Corporate profits tax liability											
1947–61	2·00	1·82	·18	10	8·50	7·74	3·14	41	7	12	36
1947–52	3·42	3·14	·28	9	9·98	9·37	6·02	64	2	9	92
1953–56	1·42	1·03	·39	38	6·65	6·09	2·57	42	1	6	50
1957–61	·82	1·16	−·35	−30	8·47	7·59	2·07	27	1	5	49
Corporate profits after tax											
1947–61	1·59	1·06	·53	50	8·56	7·56	2·52	33	6	10	34
1947–52	1·85	·78	1·07	124	9·39	8·40	4·70	56	3	13	79
1953–56	2·09	2·12	−·03	−1	7·02	7·37	1·42	19	0	—	—
1957–61	·90	·92	−·02	−2	8·83	7·61	1·87	25	0	—	—
Inventory valuation adjustment[1]											
1947–61	·10	·13	−·03	−3	1·37	1·15	·73	63	5	8	37
1947–52	·30	·06	·24	400	2·11	1·85	·76	41	1	4	92
1953–56	·24	·30	−·06	−20	1·21	·88	·55	62	1	6	113
1957–61	·14	·14	—	—	·66	·59	·26	44	2	10	51
Net interest											
1947–61	1·88	3·09	−1·21	−39	1·94	3·09	1·71	55	1	2	49
1947–52	1·47	3·45	−1·98	−57	1·62	3·45	2·01	58	1	4	44
1953–56	2·33	3·06	−·73	−24	2·34	3·06	1·71	56	0	—	—
1957–61	1·99	2·72	−·73	−27	1·98	2·72	1·39	51	0	—	—
Personal income											
1947–61	1·30	1·41	−·11	−8	1·50	1·63	·46	28	5	8	34
1947–52	1·68	1·76	−·08	−5	1·98	2·18	·60	28	3	13	23
1953–56	1·03	1·14	−·11	−10	1·19	1·26	·29	23	0	—	—
1957–61	1·07	1·14	−·07	−6	1·22	1·21	·28	23	2	10	26
Disposable personal income											
1947–61	1·29	1·37	−·08	−6	1·47	1·57	·56	36	6	10	33
1947–52	1·66	1·70	−·04	−2	1·98	2·17	·70	32	3	13	23
1953–56	1·07	1·17	−·10	−9	1·10	1·20	·37	31	0	—	—
1957–61	1·05	1·09	−·04	−4	1·19	1·13	·38	34	3	15	22

Component and period	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Seasonally adjusted series						
Personal saving											
1947–61	7·58	15·45	−7·87	−51	16·08	30·85	20·47	66	18	31	25
1947–52	16·57	49·45	−32·88	−66	3·08	93·62	80·34	86	6	26	40
1953–56	2·13	1·70	·43	25	6·33	9·89	7·10	72	6	38	65
1957–61	1·59	·66	·93	141	6·92	6·76	4·72	70	7	35	74
Capital consumption allowances											
1947–61	1·88	2·35	−·47	−20	1·96	2·36	1·27	54	2	3	23
1947–52	2·03	3·24	−1·21	−37	2·24	3·24	1·82	56	1	4	74
1953–56	2·11	2·26	−·15	−6	2·11	2·26	·70	31	0	—	—
1957–61	1·52	1·40	·12	9	1·52	1·42	·62	44	1	5	16
Indirect business and non-tax liability											
1947–61	1·39	1·77	−·38	−22	1·95	2·22	·97	44	5	8	34
1947–52	1·63	2·14	−·51	−24	2·91	2·87	·96	33	2	9	28
1953–56	1·07	1·34	−·27	−20	1·24	1·63	1·19	73	2	12	31
1957–61	1·36	1·48	−·12	−8	1·41	1·70	·75	44	1	5	15
Contributions for social insurance											
1947–61	2·47	2·31	·16	7	3·41	3·21	1·19	37	3	5	44
1947–52	1·96	1·75	·21	12	3·58	3·47	1·82	52	1	4	54
1953–56	2·94	2·43	·51	21	3·62	2·99	1·29	43	1	6	35
1957–61	2·68	2·73	−·05	−2	3·03	2·84	·55	19	1	5	47
Government transfer payments to persons											
1947–61	2·57	2·62	−·05	−2	5·87	5·16	1·05	18	6	10	30
1947–52	2·55	2·53	·02	1	10·18	10·32	1·39	13	4	17	19
1953–56	2·26	2·22	·04	2	2·80	2·37	1·50	63	3	19	70
1957–61	2·84	2·99	−·15	−5	3·37	3·26	·42	13	0	—	—

Component and period	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Seasonally adjusted series						
Net interest paid by Government											
1947–61	·86	·85	·01	1	1·30	1·29	1·36	105	1	2	246
1947–52	·38	·47	—·09	—19	·76	·47	1·05	223	0	—	—
1953–56	·96	1·18	—·22	—19	1·20	1·42	·96	68	0	—	—
1957–61	1·33	1·04	·29	28	2·01	2·14	1·88	88	1	5	148
Dividends											
1947–61	1·53	1·41	·12	9	3·68	3·16	2·46	78	7	12	43
1947–52	2·18	1·62	·56	35	5·31	4·17	3·60	86	2	9	32
1953–56	1·58	1·59	—·01	—1	3·24	2·53	1·61	64	1	6	39
1957–61	·74	1·33	—·59	—44	2·17	2·35	1·10	47	1	5	59
Personal tax and non-tax payments											
1947–61	1·37	1·71	—·34	—19	2·56	2·95	1·10	37	4	7	50
1947–52	2·01	2·43	—·42	—17	3·60	4·34	1·09	25	0	—	—
1953–56	·75	·96	—·21	—22	2·35	2·11	1·24	59	1	6	20
1957–61	1·20	1·49	—·29	—19	1·52	1·99	1·01	51	2	10	29
Federal											
1947–61	1·29	1·62	—·33	—20	2·75	3·14	1·17	37	3	5	61
1947–52	1·97	2·40	—·43	—18	3·93	4·72	1·07	23	0	—	—
1953–56	·57	·82	—·25	—30	2·49	2·17	1·33	61	1	6	188
1957–61	1·07	1·36	—·29	—21	1·60	2·06	1·13	55	2	10	40
State and local											
1947–61	1·94	2·69	—·75	—28	2·19	2·69	2·08	77	1	2	100
1947–52	2·31	3·23	—·92	—28	2·31	3·22	2·14	66	0	—	—
1953–56	1·24	2·25	—1·01	—45	2·18	2·25	1·94	86	1	6	120
1957–61	2·07	2·40	—·33	—14	2·08	2·40	1·31	55	0	—	—
					Unadjusted series						
Gross national product											
1947–61	1·66	1·80	—·14	—8	4·84	5·38	·91	17	2	3	18
1947–52	2·38	2·60	—·22	—8	5·10	5·34	1·02	19	0	—	—
1953–56	·94	1·16	—·22	—19	3·85	3·67	·76	21	1	6	18
1957–61	1·40	1·29	·11	—9	5·33	5·57	·43	8	0	—	—

Component and period	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Unadjusted series						
Personal consumption expenditures											
1947–61	1·60	1·92	—·32	—17	6·95	7·46	·75	10	4	7	5
1947–52	1·99	2·48	—·49	—20	6·99	7·66	·82	11	1	4	10
1953–56	1·29	1·45	—·16	—11	6·90	6·81	·49	7	0	—	—
1957–61	1·38	1·48	—·10	—7	6·93	7·12	·39	5	2	10	5
Durable goods											
1947–61	2·91	3·60	—·69	—19	15·48	15·85	2·62	17	0	—	—
1947–52	4·15	4·40	—·25	—6	15·57	16·04	2·74	17	0	—	—
1953–56	2·15	2·20	—·05	—2	13·84	13·34	1·72	13	0	—	—
1957–61	2·11	2·75	—·64	—23	16·70	16·88	·77	5	0	—	—
Non-durable goods											
1947–61	1·82	2·11	—·29	—14	9·81	10·68	1·05	10	1	2	4
1947–52	2·16	2·68	—·52	—19	9·19	9·85	·97	10	1	4	4
1953–56	1·47	1·56	—·09	—6	9·87	10·14	·51	5	0	—	—
1957–61	1·72	1·68	·04	2	10·48	10·90	·57	5	0	—	—
Services											
1947–61	1·42	1·79	—·37	—21	1·54	1·81	·77	43	2	3	31
1947–52	1·40	1·93	—·53	—27	1·53	2·10	·95	45	0	—	—
1953–56	1·41	1·71	—·30	—18	1·58	1·81	·74	41	2	12	23
1957–61	1·45	1·65	—·20	—12	1·53	1·65	·52	32	1	5	91
Gross private domestic investment											
1947–61	3·17	2·46	·71	29	13·14	11·32	4·68	41	4	7	9
1947–52	5·03	5·08	—·05	—1	17·83	19·28	7·08	37	1	4	7
1953–56	1·94	2·62	—·68	—26	12·77	13·08	5·01	38	0	—	—
1957–61	2·03	·81	1·22	151	8·03	7·57	2·86	38	1	5	16
New construction											
1947–61	3·01	3·50	—·49	—14	13·64	14·05	2·22	16	0	—	—
1947–52	4·37	4·99	—·62	—12	14·66	14·86	2·42	16	0	—	—
1953–56	2·49	2·99	—·50	—17	12·73	12·83	1·24	10	0	—	—
1957–61	1·86	1·89	—·03	—2	13·19	12·83	1·78	14	0	—	—

Component and period	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Unadjusted series						
Producers' durable equipment											
1947–61	3·20	2·46	·74	30	7·67	13·09	7·57	58	10	17	71
1947–52	3·46	2·97	·49	16	5·45	7·44	3·30	44	1	4	27
1953–56	2·72	1·92	·80	42	6·72	5·81	2·68	46	1	6	63
1957–61	3·28	2·07	1·21	58	10·97	13·69	6·03	44	2	10	100
Change in business inventories[1]											
1947–61	−·04	−·02	−·02	−100	1·93	2·01	·43	21	2	3	30
1947–52	0	0	0	0	1·96	2·08	·57	27	2	9	10
1953–56	−·13	−.04	−·09	−225	2·19	2·16	·57	26	0	—	—
1957–61	·01	·01	0	0	1·69	1·77	·24	14	0	—	—
Net exports of goods and services[1]											
1947–61	·01	−·08	·02	200	·38	·41	·13	32	4	7	37
1947–52	−·06	−·09	·03	33	·38	·39	·21	54	2	9	3
1953–56	·11	·09	·02	22	·34	·37	·09	24	0	—	—
1957–61	·01	−·01	·02	200	·41	·44	·08	18	1	5	11
Government purchases of goods and services											
1947–61	2·50	2·54	−·04	−2	4·27	3·97	1·83	46	7	12	18
1947–52	5·15	5·06	·09	2	6·64	5·92	2·48	42	2	9	36
1953–56	−·17	·18	−·35	−194	2·66	2·56	1·25	49	2	12	20
1957–61	1·60	1·61	−·01	−1	2·84	2·73	1·07	39	4	20	24
Federal											
1947–61	2·56	2·59	−·03	−1	4·75	5·64	3·36	60	8	14	37
1947–52	6·55	6·18	·37	6	8·47	8·73	3·67	42	2	9	57
1953–56	−1·39	−·94	−·45	−48	2·87	2·85	1·62	57	3	19	60
1957–61	1·15	1·14	·01	1	1·99	2·33	1·40	60	1	5	60
State and local											
1947–61	2·71	2·85	−·14	−5	5·66	5·39	1·78	33	4	7	45
1947–52	3·17	3·62	−·45	−12	6·48	5·47	2·79	51	3	13	39
1953–56	2·34	2·30	·04	2	5·19	5·78	1·65	29	1	6	59
1957–61	2·47	2·27	·20	9	5·10	5·01	1·17	23	0	—	—

Component and period	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Unadjusted series						
Corporate profits and inventory valuation adjustment											
1947–61	2·17	2·39	—·22	—9	7·88	9·84	4·25	43	7	12	43
1947–52	3·48	3·31	·17	5	7·43	7·31	3·66	50	2	9	59
1953–56	1·10	·66	·44	67	5·76	7·43	3·31	45	2	12	52
1957–61	1·51	1·75	—·24	—14	10·09	9·81	1·66	17	1	5	9
Corporate profits before tax											
1947–61	2·10	1·66	·44	27	7·98	9·00	3·43	38	4	7	21
1947–52	2·75	1·58	1·17	74	7·55	8·12	4·04	50	2	9	102
1953–56	2·21	1·38	·83	60	7·24	7·61	2·82	37	0	—	—
1957–61	1·26	1·33	—·07	—5	9·08	8·70	1·80	21	1	5	99
Inventory valuation adjustment[1]											
1947–61	·03	·04	—·01	—25	·34	·37	·13	35	2	3	55
1947–52	·08	·12	—·04	—33	·53	·55	·20	36	1	4	36
1953–56	—·04	—·06	·02	33	·27	·29	·09	31	1	6	68
1957–61	·04	·03	·01	33	·18	·22	·05	23	0	—	—

[1]Except (10) which represents numbers and except (2), (3) and (4) and (6), (7) and (8) for change in business inventories, net exports of goods and services, and inventory valuation adjustment, which represent billions of dollars, at annual rates in the case of the seasonally adjusted series.
[2] The relative bias is assigned the sign of the absolute bias.
[3] Number as per cent of all observations.
[4] Absolute average per cent change in quarters missed as per cent of (7).
Source: U.S. Department of Commerce, Office of Business Economics.

APPENDIX 4

Measures of error in major components of U.S. quarterly national income and product accounts, 1947–61
Quarter compared with previous year

(per cent[1])

Component	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Seasonally adjusted series						
Gross national product	5·51	6·27	−·76	−12	6·25	6·62	1·08	16	2	3	18
Personal consumption expenditures	5·06	5·74	−·68	−12	5·10	5·74	·93	16	3	5	18
Durable goods	5·76	7·48	−1·72	−23	10·82	10·85	2·59	24	2	3	14
Non-durable goods	4·12	4·16	−·05	−1	4·68	4·46	·75	17	0	—	—
Services	6·46	7·60	−1·14	−15	6·46	7·60	1·41	19	0	—	—
Gross private domestic investment	8·37	7·85	·52	7	17·53	16·74	4·44	27	2	3	13
New construction	7·93	9·70	−1·77	−18	9·42	10·69	2·75	26	8	14	14
Producers' durable equipment	9·65	7·04	2·60	37	14·58	13·30	5·21	39	4	7	25
Change in business inventories	−·62	−·29	−·32	−110	5·01	5·23	2·01	38	5	8	25
Net exports of goods and services	−·02	−·06	·04	67	2·33	2·36	·49	21	2	3	11
Government purchases of goods and services	9·24	9·65	−·41	−4	12·31	12·47	1·98	16	1	2	5
Federal	9·67	10·02	−·35	−3	17·40	18·22	2·87	16	2	3	8
State and local	10·60	11·50	−·90	−8	10·60	11·50	2·13	19	0	—	—
National income	5·81	6·00	−·19	−3	6·49	6·71	1·03	15	1	2	9
Compensation of employees	6·14	6·56	−·42	−6	6·37	6·78	·90	13	4	7	9
Proprietors' income	3·47	1·99	1·47	74	5·57	4·85	3·28	68	10	17	51
Business and professional	4·87	3·47	1·41	41	5·43	4·99	4·10	82	14	24	65
Farm	1·04	−·26	1·30	500	10·76	10·88	6·12	56	11	19	39
Rental income of persons	2·47	4·72	−2·25	−48	3·17	5·32	4·20	79	17	29	68
Corporate profits and inventory valuation adjustment	8·61	7·90	·71	9	14·98	15·18	3·84	25	5	8	17
Net interest	13·66	13·30	·36	3	13·66	13·30	9·69	73	0	—	—
Personal income	5·51	5·80	−·29	−5	5·60	5·95	1·08	18	3	5	10
Disposable personal income	5·50	5·62	−·12	−2	5·51	5·64	1·18	21	2	3	11
Personal savings	14·83	11·74	3·10	26	22·02	30·44	19·33	64	11	19	32

Note: Footnotes same as Appendix 3 except that the series inventory valuation adjustment is not included in Appendix 4.

Measures of error in major components of U.S. quarterly national income and product accounts, 1947–61
Year compared with previous year

(per cent[1])

Component	Average change				Average change (without regard to sign)				Directional misses		
	First estimate	Revised estimate	Bias	Relative bias[2]	First estimate	Revised estimate	Dispersion	Relative dispersion	Number	Relative number[3]	Relative size of change[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
					Seasonally adjusted series						
Gross national product	5·88	6·29	−·40	−6	6·50	6·44	·71	11	1	7	6
Personal consumption expenditures	5·25	5·74	−·49	−9	5·25	5·74	·77	13	0	—	—
Durable goods	5·76	7·52	−1·77	−24	10·12	10·02	2·21	22	0	—	—
Non-durable goods	4·37	4·15	·22	5	4·80	4·44	·68	15	0	—	—
Services	6·58	7·61	−1·02	−13	6·58	7·61	1·23	16	0	—	—
Gross private domestic investment	7·78	7·99	−·21	−3	16·71	15·80	2·64	17	1	7	3
New construction	8·19	9·92	−1·72	−17	8·68	10·62	2·09	20	1	7	16
Producers' durable equipment	9·04	7·10	1·94	27	14·30	12·74	4·40	35	0	—	—
Change in business inventories	−·68	−·29	−·39	−134	4·83	4·89	1·27	26	0	—	—
Net exports of goods and services	−·11	−·06	−·05	−83	2·18	2·23	·20	9	1	7	13
Government purchases of goods and services	9·50	9·70	−·20	−2	11·97	12·22	1·07	9	1	7	3
Federal	9·97	9·96	·01	0	17·46	18·07	1·54	9	0	—	—
State and local	10·37	11·60	−1·22	−11	10·37	11·60	2·29	21	0	—	—
National income	5·74	6·03	−·29	−5	6·37	6·53	·91	14	1	7	2
Compensation of employees	6·19	6·58	−·39	−6	6·34	6·67	·67	10	2	13	6
Proprietors' income	3·37	1·97	1·40	71	5·77	4·59	2·52	55	4	27	26
Business and professional	4·90	3·44	1·45	42	5·49	4·74	4·30	91	4	27	63
Farm	1·16	−·26	1·42	546	10·77	9·82	3·98	41	1	7	87
Rental income of persons	2·43	4·77	−2·34	−49	3·19	5·35	4·15	78	4	27	44
Corporate profits and inventory valuation adjustment	7·46	7·89	−·43	−5	12·25	13·87	4·31	31	2	13	5
Net interest	9·53	13·28	−3·75	−28	9·53	13·28	4·77	36	0	—	—
Personal income	5·54	5·83	−·29	−5	5·67	5·97	·83	14	0	—	—
Disposable personal income	5·52	5·64	−·11	−2	5·52	5·64	·93	16	0	—	—
Personal savings	13·10	11·98	1·12	9	18·27	27·42	13·87	51	1	7	42

Note: Footnotes same as Appendix 3 except that the series inventory valuation adjustment is not included in Appendix 5.

APPENDIX 6

Notes on the synchronization of transactions in the national economic accounts

The following discussion is intended as a first step in the clarification of the issues involved in securing proper synchronization of the transactions entering the national economic accounts. We start with a numerical illustration which will serve to make the subsequent argument more concrete.

An example

The transaction which we shall depict is the shipment of a good from seller A to buyer B, with its financial concomitants. From the standpoint of depicting the accounting entries that will accompany it, the transaction is best broken down into several steps.

Step 1: The seller ships the goods

The accounts of the seller will record a sale and an inventory decrease in the production account, and a decrease in inventories and an account receivable in the saving-investment account. (The accounts are drawn up according to social accounting specifications.) The accounts of the buyer will not be affected at this stage, since he is not yet aware that the transaction has taken place. Nor are the accounts of the seller's or buyer's banks involved yet, for similar reasons.

A

p/a	
	sales + : inventories—

s/i-a	
inventories— accounts receivable +	:

Step 2: The buyer receives the goods

The term 'receives' is somewhat ambiguous, because either receipt of the physical good or of a notification of the shipment may be involved. We shall return to this ambiguity later; at this point we shall assume that the two kinds of 'receipt' coincide in time.

The buyer will record an inventory increase and a purchase in the production account and an inventory increase and an account payable in the saving-investment account. The seller's accounts will not be affected at this stage; nor the accounts of the sellers' and buyers' banks, for the reasons mentioned in connection with Step 1.

B

p/a	
	inventories + : current account purchases —

s-i/a

inventories +	: accounts payable +

Step 3: The buyer pays for the goods

Payment may take several forms. For our immediate purpose we shall assume that the buyer puts a cheque in the mail.

The saving-investment account of the buyer shows a reduction in accounts payable (which are extinguished), and a reduction in deposits. The seller's accounts and those of the seller's and buyer's banks are not affected at this stage.

B
s-i/a

deposits −	: accounts payable −

Step 4: The seller receives the payment

The receipt of the cheque results in a reduction of accounts receivable (which are cancelled) and an increase in deposits in the seller's saving-investment account. Neither the buyer's accounts nor the accounts of the seller's and buyer's banks are affected at this stage.

It is convenient, however, to merge this with the seller's deposit of the cheque in his bank. This results in an increase in the deposits of the seller in the saving-investment accounts of the seller's bank, and an increase in an item 'Due from B's bank' in the same account. No other accounts are affected.

A
s-i/a

deposits + accounts receivable −	:

A's Bank
s-i/a

due from B's bank +	: deposits of A +

The subsequent transactions may take several forms, depending on which of several, often rather complex, methods of communication among the banks are employed. These will be sidestepped here.

To wind up the transaction, it will be assumed that A's bank mails B's cheque to B's bank.

Step 5: B's bank receives the cheque

Upon receipt of the cheque B's bank reduces B's deposits and increases the deposits of A's bank in its saving-investment account.

B's Bank
s-i/a

	: deposits of B − deposits of A's bank +

Again, there are no entries in the books of other transactors.

B's bank notifies A's bank that it has established a deposit in its name.

Step 6: A's bank receives notification of deposit at B's bank

Upon receipt of notification from B's bank that a deposit in its name has been entered, A's bank cancels the 'Due from B's bank' item and enters deposits at B's bank in its saving-investment account.

A's Bank s-i/a	
due from B's bank —	:
deposits at B's bank +	

It will be noted that this is the first time since the inception of the transaction which we have traced that the books of all parties concerned are consistent. The interbank deposits that exist at this stage are slated for elimination through a shifting of reserves held by banks at the Central Bank, but we shall not analyse this wind-up here.

A p/a		B p/a
sale + inventories —	:	inventories + current account purchases —
s-i/a	:	s-i/a
inventories — deposits +	:	inventories + deposits —
A's bank s-i/a	:	B's bank s-i/a
deposits in B's bank + deposits of A +	:	deposits of B — deposits of A's bank +

Major issues and conclusions

Against the background provided by this example, we are now ready to make several points.

1. By 'float' – the term usually employed in analyzing problems involving the consistency of the timing of transactions in the national economic accounts – we mean lack of synchronization of accounting entries which stems from the fact that the economic units involved in a transaction receive only delayed notice of the fact that a transaction has occurred.

2. Float cannot affect transactions internal to the economic unit, i.e. transactions between two accounts of the same unit. It arises only in the case of external transactions, i.e. transactions in which several economic units are involved.

3. It is apparent from the example that a transaction can involve more than two units – i.e. the often-used reference to national economic accounting as 'quadruple-entry' accounting, as distinguished from the 'double-entry' system of private accounting, does not cover the full complexity of this situation.

4. Whenever a float arises between two transactions, a corresponding float arises between two others. This stems from the principles of double-entry.

5. In classifying float, there are two principles that should not be mixed. In the first place, float can be classified according to the type of accounting entry affected. We can have inventory float, accounts payable and receivable float, deposit float, etc. – including types of entries not present in our simple example. Secondly, float may be classified by type of communication delay giving rise to it. In this sense we may have mail float, messenger-boy float, freight transportation float, telegram float, carrier-pigeon float, and so forth. Not all of these have figured in our example. It is conducive to clear thinking to keep apart these two distinct principles of classifying float.

6. Float is not confined to the transactions used in the example. In principle, any type of external transaction may be affected. For instance, transactions involving services and unilateral transfers may be involved – in addition to the transactions in commodities and financial instruments that have been illustrated. For example, A may perform a service in one locality to B who resides in another. This service transaction will be subject to float until B receives notice that the service has been performed. Again, A mails a cash gift to B. This transaction will be subject to float until B receives it.

7. Float creates difficulties for national economic accounting because it gives rise to (1) discrepancies within accounts and (2) inconsistencies among accounts.

The second point is obvious from the example.

But it is not immediately obvious how discrepancies within accounts can be created by the fact that all parties to a transaction do not record it simultaneously in their books. Discrepancies within accounts are created by the way accounts are consolidated to derive national product and income figures. In Step 1 the G.N.P. account will register only inventories (−), and in Step 2 only inventories (+). The balancing sales and current purchases items we have entered in the books of A and B in our example will not show, because they are intermediate commodities. Accordingly, a negative discrepancy is found in the G.N.P. account at Step 1 and a positive discrepancy at Step 2. Analogous discrepancies would arise if the product transaction giving rise to float were in services rather than commodities. (See point 6 above.) It is not clear to me whether the procedures that are adopted in the preparation of summary national accounts can – in the presence of float – give rise to discrepancies within accounts in other instances also.

8. As far as the national income and product accounts are concerned, their timing is largely based on sellers' records. *Ergo*, certain types of float are eliminated in principle (e.g. between business sales to consumers and consumer purchases, and business sales to Government and Government purchases from business). In the case of inventories, a float arises, however, because in this case both buyers' and sellers' records are used. There is some question whether float arises in connection with exports and imports. This should be investigated, as well as possible floats in other components of the national income and product accounts. (I mean at this stage the five-account system, before its extension to cover financial transactions.)

9. One possible treatment of float that suggests itself in principle is to base the national economic accounts on the records of the various economic

transactors and to let float appear in these accounts. This is not an appealing solution even if it were statistically feasible, since it would make the interpretation of the accounts very difficult. Moreover, it is not possible statistically, since for most types of transactors we do not have the records of all the parties concerned. Accordingly, what could be done along these lines would be a mish-mash.

10. Another possible solution that suggests itself is the establishment of a very complex accounting system that in some way would distinguish and carry separately all the float items. The complications of such a scheme might more than offset its abstract theoretical advantage; moreover, as just noted, the data are not available for implementing such an ambitious scheme.

11. It follows that some synchronization should be attempted, both for ease of interpretation and in the light of the actual data situation, even though it may be less desirable from an ultra-ambitious theoretical point of view than the proposal of point 10. If in any particular case it can be demonstrated that the isolation of a float item is essential for analytical purposes, this could be done.

12. Various types of synchronization are possible. Reverting to our example, the float to which Step 1 gives rise could be eliminated by using either A's or B's timing. In the first case we would record

A's and B's s-i/a consolidated	
accounts receivable (+)	: accounts payable (+)

on a consolidated basis; in the second case there would be no entry in the accounts at this stage – the above entry would instead appear at Step 2.

The float to which Step 3 gives rise can again be handled in two ways: either A's or B's timing may be adopted. On the former basis we have no entry at this stage. The entry would appear only when Step 4 takes place. On the latter we have on a consolidated basis

A's and B's s-i/a consolidated	
accounts receivable (−)	: accounts payable (−)

It should be noted that either of these alternatives is compatible with either of the alternatives adopted under Step I, as far as consistency is concerned: A-A, A-B, B-A, and B-B timings are all consistent.

However, it would seem to follow that once a timing has been decided for Step 3, the timing that must be adopted for the records of A's and B's banks is set. I.e. if B's timing is adopted at Step 3, and consequently his deposits are shown to decrease and those of A to rise, the bank's records must be drawn up in the same way; and a similar statement for the case in which A's timing is adopted at Step 3.

Unless I am mistaken, this covers all possibilities. In particular, it seems to me that the idea – suggested by symmetry – of basing the timing on the records of either of the banks does not offer an alternative procedure; but this should be checked.

13. Approaching the problem of the float from the standpoint of the theoretical desirability of the various treatments, it is my impression that nothing short of the elaborate treatment outlined under (10) will satisfy. The argument is here generally in terms of what treatment is best from the

standpoint of the analysis of decision-making. The considerations are often rather inconclusive even in the case of a single step in the transaction, and no clear-cut proposal emerges when all the steps are taken into account.

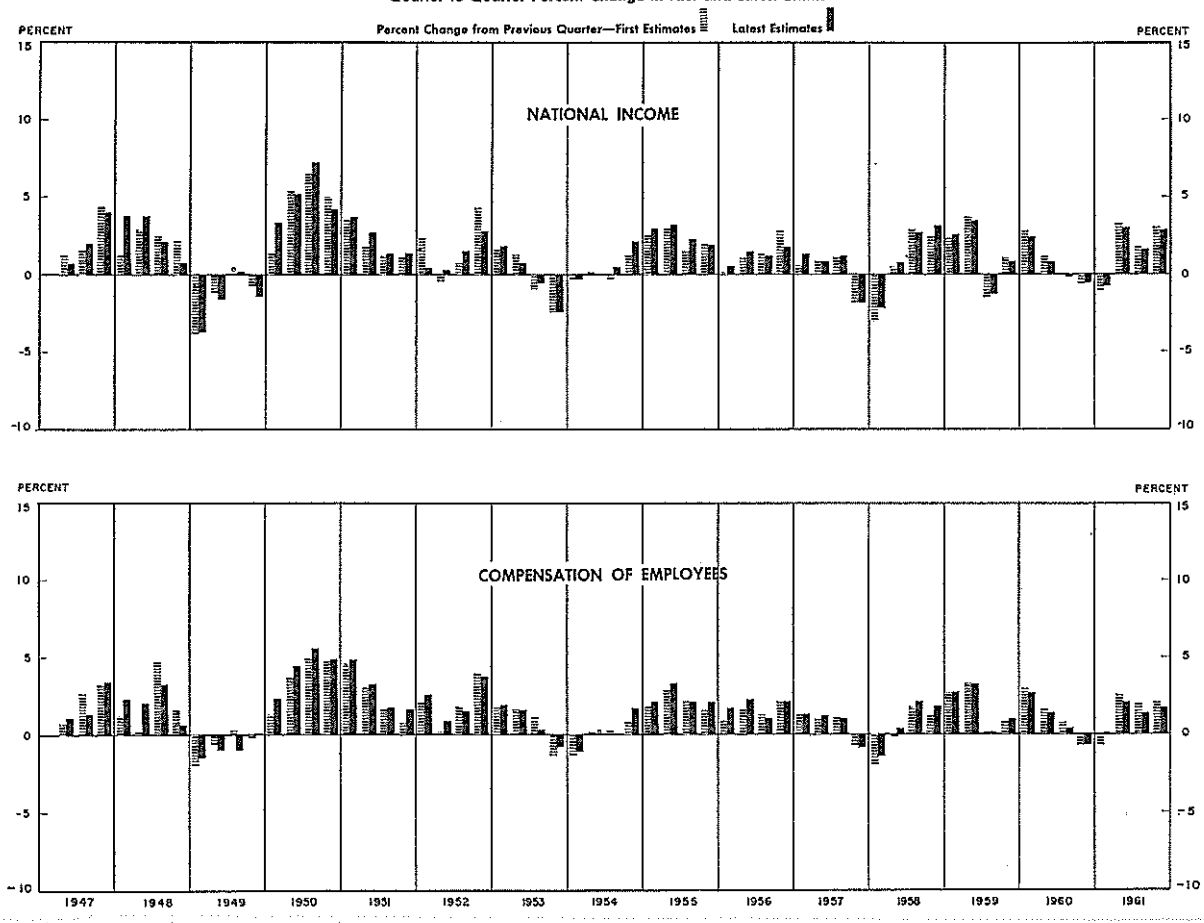
With respect to the float caused in Steps 1 and 2, I think it is perhaps somewhat preferable to adopt A's timing rather than B's. Inasmuch as B has ordered the stuff, he might just as well – at least in ordinary times – be treated as though he has actually received it. This seems to me to do less violence to the events of the real world than the alternative treatment of not letting A register sales and inventory decrease until B has actually received notification of shipment. But I am not at all sure that there is much to choose between the two treatments on theoretical grounds.

With respect to the floats that arise subsequently, there has been a suggestion – in opposition to the common-sense view – that transactors are guided in their decisions by their banks' records of their deposits rather than by that of their own cheque books. This is a somewhat tenuous position in the first place. Moreover, even if accepted, I do not see that it helps in suggesting a particular, consistent scheme of synchronization.

14. Statistical considerations may point toward the adoption of one scheme of synchronization rather than another. For instance, available deposit data come from bank records. To put them on a recipient-timing basis (A, in our example) calls for adjustment of these records only for the float that appears in transactions among banks; to put them on a payer basis (B, in our example) would in addition call for an adjustment for the float that arises between A and B.

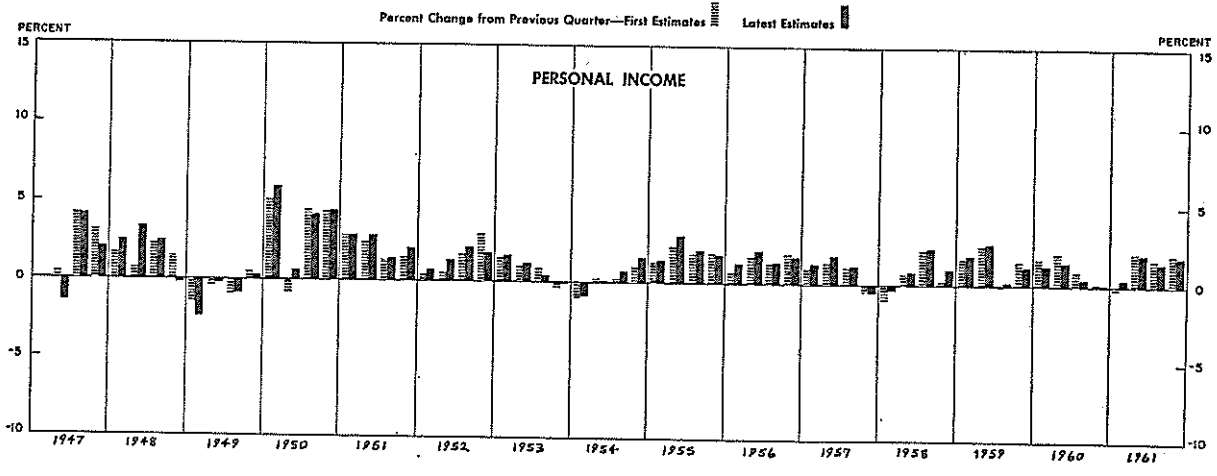
MAJOR COMPONENTS OF SEASONALLY ADJUSTED QUARTERLY NATIONAL INCOME AND PRODUCT ACCOUNTS, 1947-61

Quarter-to-Quarter Percent Change in First and Latest Estimate



MAJOR COMPONENTS OF SEASONALLY ADJUSTED QUARTERLY NATIONAL INCOME AND PRODUCT ACCOUNTS, 1947-61

Quarter-to-Quarter Percent Change in First and Latest Estimate



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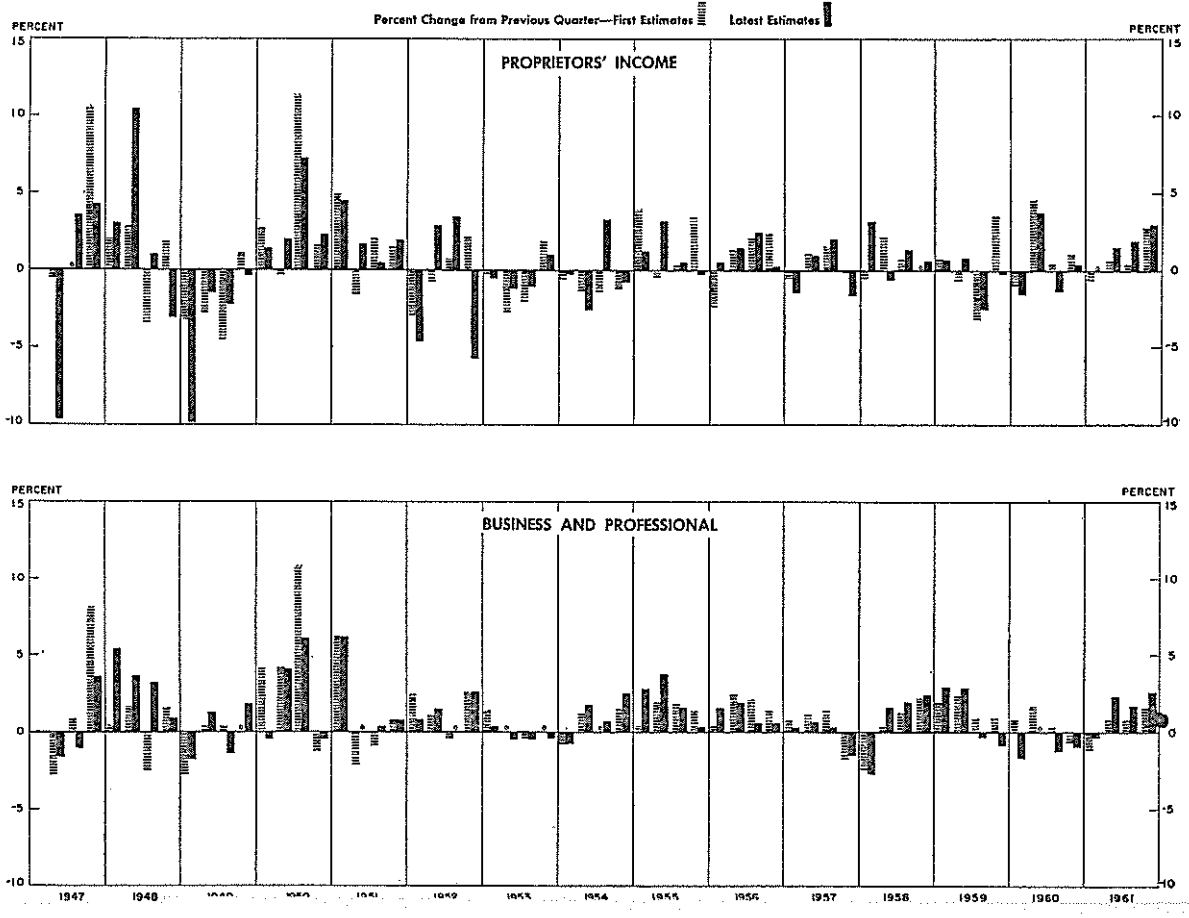

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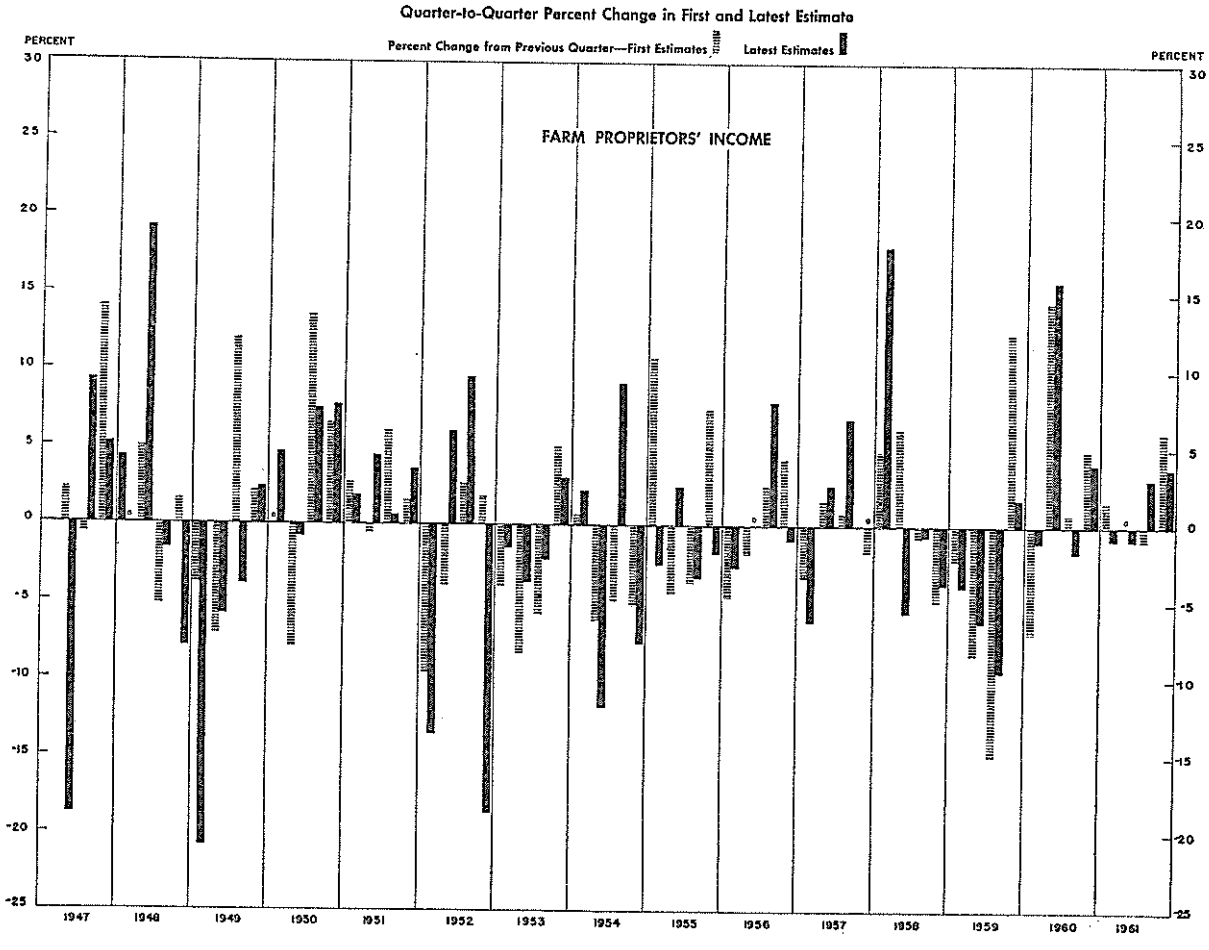

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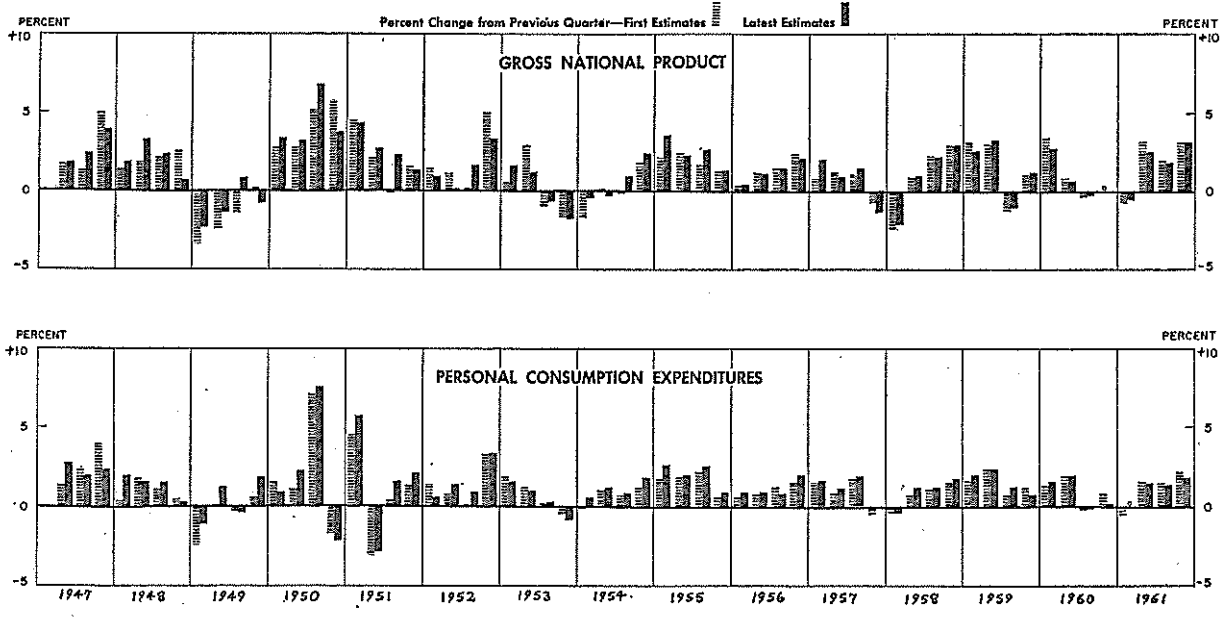

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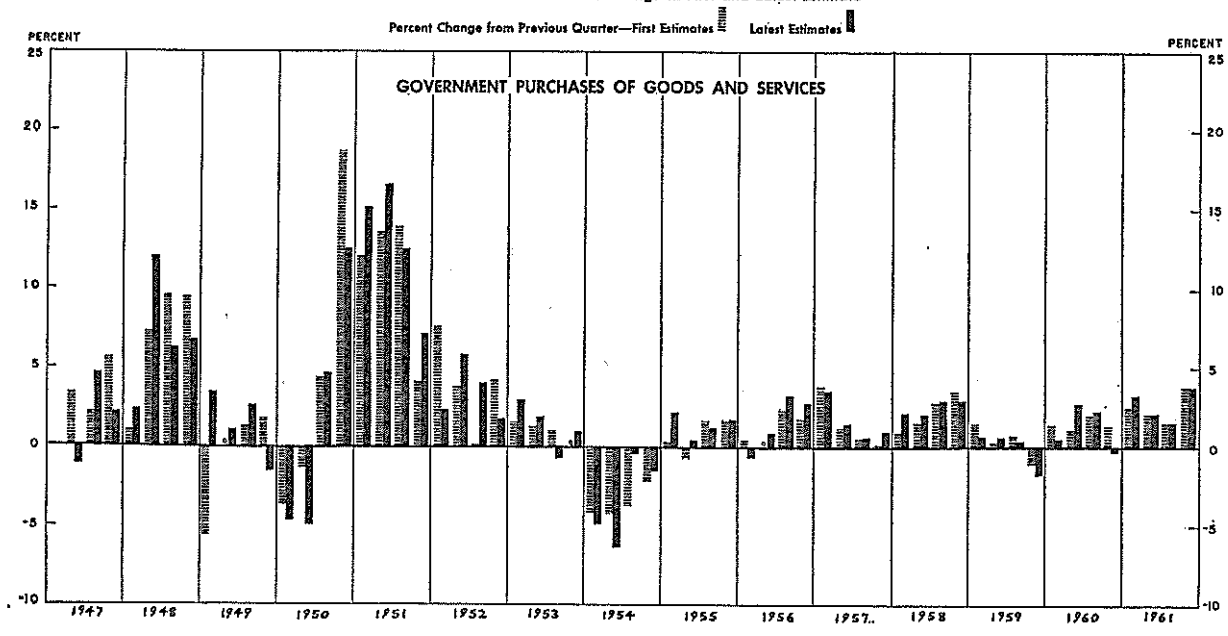
Quarter-to-Quarter Percent Change in First and Latest Estimate



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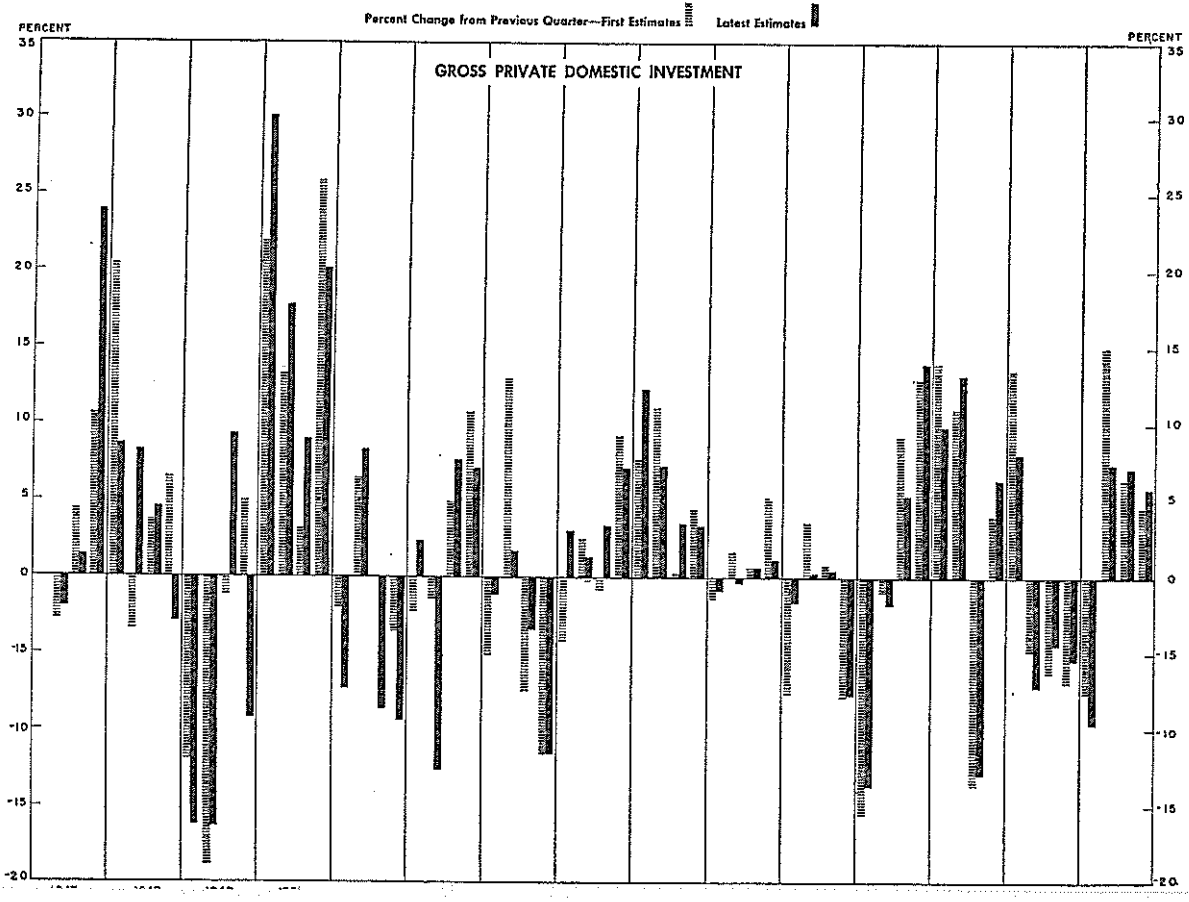
Quarter-to-Quarter Percent Change in First and Latest Estimate



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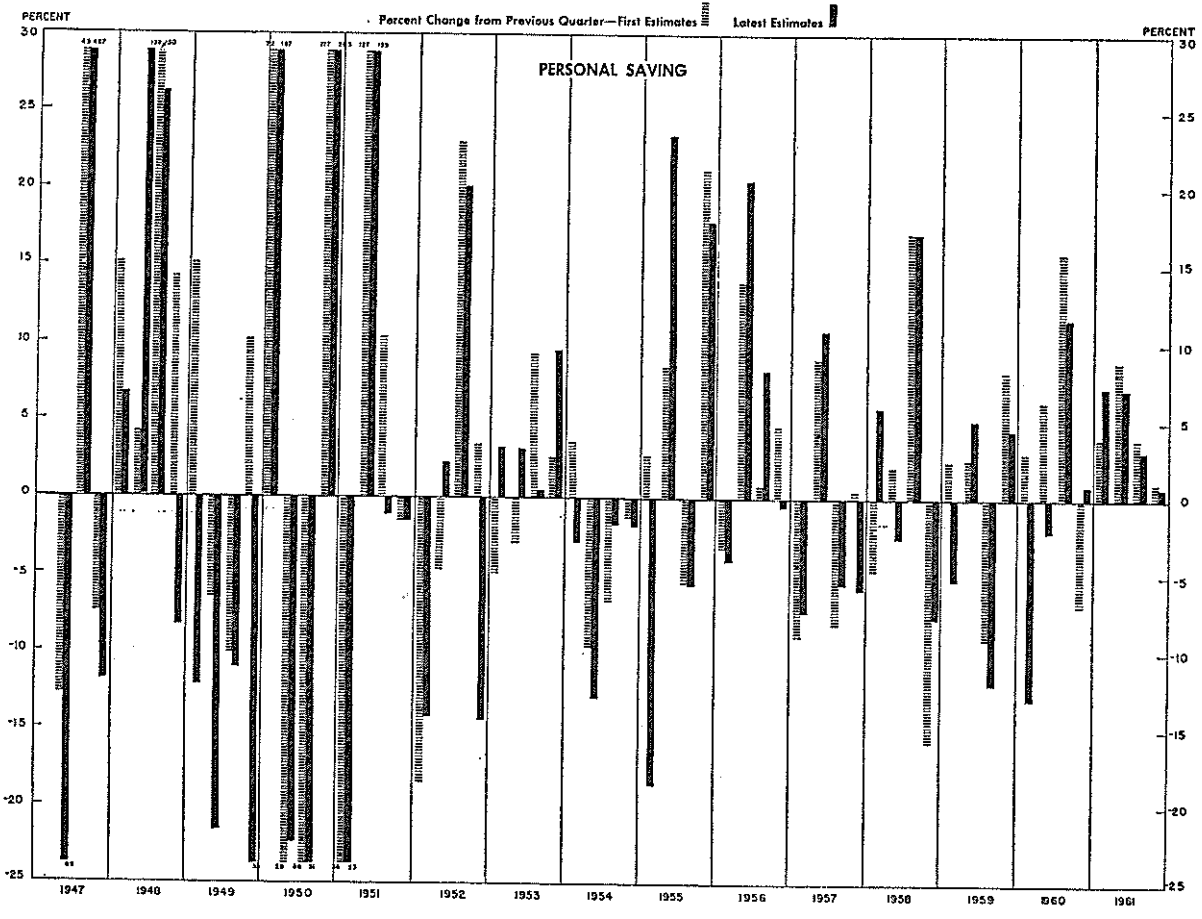
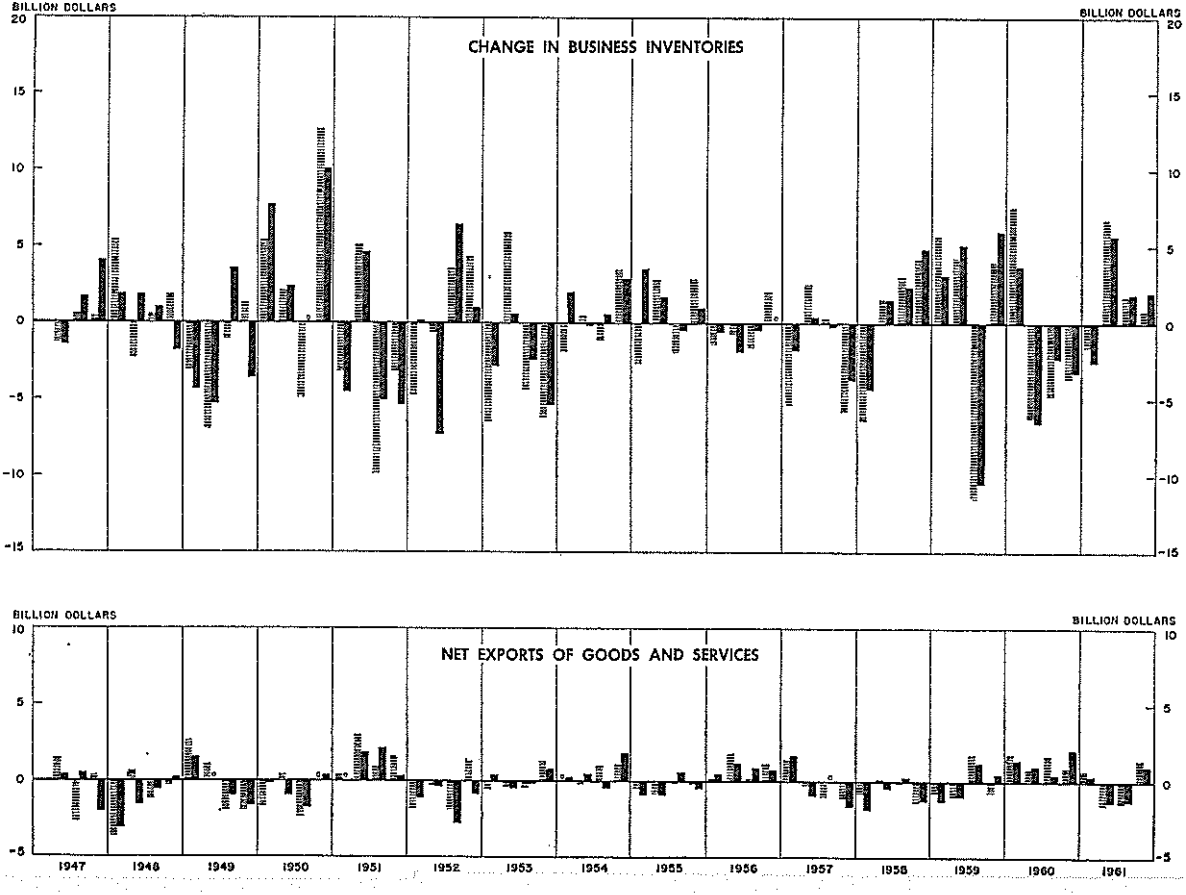
Quarter-to-Quarter Percent Change in First and Latest Estimate



MAJOR COMPONENTS OF SEASONALLY ADJUSTED QUARTERLY NATIONAL INCOME AND PRODUCT ACCOUNTS, 1947-61

Quarter-to-Quarter Percent Change in First and Latest Estimate

Percent Change from Previous Quarter—First Estimates ▒ Latest Estimates ▌



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Quarter-to-Quarter Percent Change in First and Latest Estimate