Volume Title: Output, Input, and Productivity Measurement

Volume Author/Editor: The Conference on Research in Income and Wealth

Volume Publisher: Princeton University Press

Volume ISBN: 0-870-14181-3

Volume URL: http://www.nber.org/books/unkn61-1

Publication Date: 1961

Chapter Title: Industry Net Output Estimates in the United States

Chapter Author: Almarin Phillips

Chapter URL: http://www.nber.org/chapters/c2227

Chapter pages in book: (p. 315 - 328)

Industry Net Output Estimates in the United States

ALMARIN PHILLIPS
UNIVERSITY OF VIRGINIA

THIS paper reviews three recent measures of United States industry net output (or input) which have been done within the framework of, or by methods consonant with, national income and product statistics. The studies, taken chronologically, are Simon Kuznets' "Long-Term Changes in the National Income of the United States of America Since 1870,"[1] John W. Kendrick and Carl Jones, "Gross National Farm Product in Constant Dollars, 1910–50,"[2] and the Bureau of Labor Statistics' "Trends in Output per Man-Hour and Man-Hours per Unit of Output Manufacturing, 1939–53."[3] Each is first described and then evaluated.

Estimates of net output by industrial origin should be an integral part of a complete system of national accounts. Economic change involves shifts in the allocation of resources and changes in the efficiency of their application within and among industries. The description and analysis of this process require empirical knowledge of the industrial composition of the aggregate national output. However, unlike certain other nations, the United States boasts no regularly published official estimates of industry net output.[4] The closest approximation is the Department of Commerce series on

[1] *Income and Wealth of the United States, Trends and Structure*, Income and Wealth Series II, Cambridge and Baltimore, 1952.

[2] *Survey of Current Business*, September 1951. See in addition John W. Kendrick, "National Productivity and Its Long-Term Projection," *Long-Range Economic Projection*, Studies in Income and Wealth, Volume Sixteen (Princeton University Press for National Bureau of Economic Research, 1954), where Kendrick compares farm net output and productivity with gross private national product and productivity; also, L. Jay Atkinson and Carl Jones, "Farm Income and Gross National Product," *Survey of Current Business*, August 1954, and "Note on Farm Gross National Product," *Survey of Current Business*, October 1958.

[3] BLS Report No. 100.

[4] At least twelve countries publish estimates of net production by industrial origin in constant prices. For description of techniques see W. B. Reddaway, "Movements of the Real Product of the United Kingdom, 1946–49," *Journal of the Royal Statistical Society* (Part A, 1950) and V. R. Berlinguette, "Measurement of Real Output," *Canadian Journal of Economics and Political Science* (February 1954), and Berlinguette and Leacy, "The Estimation of Real Domestic Product by Final Expenditure Categories and by Industry of Origin in Canada" (in this volume).

national income (factor payments) by major industries in current dollars. There is no official attempt to deflate these data due to the lack of an appropriate factor price index. The works reviewed here are the forerunners of what many hope will soon be a permanent addition to United States social accounts.

Study Coverage and Methods

THE KUZNETS ESTIMATES

The Kuznets' study is the only one which takes a factor payment rather than a market price approach. "Since," says Kuznets, "industries are not complexes for the production of final goods, it is difficult, if not impossible, to identify any specific final product magnitude with any specific industry's activity. Industries contribute the efforts of the factors of production engaged in them . . . Since the industries are interlocked in the production of any group of final goods . . . an industrial distribution of the national product must be based on the general assumption that the contribution of each industry is proportional to the economic magnitude of the resources engaged in them."[5]

The factor payment approach raises immediately the problem of deflation. Kuznets rejects a deflator based on the prices of goods purchased by the factor owners since this would reflect changes in the "terms of trade" of the factors in one industry vis-à-vis the rest of the economy rather than the unique value of their contribution. Instead, he would, conceptually, employ an index based on a weighted average of the difference between the prices of goods bought and sold by firms in the industry.[6] Actually, while this deflation technique is illustrated for agriculture,[7] Kuznets' final allocation of national product in constant dollars is based on indexes of physical output, most of which were presented in previous publications of the National Bureau of Economic Research.[8]

The translation of indexes of physical output into a percentage distribution of real national product is typical of Kuznets' ingenuity in treating data. A percentage distribution of national income by industry of origin in current dollars was available. Total national product, in 1929 prices, was converted to index form for overlapping decades with the average value for the decade 1919–28 as a base.

[5] Kuznets, *op. cit.*, p. 92.

[6] *Ibid.*, p. 93. See also his earlier statement of the same method, "Income Originating in Nine Basic Industries," National Bureau of Economic Research, *Bulletin No. 59*, May 1936, p. 5.

[7] *Ibid.*, pp. 93–8.

[8] *Ibid.*, pp. 99–103.

Indexes of the physical output of the respective industries for overlapping decades were converted to the same base, and these were divided by the index of constant price total national product for each decade. The quotient indexes were then multiplied by the relative shares of the respective industries from 1919 to 1928 to obtain estimates of percentage shares of national product in 1929 prices for each of the other decades. Thus any industry whose physical output grew more rapidly than deflated national product shows an increasing share, and vice versa. Kuznets was able to obtain such estimates for agriculture, mining, manufacturing, contract construction, and transportation and public utilities. Output indexes for trade, service, finance, and government were unavailable; hence, their combined share was obtainable only as a residual.

THE KENDRICK-JONES ESTIMATES

These estimates of net farm output are apparently the first expressly to use the Geary approach[9] for a major sector of the United States GNP. Gross output in current market values for each of several classes of farm products was found by summing sales (i.e., cash receipts from farm marketings), Commodity Credit Corporation loans, home consumption of farm products, net change in farm inventories, and the rental value of farm homes. The current value of intermediate products consumed was derived by totalling Bureau of Agricultural Economics data on production expenses other than contractual factor costs. Rents paid to nonfarm landlords, unlike rents accruing to farmers, were included in intermediate purchases rather than in factor costs of farming and are thus not included in the final estimates of net farm output. In line with the Commerce Department's treatment of financial intermediaries, the value of commercial banking services was measured by imputed interest on farmers' deposits in commercial banks. Net farm output, or GNP originating on farms, is the difference between gross output and intermediate purchases.

Kendrick and Jones also estimated current capital consumption by subtracting estimates of depreciation allocable to nonfarm landlords from BAE data on total farm depreciation, in order to derive farm net national product in market prices.

Deflation of output and input was done at the detailed product level with BAE price series converted to a 1939 base. Special deflation

[9] See R. C. Geary, "The Concept of Net Volume of Output with Special Reference to Irish Data," *Journal of the Royal Statistical Society* (New Series), 1944. Solomon Fabricant discussed the same concept previously in *The Output of Manufacturing Industries*, National Bureau of Economic Research, 1940, pp. 23 ff.

techniques based on moving the 1939 values were necessary for banking services and rents paid to nonfarm landlords. With ideal indexes, the deflation would yield a series of net outputs composed of given year quantities of output less given year quantities of intermediate purchases, both valued in 1939 prices.

In subsequent presentations the Kendrick-Jones constant dollar net farm output estimates or revisions of them are compared with larger aggregates of output and residual nonfarm output measures are presented. Kendrick utilized Commerce Department deflated private gross national product data to obtain gross private nonfarm product.[10] Atkinson and Jones later compared farm GNP with both private nonfarm and government GNP in constant dollars.[11]

The Kendrick-Jones estimates were used to derive productivity measures. In the original article, net farm product was compared with BAE man-equivalent hours to obtain output per man-hour. An index of composite labor, capital, and land productivity was also shown. The series for durable capital was prepared by deflating annual capital outlays, subtracting deflated annual depreciation, and successively adding the difference to the sum of fixed capital in the base year. Changes in constant dollar farm inventories were added to obtain estimates of total capital. The series for land was obtained by moving the value estimate for the base year by changes in acreage. A composite factor input index was constructed by combining the labor, capital, and land indexes with weights reflecting the distribution of income payments in the period 1940 to 1949.

Kendrick compared output per man-hour for the farm, private nonfarm, and total private sectors, and provided an analysis of the effects of interindustry shifts on productivity. The Atkinson-Jones revision of the original series changed the productivity measure from output per man-hour to output per worker, probably because of conceptual difficulties in the BAE man-hour series.

THE BUREAU OF LABOR STATISTICS ESTIMATES

These estimates for manufacturing are the first large-scale attempt to measure the net output of a major non-agricultural sector of the United States economy with the Geary method. They were made as part of a continuing study of man-hour productivity based sometimes on physical output and sometimes on value added.

The BLS study works from the details of the four-digit industry classifications of the *Census of Manufactures*, 1939 and 1947, and the *Annual Survey of Manufactures*, 1949 through 1953. Each industry's

[10] "National Productivity and Its Long-Term Projection."
[11] *Op. cit.*

value of shipments was adjusted for changes in inventories of finished goods and goods in process to obtain figures for gross output. Primary and secondary products were added together. The value of output reflects sellers' net receipts rather than market prices since indirect taxes paid by manufacturers are not included in shipments figures in the 1947 and subsequent census and surveys. The gross output of each industry contains not only the usually conceived intermediate purchases but also substantial amounts of double-counting due to interplant transfers within each industry.

Intermediate purchases were also taken from Census figures. These purchases include interplant transfers within industries so that double-counting, referred to above, is eliminated by subtraction in the calculation of net output. However, Census purchases cover only materials, supplies, containers, fuels, contract work, and purchased electrical energy. The omission of items such as legal and accounting services, insurance, telephone and telegraph, repair work, etc., leaves much in the Census and BLS value added figures which is foreign to the national product concepts.

The gross output of each industry was deflated by an average of the BLS Wholesale Price Indexes for products primary to that industry. The weights used in averaging were the relative values of the several products in 1947 as shown by the *Census of Manufactures*. Except for 1939 and 1953 when purchases were deflated for the aggregate of industries, each four-digit industry's purchases were deflated by an average of the price indexes for the supplying industries, the weights being the relative values for such industry purchases shown in the BLS Interindustry (input-output) Chart for 1947.

The price indexes available were of the Laspeyres type with base year quantity weights. These were used in two different ways to produce two indexes of net output. The first technique was to divide both gross output and intermediate purchases by their respective price indexes to obtain:

$$\frac{\sum_{1}^{n} P_1 Q_1 \left(\frac{\sum_{1}^{n} P_0 Q_0}{\sum_{1}^{n} P_1 Q_0} \right) - \sum_{1}^{m} p_1 q_1 \left(\frac{\sum_{1}^{m} p_0 q_0}{\sum_{1}^{m} p_1 q_0} \right)}{\sum_{1}^{n} P_0 Q_0 - \sum_{1}^{m} p_0 q_0}, \tag{1}$$

where P and Q represent prices and quantities of n items of gross output, p and q prices and quantities of m items of intermediate purchases, and the subscripts 0 and 1, the base and given years, respectively. Since the BLS lacked the necessary Paasche price

indexes, this provided the best approximation to the generally preferred Laspeyres production index. The second method was to "inflate" 1947 gross output and intermediate purchases by the price indexes for given years and to divide the result into the given year value of net output to yield the index:

$$\frac{\sum_{1}^{n} P_1 Q_1 - \sum_{1}^{m} p_1 q_1}{\sum_{1}^{n} P_1 Q_0 - \sum_{1}^{n} p_1 q_0}. \tag{2}$$

This results in a straight Paasche production index in which each year's index is comparable only with that of the base year. The labor productivity indexes were prepared by simple division of a man-hour index into the relevant net output index.

Evaluation

THE KUZNETS ESTIMATES

These estimates of net output by industry of origin are certainly of the "rough and ready" variety. With the exception of the agricultural estimate, they are not net at all. Their validity depends on the generally untested assumption that the ratio of real net output to real gross output is constant.[12] Other issues could be raised—Kuznets' concept of national income, the very limited level of disaggregation, the use of overlapping decades rather than individual years in some of the initial computations, the failure to distribute rent by industrial origin, index number biases—but a discussion of them seems inappropriate here. This was a pioneering study and its positive contributions far outweigh its apparent shortcomings.

Kuznets' analysis of his estimates illustrates the value of industry net output data. The insights he derived from a comparison of industry product shares through time and from the observation of productivity changes within and among industries constitute a strong argument for devoting greater effort to the development of a continuing series of this nature.

More specifically, Kuznets' method for deflating factor incomes may have more merit and applicability than is currently recognized. The most widely recommended approach to measuring net output is

[12] The same criticism applies to the method of combining indexes of gross output with value added or net output weights. See Jack Alterman and Eva E. Jacobs, "Estimates of Real Product in the United States by Industrial Sector, 1947–55," this volume, p. 227. Berlinguette and Leacy, *op. cit.*, pp. 222–223, suggest that it is sometimes necessary to adjust gross output indexes for Canadian industries before they can be used as substitutes for indexes of net output.

to use the Geary formula usually with a Paasche price index.[13] However, where the necessary data on purchased materials and services are lacking, or where the definition of output is problematical, deflated gross dollar output or some "representative" physical production series are usually substituted.[14] Resort to Kuznets' factor payments approach in such cases may be preferable. There is a simple algebraic relationship between one variant of the Kuznets' deflation technique and the Geary formula which seems to have gone unnoticed.

The Census gross industry output data exclude indirect taxes, while the industry purchase data include such taxes. When value added is computed by subtracting purchases from gross output, indirect taxes are eliminated and what is left, except for purchases not collected by Census, is factor income plus capital consumption allowances. Thus, the OBE estimates of income originating in an industry plus their unpublished estimates of capital consumption allowances are *conceptually* identical to Census value added, again ignoring uncollected items of purchase. This makes it possible to estimate net output in any given year, $\sum_1^n P_1Q_1 - \sum_1^m p_1q_1$, with OBE data.

Given-year net output can be deflated directly, without the separate deflation of gross output and inputs, by applying a price index formed by taking the weighted average of the difference between the gross output and the input price indexes. The weight for the gross output index is unity (i.e., the ratio of gross output to gross output) and the weight for the input price index is the ratio of inputs to gross output in the base year. This index appears as:

$$\frac{\dfrac{\sum_1^n P_1Q_0}{\sum_1^n P_0Q_0} - \left(\dfrac{\sum_1^m p_0q_0}{\sum_1^n P_0Q_0}\right)\left(\dfrac{\sum_1^m p_1q_0}{\sum_1^m p_0q_0}\right)}{1 - \dfrac{\sum_1^m p_0q_0}{\sum_1^n P_0Q_0}}, \tag{3}$$

which reduces to

$$\frac{\sum_1^n P_1Q_0 - \sum_1^m p_1q_0}{\sum_1^n P_0Q_0 - \sum_1^m p_0q_0}. \tag{4}$$

[13] "Index Numbers of Industrial Production," *Studies in Methods*, Statistical Office of the United Nations (September 15, 1950).

[14] For illustrations, see Reddaway, *op. cit.*, and Berlinguette and Leacy, *op. cit.*, pp. 222 ff.

The index of net output (factor incomes plus capital consumption) before price correction is:

$$\frac{\sum_{1}^{n} P_1 Q_1 - \sum_{1}^{m} p_1 q_1}{\sum_{1}^{n} P_0 Q_0 - \sum_{1}^{m} p_0 q_0}, \tag{5}$$

and deflation of (5) by the price index in (4) yields:

$$\frac{\sum_{1}^{n} P_1 Q_1 - \sum_{1}^{m} p_1 q_1}{\sum_{1}^{n} P_1 Q_0 - \sum_{1}^{m} p_1 q_0}, \tag{6}$$

the Paasche variety of the Geary formula.[15] This is precisely the algebraic result of the second BLS deflation technique shown in (2) above, but the need for deflating output and inputs separately is avoided.[16]

This method was checked, using the BLS price indexes for gross output and inputs for manufacturing as a whole. Since Census does not publish gross shipments for all manufacturing, the $\sum_{1}^{n} P_0 Q_0$ value was estimated by multiplying total manufacturing value added in 1947 by one and a half on the strength of a statement in the *1947 Census of Manufactures* that value added tends to be two-thirds of gross shipments.[17] The value for $\sum_{1}^{m} p_0 q_0$ was derived by subtracting OBE income originating in manufacturing plus manufacturing depreciation from the estimated gross output value.[18] This produced a weight for the input price index of .451.

Table 1 compares the BLS current year weighted net output index for manufacturing with the net output index derived by deflating Census value added in manufacturing directly by the price index

[15] The Laspeyres type of the Geary formula results if Paasche price indexes of gross output and input are used, the weights being unity and the ratio of input to gross output in the given year valued in base year prices. These price indexes will be negative under the same circumstances as those which produce negative results for the Geary formula.

[16] Alterman and Jacobs, *op. cit.*, state that the net output of an industry "must be obtained by deflating output and intermediate goods and services separately and then subtracting deflated inputs from deflated output." This is an apparent denial of the point made here. Their position is based, however, on the lack of a satisfactory index for the prices of the factors of production which might be used to deflate income originating, not on a refutation of the possibility of using price index (3), above.

[17] Vol. I, p. 20.

[18] At the time this was prepared the data on depreciation were the only part of total capital consumption allowances available from the OBE on an industry basis.

in (3) above. The difference is slight and appears to be wholly attributable to differences in the underlying data, as follows. First, the BLS index is a weighted average of the component indexes of the individual four-digit industries while aggregate manufacturing value added was deflated by the direct method. Second, the BLS adjusted inventories to change shipments to production. Data to make a similar adjustment to Census value added were not available. Finally, the weights used in deriving the value added deflator may be inexact. Whatever the reasons for the differences, it is clear that precisely the same index would result if identical data were used with the same level of disaggregation.

TABLE 1

Comparison of Variously Derived Indexes of Net Output for Manufacturing, 1947–55 (1947 = 100)

Year	BLS Current Year Weighted Index (Geary Method) (1)	Index Based on Direct Deflation of Census Value Added (2)	Index Based on Direct Deflation of OBE Income Originating Plus Depreciation (3)
1947	100.00	100.00	100.00
—	—	—	—
1949	94.51	94.92	100.96
1950	109.37	110.49	116.52
1951	120.40	115.40	127.15
1952	124.09	122.85	129.86
1953	136.13[a]	135.87	140.67
1954	123.36[a]	128.69	130.60
1955	138.36[a]	142.58	147.17

[a] Cost of materials was deflated for total manufacturing rather than at the four-digit industry level.

Source: Col. (1)—Bureau of Labor Statistics Report No. 100. Derivation of the indexes in cols. (2) and (3) is described in the text in the section evaluating Kuznets' estimates.

Table 1 also presents a net output index prepared by deflating value added estimated by summing OBE income originating and depreciation for manufacturing industries. If there were a constant relationship between value added thus computed and Census value added, this index would be identical with that in column (2). However, the two series are markedly different.

Manufacturing has been used in these illustrations only because the necessary price indexes were at hand. The alternative proposed for the Geary formula is not designed for industries such as farming and manufacturing where annual estimates of both output and input are available. Instead it should be useful for those industries where factor

payments and capital consumption estimates are available annually but where input data are known only occasionally.

THE KENDRICK-JONES ESTIMATES

These estimates and the subsequent revisions are careful work but immediately apparent is the inadequacy of the deflation techniques and the sensitivity of the findings to alternative deflation processes. The estimates based on 1939 prices used price indexes converted from an original 1910–14 base. The Atkinson and Jones revision used the newer 1947–49 based price indexes with pronounced differences in the results. Based on 1939 prices, net farm output grew at an average annual rate of about 0.6 per cent between 1910 and 1950. In 1947–49 dollars, the annual rate of increase was 0.9 per cent between 1910 and 1953. This is a considerable difference, especially if the output measures are to be used in ratio to make productivity estimates.

Regarding this disparity, Atkinson and Jones point out that the prices of products produced were higher in 1947–49 than in 1939 relative to the prices of products consumed. Since gross output rose less rapidly than intermediate consumption, this explanation seems correct. There were also some revisions in the underlying USDA output and input estimates which may have affected the two rates of growth. Atkinson and Jones also point out that there was a shift between 1939, and 1947–49 in the mix of purchased materials, relatively cheaper items becoming more important and vice versa. Whatever the full explanation, it is apparent that alternative weight bases can change the output estimates significantly.

The comparison of deflated net farm output with deflated private GNP raises other problems. First, certain components of GNP which are not easily deflated are glossed over when one or a few industries are deflated individually and the remainder treated as a residual between these and GNP. Kendrick recognized one such problem area when he excluded general government from GNP prior to comparing farm and nonfarm net output. However, the rationale for this deletion was not the difficulty of deflating general government. Rather it was that the inclusion of this sector would dampen nonfarm productivity, since the index of government productivity would be constant at one hundred for all years.

The same reasoning which leads to government's exclusion would seem to apply with equal force to many areas in the private economy. The output values for households and some of the service industries such as the medical, legal, and insurance professions, can hardly measure more than real factor input after deflation. Kendrick himself

estimates that 20 per cent of real GNP is thus constituted.[19] The industries where net output is measured through inputs should be separated from those where net output is measured directly.[20] Then a particular industry, say farming, could be compared with aggregates similarly derived: all private commodity producing industries, all private business production, etc.

Another issue concerns the validity of the comparison of net farm output with private GNP. The net production of an individual domestic industry includes all domestic and foreign demand on the output side, and all factor payments to nationals and nonnationals on the input side. Since factor payments from abroad are in no way included, the sum of the net outputs of private domestic industries equals gross private *domestic* product rather than gross private *national* product.[21] Hence, the former provides a better basis for comparison and for the computation of a residual from the output of specific industries.

Had Kendrick and Jones been able to show subgroups of net outputs within farming, such data would have provided much more knowledge about how the growth in farm output has occurred. It would have been possible to study the effects of shifts within agriculture as well as shifts between agriculture and other activities. However, agricultural data do not readily lend themselves to such calculations.

THE BLS ESTIMATES

BLS has noted many of the limitations to their net output measures and most of them need only be mentioned. For example, a full listing of intermediate purchases is not available. For use in national product accounts it obviously would be preferable if such data were provided. Similarly, the industry output estimates should include indirect taxes levied at the manufacturing level if these data in the aggregate are to coincide conceptually with gross national or gross domestic production valued in market prices.[22]

[19] "Measurement of Real Product," *A Critique of the United States Income and Product Accounts*, Studies in Income and Wealth, Volume Twenty-Two (Princeton University Press for National Bureau of Economic Research, 1958), p. 414.

[20] For a similar suggestion see Kendrick, "Measurement of Real Product."

[21] See "A System of National Accounts and Supporting Tables," *Studies in Methods* (No. 2), Department of Economic Affairs, United Nations, 1953; G. Stuvel, "A System of National and Domestic Accounts," *Economica* (New Series), August 1955; Kendrick, "Measurement of Real Product;" and Berlinguette and Leacy, *op. cit.*, pp. 212–13.

[22] It is not impossible to distribute indirect business taxes by industry from existing U.S. data. Alterman and Jacobs, *op. cit.*, distribute indirect taxes by major sector in order to obtain weights for combining the sectors' production indexes which are consistent with the concept of GNP in market values. Neither the manufacturing net output series nor the wholesale prices indexes used for deflation contain these taxes, however, so they remain somewhat inconsistent with the GNP concept.

Paasche price indexes would yield Laspeyres production figures but these are nonexistent. In certain industries where product heterogeneity is great and secondary production bulks large in the aggregate, deflation of industry output by indexes of primary products may be quite crude.[23] Deflation of the output values of the individual products of an industry in each year would be a preferable procedure. It would take care of secondary production and automatically allow for the effects of a varying product mix.

An analogous argument applies to the deflation of intermediate purchases. The prices of products actually purchased may be quite different from the average price of the products of the supplier industry. Again, if individual items purchased could be deflated separately, the effects of changes in the purchase mix would be included in the deflated total of intermediate purchases. Reliance on the fixed weighting scheme of the Interindustry Chart probably causes an overstatement of intermediate purchases and, hence, an understatement of net output since the impact of price-induced materials substitution is not incorporated.[24]

Unfortunately, the BLS has not presented their detailed industry figures for net output. Although the composite index for manufacturing is formed by aggregating 453 Census industries and both production and man-hour indexes could be shown for each of them, the only breakdown given is between durable and nondurable goods. This lack of detail makes it impossible to study the structural aspects of growth within the manufacturing sector. Presumably, detail was omitted because of the likelihood of error in individual industries. Granting that this is a good reason for not showing four-digit industry data, it is less valid in the case of two-digit or even three-digit data.

Conclusion

These studies clearly demonstrate that estimates of industry net output are possible when adequate resources are applied to the task. An even clearer demonstration is provided by the Alterman and Jacobs and the Berlinguette and Leacy papers in this volume.

It is significant that all three estimates are virtually devoid of conceptual error. Measurement of net output has progressed to the point where everyone is generally agreed on what should be measured. Disagreement is largely confined to questions of procedure, and it exists here principally because of data limitations. More and better price

[23] BLS provides a test for this (see Report No. 100, p. 332). The test is inappropriate for individual industries, but seems acceptable for large aggregates.

[24] This indicates a need for periodic interindustry flow data so that the weighting of intermediate purchases can be up-dated fairly often.

indexes, more and better information on the industrial origin of capital consumption, etc., are needed.

Estimation of net output by industry of origin cannot await improved data, however, and the latter are apt to be provided only as demanded. It is encouraging to learn[25] that progress is being made in the development of an official series on net output and productivity for the whole economy. The three studies reviewed here form a solid foundation for the future work. Closing the residual area of national production will entail some crude techniques in estimation but knowledge of the operation of the economy requires that the effort be made. Also, we can expect continuous refinement once a program is underway.

[25] See *Economic Report of the President*, January 1958, p. 91.