Chapter Title: Gross National Product in the United States, 1834–1909

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Consumption, Investment, and Employment

Gross National Product in the

United States, 1834–1909

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This paper is a short summary of the main findings of a study of American national product since 1834. Concepts, estimating procedures, and a few tests of the estimates are described in the appendix. We have attempted to keep these matters out of the body of the paper. The reader is duly warned to look into the appendix before he makes use of the series in his own work.

Levels and Rates of Growth of National Product and National Product Per Capita

The findings described in this section are similar to the findings of two earlier papers. Therefore, they are discussed very quickly and the reader is referred to the earlier papers.[1]

[1] "Commodity Output, 1839–1899," *Trends in the American Economy in the Nineteenth Century*, Studies in Income and Wealth 24, Princeton for NBER, 1960; "Estimates of American National Product Made Before the Civil War," *Economic Development and Cultural Change*, April 1961.

LEVELS OF NATIONAL PRODUCT AND NATIONAL PRODUCT PER CAPITA
CIRCA 1840 AND 1950

In 1839 the United States was a very young country, not long on the path of industrialization. One tends to think of it as still small and relatively weak; but, in fact, this is not correct. American aggregate product was probably smaller, but not much smaller, than the aggregate product of each of the two major world powers of the time, Great Britain and France (see Table 1). International comparisons are difficult to make today and the difficulties are multiplied when we attempt comparisons for a date well over a hundred years in the past. But there are several different ways of going about it and the results obtained are similar enough to yield useful conclusions.

First, Deane and Cole have recently estimated British national income for 1841.[2] Converting their figure into dollars by use of the par of exchange yields a result about one-quarter above the level of American GNP (less changes in inventories) for 1839. The American figure probably exceeds American national income by about 5 per cent. Consequently, British national income probably exceeded American national income by about 30 per cent.

Ideally, international comparisons should be made by valuing components of the national products to be compared by a common price system. Gilbert and Kravis have shown that this procedure may give results quite different from those of a comparison conducted through the rate of exchange. Seaman made estimates of this kind for 1839, which show that British national income exceeded the American by 50 per cent; French national income exceeded the American by nearly 60 per cent. Three points should be made about the Seaman estimates. First, Seaman's American estimate is very much lower than ours; the margin is too great to reflect only conceptual differences. Second, we derived the British estimate by multiplying Seaman's per capita figure for England and Wales by the 1841 population of Great Britain. But per capita product in England and Wales may very well have exceeded per capita product in Great Britain. Third, Seaman used American prices in all of his computations. When a comparison is made between two countries, one of which is more highly developed (industrialized) than the other, the use of the prices of the less-developed country to make the comparison will lead to results relatively favorable to the more highly developed country, and vice

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[2] The next few paragraphs refer to Table 1. Citations should be sought in the sources of that table.

TABLE 1

COMPARISONS OF BRITISH, FRENCH, AND AMERICAN
NATIONAL PRODUCTS AND NATIONAL PRODUCTS PER CAPITA,
CIRCA 1840 AND 1950

	In Prices Circa 1840 (as per cent of U.S.)		In Prices of 1950 (as per cent of U.S.)	
	Great Britain	France	United Kingdom	France
1. National income, circa 1840				
A. Deane-Cole-Gallman	130			
B. Seaman	150	157		
2. GNP, circa 1840			85–112	123–156
3. GNP, 1950			18–22	12–15
4. National income per capita, circa 1840				
A. Deane-Cole-Gallman	120			
B. Seaman	140[a]	78		
5. GNP per capita, circa 1840			78–103	60–76
6. GNP per capita, 1950			53–63	42–53

Source

Line 1A: British national income, 1841: Phyllis Deane and W. A. Cole,
  British Economic Growth, 1688–1959, Cambridge, Eng., 1962, p. 166.
    American national income, 1839: GNP, Table A-1, minus 5 per cent
      (see text).
    Par of exchange: *Hunt's Merchants' Magazine*, XXXX, Volume III, p.
      345 ($4.40).
Line 1B: Line 4B adjusted for population differences, the latter taken from
  sources for lines 4A and 2 (France).
Line 2: U.S., U.K., and French GNP, 1950, extrapolated to 1840 (circa) on
  constant price national product series (see text).
    1950 estimates: Milton Gilbert and Irving B. Kravis, *An International
      Comparison of National Products and the Purchasing Power of Currencies*,
      OEEC, Paris, 1954, p. 37.
    Extrapolators: U.S., 1899–1908 to 1944–53, Simon Kuznets, *Capital in
      the American Economy*, Princeton for NBER, 1961, p. 521, GNP, 1929
      prices, Variant I; U.S., 1834–43 to 1899–1908, Table A-1, GNP, 1860
      prices; U.K., 1870–79 to 1949–53, Simon Kuznets, "Quantitative Aspects
      of the Economic Growth of Nations," *Economic Development and Cultural
      Change*, October 1956, p. 53, national income, 1912–13 prices; Great
      Britain, 1841–51 to 1871–81 (carried back to 1831–41 at the same rate
      of change), Deane and Cole, *British Economic Growth*, p. 170, national
      income, mean prices of 1865 and 1885; France, 1831–50 to 1949–53,
      Kuznets, in *Economic Development and Cultural Change*, October 1956,
      p. 53, net national product, 1938 prices.
Line 3: Computed from data in Gilbert and Kravis, *International Comparison*,
  p. 37.
Line 4A: Data underlying line 1A divided by population estimates in Deane
  and Cole, *British Economic Growth*, p. 8, and *Historical Statistics of the
  United States, Colonial Times to 1957*, Washington, 1960, Series A-2.
Line 4B: Ezra C. Seaman, *Essays on the Progress of Nations*, 2nd ed.,
  New York, 1852, pp. 445, 462.
Line 5: Data underlying line 2 divided by population estimates from
  sources of lines 4A and 2 (France).
Line 6: Gilbert and Kravis, *International Comparison*, p. 39.

[a]England and Wales.

versa.[3] Since Britain was more highly developed around 1840 than was the United States, Seaman's procedure tends to maximize the difference between the national products of the two countries.

Gilbert and Kravis have produced comparisons for 1950 in both American and foreign prices. That is, they have estimated American GNP in dollars, francs, and pounds; British GNP in dollars and pounds; French GNP in dollars and francs. The estimates can be extrapolated back to 1840 on a constant price national product series so that we can compare, e.g., British and American GNP in 1840 in terms of both dollars and pounds. There is a second advantage to this procedure. The constant price extrapolating series consist of ten- to twenty-year averages. Therefore, the effects of cyclical phenomena on the comparisons are limited.

The procedure has one very important disadvantage: the results are difficult to interpret. As a first approximation, we are comparing 1840 (circa) national products valued in 1950 prices, since the extrapolated estimates are in 1950 prices. But the extrapolators are not based on 1950. The price base of a constant price national product series affects the rate of growth of the series; in general, the earlier the price base, the higher the rate of growth.[4] Since the base years of the extrapolators are earlier than 1950, the extrapolated 1840 values are really smaller than 1840 national products in 1950 prices. If the extent of "bias" in the three series were identical, the comparisons would be unaffected, of course; but there is no good reason for supposing that they are. The date of the price base differs from series to series. In addition, the extent to which an early price base raises the rate of growth of a national product series, compared with a late price base, depends on the extent of changes in the price structure over time. There is no good reason for believing that the price structures of the three economies changed at the same pace.[5]

In view of the above remarks, it is a little surprising to find that the results of the third procedure are not very far from the results of the first two. French national product is shown to be between 23 and 56 per cent above American product. The upper limit is almost identical

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[3] See Milton Gilbert and Irving B. Kravis, *An International Comparison of National Products and the Purchasing Power of Currencies*, OEEC, Paris, 1954, p. 39. Simon Kuznets has provided the theoretical explanation for these results. See his *Economic Change*, New York, 1953, p. 171.

[4] For the same reason discussed by Kuznets (*ibid.*).

[5] Additionally, the French and the early segment of the British extrapolators are national income series, not GNP series; the early segment of the British extrapolator refers to Great Britain, while the 1950 comparison and the later segment of the extrapolator refer to the United Kingdom; the early segment of the American extrapolator excludes changes in inventories.

with the result obtained from Seaman's work. The American-British comparison worked out through the third procedure is less favorable to the British than are the comparisons resting on Seaman's work and on the exchange rate conversion of the Deane and Cole figure.[6] But even in the American-British case, the range of results of the three procedures is not very great, when put in the context of the differences among national products of developed countries in more recent years. That is, we find that American product may have been slightly higher (unlikely) or as much as a third lower than British product in 1840. In 1950, according to Gilbert and Kravis, American product was four or five times the size of British product; six or eight times the size of French product; roughly twice the size of the combined products of Italy, Germany, France, and the United Kingdom. According to Bornstein, American GNP was roughly two to four times the magnitude of Soviet GNP in 1955.[7] The position has changed somewhat in the last several years, but not enough to invalidate the main point, which is that, relative to the variations observed since, the margins between American product and both British and French product around 1840 were slight. Very early in her history the United States was one of the great economic powers.

In 1840, American population was somewhat smaller than British and very much smaller than French population. Consequently, the per capita comparisons are more favorable to the United States than are the national product ones. French product per capita ran between 24 and 40 per cent below the American; British product per capita, between 22 per cent below and 40 per cent above the American. Again, the American situation was closer to the British and French in 1840 than in recent years (see Table 1). According to Gilbert and Kravis, American product per capita was roughly double French product per capita in 1950, and about 60 to 100 per cent larger than British.

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LONG-TERM RATES OF GROWTH OF REAL GNP
AND REAL GNP PER CAPITA

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The data on the relative positions of the three countries in 1840 and 1950 imply widely disparate rates of growth between these dates and dramatize the rapidity with which major changes in relative economic strength can take place during the process of growth. This is especially

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[6] Note, also, that the third procedure involves comparisons with the U.K., whereas the first two involve comparisons with Great Britain.

[7] Morris Bornstein, "Comparison of Soviet and United States National Product," *Comparisons of the United States and Soviet Economies*, Part II, Joint Economic Committee, 86th Cong., 1st Sess., Washington, 1959, p. 385.

clear if growth is measured in terms of the rate of change of national product, rather than product per capita.

Comparisons with other countries are harder to come by, since the records of few go back as far as the American. However, for eleven countries, including Britain, France, and most of the other developed economies of the world, there are records running back as far as the 1860's or 1870's. The average decade rates of change of real national product of these countries (to the 1950's) range from 13 to 42 per cent.[8] Only two of these nations show rates in excess of 36 per cent. The American rate of growth over the longer period, 1834–43 through 1944–53, is 42 per cent, or an increase of very nearly forty-seven-fold.[9] The growth of American national product, then, was exceptionally rapid, compared with growth in the rest of the developing world.

The growth of American national product per capita, however, was not exceptionally rapid. Between 1834–43 and 1944–53, there was a fivefold increase; the average decade rate of growth was just under 16 per cent. Of the eleven countries mentioned above, four exhibited rates of growth substantially higher (19–28 per cent) and three substantially lower (10–14 per cent).

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LONG-TERM CHANGES IN RATES OF GROWTH OF
REAL GNP AND REAL GNP PER CAPITA

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The rate of growth of American GNP was higher in the nineteenth century than it has been in the twentieth (see Table 2). The average decade rate of growth between 1834–43 and 1894–1903 was 48 per cent; between 1894–1903 and 1944–53, only 34 per cent.[10] The magnitudes of the computed rates depend, to some extent, on the locations of the terminal dates within the long-swing chronology. But shifting the terminal dates by a decade does not alter the results appreciably. The finding does refer to a long-term change in the rate of growth of the series.

There is no reason to suppose that the series misrepresents the broad course of change or even that it overstates the degree of retardation. An inspection of the appendix will show that there is a possibility that we

[8] Simon Kuznets, "Quantitative Aspects of the Economic Growth of Nations," *Economic Development and Cultural Change*, October 1956, p. 13.

[9] The rate of growth was calculated from a linked series composed of the series described in this paper and Kuznets' Variant I, in 1929 prices, 1899–1908 through 1944–53. See Simon Kuznets, *Capital in the American Economy: Its Formation and Financing*, Princeton for NBER, 1961, p. 521.

[10] This rate would have been slightly higher had the series been constructed along the lines of the Department of Commerce concept instead of the Kuznets concept. See John W. Kendrick, *Productivity Trends in the United States*, Princeton for NBER, 1961, p. 62.

TABLE 2

DECENNIAL RATES OF GROWTH OF GNP AND GNP PER CAPITA,
CONSTANT PRICES, 1834–43 THROUGH 1944–53
(per cent)

Decades		GNP I[a] (1)	GNP II[b] (2)	GNP I[a] + Population (3)	GNP II[b] + Population (4)
1834–43	to 1844–53	63	51	20	11
1839–48	to 1849–58	70	65	25	22
1844–53	to 1854–63				
1849–58	to 1859–68				
1854–63	to 1864–73				
1859–68	to 1869–78				
1864–73	to 1874–83				
1869–78	to 1879–88	65	60	31	27
1874–83	to 1884–93	50	49	19	18
1879–88	to 1889–98	36	34	9	8
1884–93	to 1894–1903	36	35	13	12
1889–98	to 1899–1908	51		25	
1894–1903	to 1904–13	49		23	
1899–1908	to 1909–18	35		12	
1904–13	to 1914–23	28		11	
1909–18	to 1919–28	38		20	
1914–23	to 1924–33	29		11	
1919–28	to 1929–38	4		−5	
1924–33	to 1934–43	17		9	
1929–38	to 1939–48	50		44	
1934–43	to 1944–53	52		33	
Average rates[c]					
1834–43	to 1894–1903	48	45	16	13
1894–1903	to 1944–53	34		16	

Source

Col. 1: 1834–44 through 1899–1908, derived from data of Table A-1, 1860
   prices; 1894–1903 through 1944–53, derived from data in Kuznets,
   Capital in the American Economy, p. 521, Variant I, 1929 prices.
Col. 2: Derived from data in Tables A-1, A-4, and A-5. It was assumed
   that the ratio of value added by home manufacturing to GNP was the
   same, in current and constant prices. Benchmark ratios were interpo-
   lated and extrapolated on GNP.
Col. 3: Derived from data underlying col. 1 divided by Series A-2 of
   Historical Statistics (1840, 1845, 1850, etc.).
Col. 4: Derived from data underlying col. 3 divided by Series A-2 of
   Historical Statistics (1840, 1845, 1850, etc.).

  [a]Excludes changes in inventories, 1834–43 to 1899–1908.

  [b]Excludes changes in inventories; includes value added by home manu-
facturing and the value of improvements to farm land (Variant I, since
this is the more relevant measure--see appendix). See text.

  [c]Computed from terminal values.

have overestimated the size of GNP in the pre-Civil War decades and that, therefore, the computed rate of change for the nineteenth century is somewhat too low, rather than too high. The price bases for the nineteenth- and twentieth-century segments of the series are located toward the middle of each segment. Therefore there is no reason to suppose that the deflation procedure imparts bias to the rate of growth of one segment relative to the rate of growth of the other. The finding of retardation appears to be secure.

In some measure, the rapidity of nineteenth century growth reflected the transfer of economic activities out of the home into the market place, where the consequences of these activities could be measured. It is a little surprising to see how limited the impact of these transfers really was. Our measure of GNP, which includes value added by home manu-facturing and the value of improvements made to farm land with farm materials (GNP II), increases at a rate of 45 per cent per decade during the nineteenth century—a rate only 3 points below the rate of growth of GNP less the value of these activities (GNP I, see Table 2).

The rate of growth of population was also subject to sharp retardation, so that the ratio of GNP to population—GNP per capita—increased at the same rate in the twentieth century as in the nineteenth, 16 per cent per decade. There is an alluring quality to the constancy of this rate of increase—a constancy which masks any number of secular decisions on immigration, child labor, the length of the workweek, etc.—which asks for simple explanations from the unwary. Warily, we move on and note that nineteenth century GNP per capita, including value added by home manufacturing and the value of improvements to farm land (GNP II), increased at a somewhat lower rate, 13 per cent. The more inclusive measure, then, gives us a slight acceleration in the rate of increase over the long run.

Composition of GNP and GNP*, 1834–43 Through 1899–1908

SHARE OF CAPITAL FORMATION IN GNP AND GNP*

We have computed four variants of the share of capital formation in product (see Table 3), two referring to the share of gross national capital formation (GNCF) in GNP, two to gross domestic capital formation (GDCF) in gross national product less changes in claims against foreigners (GNP*), the closest approximation to gross domestic product that we have. All are in prices of 1860. GDCF refers to domestic investment, however financed; GNCF to investment financed by Americans, whether carried out at home or abroad. The share of GNCF in GNP is the share

of domestic savings in product; the share of GDCF in GNP* is the share of domestic investment in product.

The shares of GNCF I in GNP I and GDCF I in GNP* I are calculated from capital formation and product data which *exclude* value added by home manufacturing and the value of farm improvements made with farm construction materials; i.e., the data conform to the capital formation and product definitions which are in common use today. The shares of

TABLE 3

SHARES OF CAPITAL FORMATION IN GROSS NATIONAL PRODUCT,
1860 PRICES, 1823–44 THROUGH 1899–1908
(per cent)

| Decades | Shares of Capital Formation in | | | |
	GNP I (1)	GNP II (2)	GNP* (3)	GNP* II (4)
1834–43	9	16	10	16
1839–48	11	14	11	14
1844–53	13	14	13	15
1849–58	14	16	15	17
1854–63				
1859–68				
1864–73				
1869–78	22	24	23	24
1874–83	21	22	21	22
1879–88	22	23	23	24
1884–93	26	26	27	27
1889–98	28	28	28	28
1894–1903	27	27	26	26
1899–1908	28	28	27	28

Source: Cols. 1–2, see source to Table 2, cols. 1–2, and Table A–3; cols. 3–4, calculated from data underlying cols. 1–2 less changes in claims against foreigners. See text.

GNCF II in GNP II and GDCF II in GNP* II are calculated from capital formation and product data which *include* value added by home manufacturing and the value of farm improvements made with farm materials (see the notes to Table 2 and the appendix). We have computed these "II" series because economic activities conducted beyond the market[11] were relatively more important in the early years of the period under review than in the later years and, therefore, changes in the composition, as well as the level (see Table 2), of GNP II and GNP* II might very

[11] It is convenient to make the distinction in terms of the market. However, one should bear in mind that modern measures of GNP do cover important outputs which do not flow through markets, such as the imputed rents of owner-occupied houses and agricultural products consumed on the farms where they are produced. Our GNP I includes these products, of course.

well be different from changes in GNP I and GNP* I. Therefore, before the fact, there was reason to suppose that the additional series might provide important information on the nature of nineteenth century American growth.

All four series show that the share of capital formation in product increased markedly. In the series in which the most moderate increase occurs, the share doubles; in the series in which the most pronounced increase occurs, the share triples. All of the postwar shares are higher, by wide margins, than all of the prewar shares. There is no question that the rise is a long-term phenomenon.

The duration of the increase varies among the four series. The two variant I series rise from 1834–43 through 1889–98, a period of five and a half decades. There is no clear evidence of increase in the variant II series in the prewar period, nor is the evidence for an increase after the Civil War completely convincing. The entire long-term increase may have taken place in the twenty-year period 1849–58 through 1869–78, or in the forty-year period 1849–58 through 1889–98. But we cannot really say much about the timing or duration of the long-term increase in any of the four series, since the data are surely affected by long swings and by the results of the Civil War. The break in the series over the period 1849–58 through 1869–78 makes it very difficult to appraise the effects of these phenomena on the series. The increase was a long-term phenomenon, but we cannot presently establish precisely when it began and when it ended.

The capital formation and product data from which the series in Table 3 were calculated are lacking an important component of capital formation, changes in inventories. The volume of inventories depends upon the structure of the economy and the level of economic activity; changes in inventories, on changes in the structure of the economy and the level of activity. Some of the structural changes taking place between 1834–43 and 1899–1908 no doubt tended to reduce inventories relative to output (e.g., the decline in the relative importance of agriculture), whereas others worked in the opposite direction (e.g., the increase of economic specialization and interdependence). We do not know what the net effects were. Assuming that the net effects were zero and that the ratio of inventories to output remained constant, then the ratio of inventory change to output at any given time would depend upon the rate of increase of output; the higher the rate of increase, the larger the ratio of inventory increase to output, and vice versa.

The data in Table 2 (and Table 6) show that the rate of increase of output during the first decade of the postwar period was roughly the

same as during the prewar period, which suggests that the share of inventory increase in product may have been roughly the same in the two periods. Assume that this share was 4 per cent (and ignore the differences among the various product concepts). This means that the share of capital formation (including inventory change) in product rose from between 18 and 21 per cent in the decade 1849–58 to between 26 and 28 per cent in the decade 1869–78. The absolute magnitudes of the increases are, of course, the same as the absolute magnitudes of the increases of the shares of capital formation, less inventory changes, in product. In relative terms, they are somewhat smaller, but still very large.

The assumption of an average inventory increase of 4 per cent of product in 1869–78 may be roughly correct. Kuznets' estimate of average inventory change in that decade (current prices)[12] amounts to something less than 5 per cent of our GNP estimate. For reasons given in the appendix, we think that Kuznets' estimate is somewhat too high.

The data in Table 2 (and Table 6) show that the rate of growth of product fell quite sharply after the interval 1869–78 through 1879–88 and then rose again during the interval 1889–98 through 1899–1908. Presumably, then, the share of inventory change in product also fell and then rose, while the share of the remainder of capital formation in product was rising and falling (see Table 3). The share of total capital formation in product during the postwar period, then, probably was very much more stable than the share of capital formation, less inventory change, in product. As noted above, the short-term influences on the share of capital formation in product in the first decade of the postwar period are difficult to appraise, so that the interpretation which should be placed on this finding is uncertain. However, it is important to notice that, in the more comprehensive measures we have used, the period during which the share of capital formation in product rose tends to be much shorter than in the less comprehensive measures, and that it appears to be centered on the two decades around the Civil War.

We have been dealing only with the share of gross capital formation in gross product, since we have no capital consumption estimates for the prewar decades. However, net capital formation estimates can be derived for the postwar decades from the gross estimates and Kuznets' data on capital consumption,[13] deflated by our implicit price index for capital formation (Table A-3). The share of net national capital formation (NNCF I) in net national product (NNP I) thus derived runs between 14 per cent (1869–78 through 1879–88) and 17 per cent (1889–98) over

[12] Kuznets, *Capital in the American Economy*, p. 524.
[13] *Ibid.*, p. 528.

the postwar decades. That is, the share of NNCF I in NNP I, after the Civil War, was roughly as high as the share of GNCF I in GNP I, before the war (Table 3). Then the share of NNCF I in NNP I must have been smaller before the Civil War than after it. That is, there must have been a long-term increase in the share of NNCF I in NNP I over the period under study. While the example used here refers only to the NNCF I and NNP I concepts, the results would have been similar had we used any of the other three net capital formation and net product concepts.

However measured, the share of capital formation in product (1860 prices) rose. It is important to notice that the increase was from a high level to an exceptionally high level. For example, if we assume (as above) that the ratio of inventory increase to GNP was 4 per cent in all of the prewar decades, then the share of gross capital formation (including inventory changes) in gross product ran between 13 and 21 per cent in these decades. Assuming that capital consumption accounted for one-third of gross capital formation—an estimate which is probably too high, since it is based on the ratio of capital consumption to gross national capital formation (including inventory changes) in 1869–78—the share of net capital formation (including inventory changes) in net product ran between 9 and 14 per cent before the Civil War. These rates are by no means low.[14]

THE COMPOSITION OF CAPITAL FORMATION

The shares of GNCF (I and II) in GNP (I and II) increased slightly more rapidly than did the shares of GDCF (I and II) in GNP* (I and II) (see Table 3).[15] That is, the domestic savings rates increased more rapidly than did the domestic investment rates. In the early decades, Americans financed part of domestic investment by net borrowing abroad; in the later decades, they reduced their net foreign indebtedness. But these international transactions were quantitatively relatively unimportant, and this is why the behavior of the domestic savings rates over time was so similar to the behavior of the domestic investment rates. Changes in claims against foreigners amounted to only 7 per cent of GNCF in the decade in which this component of capital formation was most prominent (Table 4, column 1).

Much more striking, especially in the prewar period, are the differences between the variants I and II of domestic savings and investment rates.[16]

[14] See Kuznets in *Economic Development and Cultural Change*, July 1961, Part II, pp. 10, 11.

[15] We are comparing here the share of GNCF I in GNP I with the share of GDCF I in GNP* I; the share of GNCF II in GNP II with the share of GDCF II in GNP* II.

[16] We are comparing here the share of GNCF I in GNP I with the share of GNCF II in GNP II; the share of GDCF I in GNP* I with the share of GDCF II in GNP* II.

The variant II series are much higher, before the Civil War, than the variant I series. Also, the increases over time are less pronounced in the variant II series, especially in the prewar period (Table 3). The explanation for this, of course, is that the variant II series include farm improvements in capital formation, while the variant I series do not. Farm improvements constituted a very important component of capital formation in the early decades. Over time, the relative importance of this component declined precipitately (Table 4, column 2).

TABLE 4

SHARES OF COMPONENTS OF CAPITAL FORMATION IN VARIOUS
AGGREGATES OF CAPITAL FORMATION, 1860 PRICES,
1834–43 THROUGH 1899–1908
(per cent)

Decades	Share in GNCF I of Changes in Claims Against Foreigners (1)	Share in GDCF II of Farm Improvements (2)	Shares in GDCF I of		
			Manufact. Producer Durables (3)	New Gross Construc. (4)	Col. 3 Plus Col. 4 (5)
1834–43	-7	47	21	79	100
1839–48	5	28	22	78	100
1844–53	-3	18	23	77	100
1849–58	-4	20	23	77	100
1854–63					
1859–68					
1864–73					
1869–78	-5	9	31	69	100
1874–83	a	7	39	61	100
1879–88	-2	4	45	55	100
1884–93	-3	3	43	57	100
1889–98	1	2	45	55	100
1894–1903	4	2	51	49	100
1899–1908	3	1	57	43	100

Source: Derived from data in Tables A-1, A-3, A-4, and A-5. See source to Table 2.

[a]Less than .5 per cent.

There is some question of whether the data in Table 4 overstate the relative importance of farm improvements in the early decades and understate it in the later decades. The figures on most of the other components of capital formation were derived by deflating current price estimates of value of output or by valuing physical outputs in 1860 prices (see the appendix). In the case of farm improvements, however, inputs were valued in 1860 prices. We estimated inputs required to carry out improvements with 1860 techniques, so that the effects of technical

changes on the constant price farm improvements series should be the same
as the effects of technical changes on the other constant price components
of capital formation. However, we estimated the input requirements for
the clearing of forest and nonforest land separately. Forest land took
many more inputs per acre to clear than nonforest land. As the frontier
moved westward, out of the forest and into the prairies and the plains,
input requirements per acre cleared fell and this is reflected in our series
by a decline in the constant price value of new farm improvements per
new acre cleared.

If the output involved was a single, homogeneous one—acres cleared,
fenced, etc.—then this procedure overestimates the constant price value
of improvements in the early years, and underestimates it in the later years.
In a way, the economies in clearing realized by the westward movement
are analogous to economies in the production of, e.g., plows arising out of
the discovery of new and better sources of iron ore. The evaluation of a
homogeneous plow series in constant prices involves applying a single
price, determined in a particular resource context, to the output series. One
could argue that the same procedure should be followed in the case of
farm improvements. To follow the procedure we did is to assert that
improvements to forest land were different products from improvements
to nonforest land and that they commanded premium prices. Whether
this, in fact, was true and whether, if it was, the premium equaled the
differential input cost, we cannot say, but it seems reasonable to suppose
that these things were broadly true. That being the case, the data in
Table 4 give an accurate representation of the changing relative importance
of farm improvements in capital formation. However, if total acres
improved were treated as a single, homogeneous product, then the share
of farm improvements in GDCF II would be somewhat smaller (but still
large) in the decades before 1860, and somewhat larger (but still relatively
small) in the decades after 1860 than the shares shown in Table 4. The
main points of interest would remain, however: a major share of American
investment before the Civil War went into the improvement of land; this
investment involved the direct commitment of agricultural manpower—
mainly the manpower of land owners—in the creation of capital; the
market, savings in money form, financial intermediaries, etc., played
virtually no direct role in the process.

The main drift of the composition of GDCF I is very clear and very
familiar. The share of construction fell from about 80 per cent to less than
50 per cent, while the share of manufactured producer durables rose from
about 20 per cent to over 50 per cent (Table 4, columns 3 and 4). However,
there are long periods during which the shares change little (1834–43

through 1849–58, 1874–83 through 1889–98) and relatively short periods when the movements are striking (during the Civil War, 1869–78 through 1879–88, 1889–98 through 1899–1908). The explanation may lie in the long swing. During periods of rising or peak long-swing rates of advance for construction, the share of construction in GDCF I remained roughly constant; during periods of declining or trough rates of advance, the share of construction fell sharply (compare Tables 4 and 6). We return to this point below.

The long-term rise in the share of manufactured producer durables in GDCF I may be overstated somewhat, since the estimates miss production in the home and, probably, production by some of the hand trades, sources of output relatively more important in the early decades than in the later. However, we do not believe that bias from this source is important.

The supply of manufactured producer durables came mainly from domestic sources. Before the Civil War, both imports and exports were limited. Interestingly, the balance of trade in durables, including ships, was apparently an export balance during this period. Omitting ships, there was a small import balance before 1850 and a small export balance thereafter. Of the imports, most important were saddlery and harnesses. Apparently Americans produced their own machines in the process of industrialization.

THE COMPOSITION OF GOODS FLOWING TO CONSUMERS

In the period following the Civil War, there are two major changes in the distribution, among major groups, of goods flowing to consumers in current prices (GFC I). The share of perishables declines by 4 percentage points, while the share of services rises by 5 points. The shares of the other two major groups remain roughly constant (Table 5, panel A).

The pattern displayed by the deflated series is quite different. The share of durables increases and the share of services declines slightly, whereas the shares of the other two groups remain constant (Table 5, panel A). Apparently the prices of durables fell and the prices of services rose relative to the price index of goods flowing to consumers. The finding is not surprising. However, the price index of services is not fully representative (see the appendix). Also, the changes in the composition of the constant price aggregate involve only a few percentage points. Consequently, it would be safest to regard the distribution of flows (1860 prices) as roughly unchanging over the entire period 1869–78 through 1899–1908.

The current price estimates for the prewar years refer only to single years, not to decade averages. Therefore, it is not easy to identify trends. The

TABLE 5

COMPOSITION OF GOODS FLOWING TO CONSUMERS, CURRENT PRICES
AND 1860 PRICES, 1834-43 THROUGH 1899-1908
(per cent)

Years or Decades	Current Prices					1860 Prices				
	Perishables (1)	Semi-durables (2)	Durables (3)	Services (4)	Total (5)	Perishables (6)	Semi-durables (7)	Durables (8)	Services (9)	Total (10)
PANEL A: SHARES OF MAJOR GROUPS IN GFC I[a]										
1839	57	12	3	27	99	58	7	3	32	100
1844	50	16	4	29	99	57	12	3	28	100
1849	50	18	5	27	100	53	15	4	27	99
1854	54	16	6	25	101	52	15	6	27	100
1859	52	17	6	25	100	51	17	6	26	100
1834-43						57	9	2	32	100
1839-48						57	11	3	29	100
1844-53						53	16	4	27	100
1849-58						51	17	6	26	100
1854-63										
1859-68										
1864-73										
1869-78	51	17	7	25	100	51	17	8	24	100
1874-83	51	16	7	26	100	51	17	8	24	100
1879-88	50	17	7	26	100	51	17	10	22	100
1884-93	48	17	8	27	100	50	18	11	20	99
1889-98	48	17	8	28	101	51	18	11	20	100
1894-1903	48	16	7	29	100	52	18	10	20	100
1899-1908	47	16	8	30	101	50	18	10	22	100
PANEL B: SHARES OF MAJOR GROUPS IN GFC II[b]										
1839	56	16	3	24	99	58	10	2	30	100
1849	50	20	5	26	101	52	18	4	26	100
1859	52	18	5	24	99	51	19	5	25	100
1869-78	52	17	7	24	100	51	18	8	23	100
1874-83	51	17	7	25	100	51	17	8	24	100
1884-93	48	18	7	27	100	50	18	11	20	99

(continued)

TABLE 5 (concluded)

PANEL C: SHARES OF COMPONENTS OF MAJOR GROUPS IN GFC II^b (current prices)

Years	Unmanu- factured Perishables (1)	Factory Manufact. Perishables (2)	Home Manufact. Perishables (3)	Factory Manufact. Semi- durables (4)	Home Manufact. Semi- durables (5)	Durables (6)	Rents (7)	Other Services (8)	Total (9)
1839	36	16	4	11	5	3	11	13	99
1849	30	17	3	17	3	5	11	14	100
1859	29	20	3	16	2	5	11	13	99

Source: Computed from data in or underlying Tables A-2 and A-5. See source to Table 2.

^{a}Excludes value added by home manufacturing.

^{b}Includes value added by home manufacturing.

shares of perishables and services fluctuate fairly widely from year to year. The trend of each series appears to be downward. The share of semidurables rises to 1844 and then fluctuates around a level maintained into the postwar period. The share of durables rises steadily.

The same trends appear somewhat more clearly and in more pro-nounced form in the constant price series (both single-year and decade average estimates). In particular, the year-to-year fluctuations of the shares of perishables and services disappear and the downward movements of these series are strong and persistent. The share of semidurables in the early years is smaller and it is not until 1859 (or 1849–58) that it reaches the postwar level.

In both the current and constant price series, changes in the composition of goods flowing to consumers are more pronounced in the prewar than in the postwar period. However, when value added by home manufacturing is included in final flows (Table 5, panel B), the prewar composition of final flows becomes somewhat more stable. The decline over time in the share of perishables and the rise in the share of durables are very nearly as strong as before. But, in the constant price aggregates, the increase over time of the share of semidurables and the decrease of the share of services are less marked, while in the current price aggregates the shares of these components remain almost constant over time.

In panel C of Table 5 the shares of several components of the major groups in GFC II (current prices) are distinguished. Perhaps the most interesting finding is the sharp decline in the share of unmanufactured perishables (column 1), which fully accounts for the decline in the share of perishables (panel B, column 1). The share of factory production of perishables actually increased (panel C, column 2), more than offsetting a small decline in the share of home production of perishables (column 3). The relative importance of home manufacturing of semidurables declined, of course (column 5).

Fluctuations of the Rates of Growth of GNP and Components

The rates of change of GNP and components fluctuate fairly widely, pre-sumably reflecting long swings. The series are not well designed for analysis of long swings, since they are overlapping decade averages rather than cycle averages and since the record is seriously broken by the Civil War. We are concerned here only with whether the movements of the series appear reasonable in the light of research on long swings.

All of the series (1860 prices), with the exception of perishables and services, show a clear prewar peak rate of growth centered on 1846 (Table 6), matching the long-swing peak rate of growth of output found by Abramovitz.[17] As for the exceptions, perishables shows no marked variations in rates of growth, which is not surprising. The series is heavily weighted with components which either did not enter markets at all or entered only local markets (firewood, components of animal products). The effects of long swings on this series ought to have been limited.

The rate of change of the services series rises over the entire period, possibly peaking over 1851, although we cannot be sure of this. Again, the finding is not unreasonable. A major component of services is rents, which depends upon the stock of dwellings (see the appendix). The rate of increase of the stock of dwellings varies with the absolute level of new construction, while the peak in the level of construction lags well behind the peak *rate of increase* of construction. Therefore, the rate of increase of the rents component of services ought to follow a long-swing path lagged well behind the long swing of construction.

Abramovitz identifies three postwar trough rates of change, centered on 1874, 1886, and 1892, in the measure which he prefers. A second measure yields a trough in 1891.[18] Our series gives us quinquennial rates of change centered on years five years apart—1876, 1881, 1886, 1891, etc. Consequently, it is impossible for the series to show trough rates over both 1886 and 1891 (or 1892, of course). As it turns out, four of the series exhibit trough rates over 1891 and two more over 1886. One rate, centered on 1876, is so low that it may very well be a trough rate, nearly matching Abramovitz' trough rate over 1874.

Abramovitz identifies postwar peak rates of change over 1881, the end of 1889, and 1899 in the preferred measure, and over 1876 (tentative) and 1901 in the second measure.[19] Of course, none of our series which trough over 1886 or 1891 (all but one) could possibly show the Abramovitz peak of 1889. However, all of the series do show what may be peaks over 1901 or 1896 (one series), as close to the Abramovitz dates as these series could come.

Only two series, consumer and producer durables, pick out the Abramovitz 1881 peak. Of the remaining series, all but one show high rates over 1876, which may be peak rates, matching the 1876 peak in

[17] Moses Abramovitz, "Long Swings in U.S. Economic Growth," in *The Study of Economic Growth*, 39th Annual Report of the NBER, New York, 1959, p. 25.
[18] *Ibid.*
[19] *Ibid.*

TABLE 6

QUINQUENNIAL RATES OF GROWTH, GNP AND COMPONENTS,
1860 PRICES, 1834–43 THROUGH 1899–1908
(per cent)

Quinquennia		GNP (1)	Gross New Construct. (2)	Producer Durables (3)	Perishables (4)	Semi-durables (5)	Consumer Durables (6)	Services (7)
1834–43 to 1839–48		24	34	43	22	49	61	11
1839–48 to 1844–53		31	58	65	21	87	91	18
1844–53 to 1849–58		30	49	52	22	38	54	25
1849–58 to 1854–63								
1854–63 to 1859–68								
1859–68 to 1864–73								
1864–73 to 1869–78								
1869–78 to 1874–83		31	6	55	33	33	35	31
1874–83 to 1879–88		26	24	58	24	25	46	16
1879–88 to 1884–93		20	46	35	11	15	31	4
1884–93 to 1889–98		13	15	22	13	12	10	8
1889–98 to 1894–1903		20	0	28	22	20	12	25
1894–1903 to 1899–1908		26	15	48	21	25	22	32

Source: Computed from data in Tables A–1, A–2, and A–3.

Abramovitz' second measure. However, the 1876 rates of change are not much higher than the rates centered on 1881. Also, our smoothing device is not well designed to handle the very long business cycle of 1873–82. We tested to see whether the peaks at the early date were the results of the smoothing procedure used. We computed GNP cycle averages and calculated average annual rates of change between cycle averages. The cycle averages running from peak to peak show a clear peak rate of change centered on 1881; the trough-to-trough averages, a high rate, perhaps a peak, centered on the two years 1877 and 1878.

There is a peak rate of change in the construction series centered on 1886, a trough date, in the Abramovitz chronology. However, Abramovitz also gives evidence of a peak rate of change in urban building over 1884 and a peak rate for transportation investment over 1891.[20] The differential movements of these two components of construction could easily result in a peak for the aggregate over 1886. The last trough for construction is also late (1896). But, again, it is not far from the troughs in urban building and transportation (1892 and 1893).[21]

In the main, then, the series conform well to the long-swing chronology.

Summary

At the beginning of the period of this study, American national product was somewhat smaller than national product in Britain or in France. American product per capita was also probably smaller than the British, but was considerably larger than the French. Between 1834–43 and 1944–55, American GNP increased at an exceptionally high rate of 42 per cent per decade, a rate perhaps never equaled elsewhere for such an extended period. GNP per capita also increased at a high rate, compared with British and French growth. However, several developed countries have experienced higher rates of growth, at least since the 1860's and 1870's.

The rate of growth of American GNP has been subject to quite sharp retardation. But GNP per capita has increased at a roughly constant rate. If value added by home manufacturing and farm improvements made with farm materials are included in GNP, then the rate of growth of GNP per capita has probably undergone a slight acceleration.

The share of capital formation (gross and net) in real national product was relatively high before the Civil War. Sometime between 1834–43 and

[20] *Employment, Growth, and Price Levels*, Joint Economic Committee, 86th Congress, 1st Session, 1959, Part 2, p. 434.

[21] *Ibid.*

1899–1908, there was a marked long-term increase in the investment proportion, although the precise timing and duration of the increase cannot be established.

The share of changes in claims against foreigners in capital formation was small throughout the period. In the early decades it was negative; in the later decades, positive. Farm improvements made with farm materials accounted for nearly half of real gross domestic investment (less changes in inventories) in the decade 1834–43. Thereafter, the share fell sharply, reaching a level of about 2 per cent of real investment by 1899–1908. At the beginning of the period, gross new construction was roughly four times as important as gross new investment in manufactured producer durables, but by 1899–1908 the two forms of investment were of roughly equal importance.

Following the Civil War, the share of perishables in flows of goods to consumers declined, while the share of services increased and the share of semidurables and durables remained constant, if measurements are made in current prices. In 1860 prices, the shares of all the major groups in flows to consumers are roughly constant over time.

Prior to the Civil War, both the current and constant price series show that the share of perishables in flows to consumers decreased, while the share of durables increased. The share of semidurables increased, reaching the postwar level before the Civil War. The movement is most pronounced in the constant price measure which excludes value added by home manufacturing from flows to consumers; it is barely discernible in the current price measure which includes value added by home manufacturing in flows to consumers. The share of services in current price flows to consumers, including value added by home manufacturing, is roughly constant over the prewar period. However, in the constant price variant which excludes value added by home manufacturing from flows to consumers, the share of services declines quite markedly.

The movements of the real GNP series and the main components conform well to the Abramovitz long-swing chronology.

Appendix

This appendix describes the derivation of the various series produced in the course of the study. Limitations of space prevent the reproduction of detailed estimating procedures. The general descriptions given, however, should allow a careful reader to make a preliminary appraisal of the series. Hopefully, a subsequent, longer publication will provide greater detail.

The estimates for 1869–1909 are revisions of Kuznets' figures, which rest in part on the work of Shaw.[22] Kuznets offers three statistical variants which differ in the magnitudes of the various flows to consumers. For present purposes, there is very little to gain in working with three variants and there is little basis for choice among the three. All three embody the same concepts and differ only in estimating procedures. For the period 1869–1909, the components of Variants II and III are extrapolated on the components of Variant I, which are based on the series contained in *National Product since 1869*.[23] The trends displayed by the three series over this period ought to be, and are, essentially the same. We chose to work only with Variant I, which reflects the basic Kuznets estimates for the period.

Commodities Flowing to Consumers, in Producer Prices

The nineteenth century trends of the Kuznets series are determined, in the main, by comprehensive commodity flow estimates at ten-year intervals (1869, 1879, 1889, 1899) based largely on manufacturing Census data. The components of these benchmark figures were interpolated for the intercensal years on change indexes drawn up from less comprehensive data.[24] Kuznets believes that the 1869 benchmark figure is short because of deficiencies of the Census. For this reason, his 1869 GNP estimate is too low, but probably less than 10 per cent too low. The effect of this, in turn, is to make the decade average GNP estimate for 1869–78 short by something under 5 per cent and to give the rate of change of the series a slight upward bias.[25]

There are several reasons for believing that Kuznets overestimated the effect of deficiencies of the 1869 Census on his series. He gave some weight to Census Commissioner Walker's estimate that returns were short by 13 per cent; but Walker attributed the shortage to poor returns of the

[22] Kuznets, *Capital in the American Economy;* William Howard Shaw, *Value of Commodity Output since 1869*, New York, NBER, 1947. Kuznets kindly allowed us to use the unpublished annual estimates for the period 1869–89.

[23] Kuznets, *Capital in the American Economy*, pp. 471, 472, 517; Kuznets, *National Product since 1869*, New York, NBER, 1946.

[24] Shaw, *Commodity Output*, pp. 79, 92–107; Kuznets, *Capital in the American Economy*, pp. 545–546. The procedure is somewhat more involved than our description of it.

[25] Kuznets, *National Product*, p. 60. See also Kuznets, "Long-term Changes in the National Income of the United States of America since 1870," *Income and Wealth of the United States*, Income and Wealth Series II, Cambridge, Eng., 1952, p. 37.

hand trades, especially the construction hand trades.[26] Shaw and Kuznets made no use of these data.

Kuznets also took into account Shaw's estimate that the 1869 returns were low by about 5 per cent, chiefly because several minor industries were omitted from the canvass. Study of Shaw's tables shows that the industries

TABLE A-1

GROSS NATIONAL PRODUCT, VARIANT I[a], SINGLE-YEAR ESTIMATES AND
OVERLAPPING DECADE AVERAGES, CURRENT PRICES, 1860 PRICES, AND
IMPLICIT PRICE INDEX, 1834-1908
(billion dollars)

Year or Decade[b]	GNP, Current Prices (1)	GNP, 1860 Prices (2)	Implicit Price Index (3)
1839	1.54	1.62	94
1844	1.80	1.97	90
1849	2.32	2.43	96
1854	3.53	3.37	105
1859	4.17	4.10	102
1834-43	--	1.56	--
1839-48	--	1.94	--
1844-53	--	2.54	--
1849-58	--	3.30	--
1869-78	7.87	6.40	123
1874-83	9.54	8.40	115
1879-88	11.2	10.6	106
1884-93	12.3	12.7	97
1889-98	13.2	14.4	92
1894-1903	16.2	17.3	94
1899-1908	22.4	21.8	103

Source: Tables A-2 and A-3.

[a]Excludes the value of improvements made to farm land with farm construction materials (Table A-4), value added by home manufacturing (Table A-5), and changes in inventories.

[b]1834-59 are Census years; 1869-1908 are calendar years.

covered in 1879 but apparently left out in 1869 accounted for only about 2.7 per cent of final product in 1879. Almost half of the total is due to the mixed textiles industry, unenumerated in 1869, according to Shaw. It is likely that the product of this industry *was* counted in 1869, but was included with the product of the cotton and woolen industries. Apparently this is what happened in 1879. The separate identification of the industry in Census tables of that year was accomplished at the Census office and

[26] *Ninth Census of the United States: 1870*, Washington, 1872, Vol. III, p. 376.

TABLE A-2

FLOWS OF GOODS TO CONSUMERS[a], SINGLE-YEAR ESTIMATES AND OVERLAPPING
DECADE AVERAGES, CURRENT PRICES, 1860 PRICES, AND
IMPLICIT PRICE INDEX, 1834–1908
(billion dollars)

Year or Decade[b]	Perishables (1)	Semi-durables (2)	Durables (3)	Services (4)	Total (5)	Implicit Price Index[c] (6)
PANEL A: CURRENT PRICES						
1839	.775	.160	.044	.366	1.35	
1844	.804	.260	.069	.474	1.61	
1849	1.03	.364	.113	.564	2.07	
1854	1.60	.466	.180	.744	2.99	
1859	1.87	.623	.207	.924	3.63	
1869–78	3.34	1.08	.449	1.64	6.51	
1874–83	4.04	1.28	.518	2.03	7.88	
1879–88	4.52	1.51	.646	2.40	9.08	
1884–93	4.64	1.64	.762	2.59	9.63	
1889–98	4.96	1.70	.786	2.88	10.3	
1894–1903	6.18	2.00	.936	3.76	12.9	
1899–1908	8.24	2.79	1.35	5.36	17.7	
PANEL B: PRICES OF 1860						
1839	.826	.108	.031	.457	1.42	94
1844	1.01	.217	.052	.502	1.78	90
1849	1.15	.335	.097	.594	2.17	95
1854	1.46	.446	.162	.758	2.82	106
1859	1.83	.623	.200	.919	3.57	102
1834–43	.809	.125	.033	.454	1.42	
1839–48	.985	.186	.053	.504	1.72	
1844–53	1.19	.348	.101	.593	2.23	
1849–58	1.45	.480	.156	.739	2.83	
1869–78	2.56	.858	.412	1.19	5.02	130
1874–83	3.40	1.14	.555	1.56	6.65	119
1879–88	4.21	1.43	.810	1.81	8.27	110
1884–93	4.68	1.65	1.06	1.88	9.26	104
1889–98	5.30	1.85	1.17	2.04	10.4	100
1894–1903	6.48	2.22	1.31	2.56	12.6	102
1899–1908	7.83	2.77	1.60	3.39	15.6	114

Source: See text.

[a]Excludes value added by home manufacturing (Table A-5).

[b]1834-59 are Census years; 1869-1908 are calendar years.

[c]Col. 5 of panel A divided by col. 5 of panel B multiplied by 100.

involved double-counting of at least part of the product of mixed textiles.[27]

In connection with another study, the results of which were published in Volume 24 of Studies in Income and Wealth, we evaluated the Ninth and Tenth Manufacturing Censuses, deducted the returns of nonmanufacturing industries, added estimates for manufacturing industries which had been omitted by the Censuses, and corrected the returns of industries which we judged to be in error.[28] There is no reason to repeat here the justifications for these adjustments. However, the data published in Volume 24 are value-added data, whereas we are concerned here with value of output. Therefore, we will review the adjustments described in Volume 24, indicating how they affect value of output and comparing them with the adjustments made to the same data by Shaw. We begin with the subtraction of nonmanufacturing returns from the Census totals:

	Shaw (p. 200)		Data Underlying Volume 24 Estimates (pp. 56–58)	
Value of Output of:	1869	1879	1869	1879
			(million dollars)	
1. Census totals	4,232	5,370	4,232	5,370
2. Nonmanufact. industries				
a. Mech. and hand trades	249	262	228	215
b. Agricultural industries		6		3
c. Roofing work		3		
d. Mining			5	5
e. Personal and health services			6	10
f. Kindling wood			1	2
g. Total	249	271	240	235
3. Line 1 minus line 2g	3,983	5,099	3,992	5,135

The Shaw and Volume 24 totals of value of output of nonmanufacturing industries are fairly close in both 1869 and 1879. Shaw's figures are somewhat larger, probably mainly because Shaw estimated part of the value of output of mechanical and hand trades, whereas the data listed under the Volume 24 heading were taken directly from the Censuses. Differences between the detailed deductions probably reflect, in some measure, differences between the classification systems. For example, Shaw may have included personal and health services in his total for mechanical and hand trades.

[27] *Eleventh Census of the United States: 1890*, Washington, 1897, Vol. VI, Part I, p. 4.
[28] Gallman in *Trends in the American Economy*, pp. 56–60.

As noted above, the Tenth Census double-counted part of the value of output of the textile industries:

4. Double-counting in textiles				66
5. Line 3 minus line 4	3,983	5,099	3,992	5,069

According to Volume 24 (p. 58), various manufacturing industries were either omitted or badly returned in the Ninth and Tenth Censuses. The appropriate adjustments to value of output are:

6. a. Fish curing				6
b. Coopering			16	23
c. Wheelwrighting			12	
d. Periodical press			16	89
e. Manufactured gas				30
f. Petroleum refining				44
g. Hydraulic lime and cement				2
h. Smelting				18
i. Products of steam R. R. shops				38
j. Total			44	250
7. Line 5 plus line 6j	3,983	5,099	4,036	5,319

By the standard of the estimates underlying the Volume 24 series, then, it appears that the aggregates Shaw worked with were about 1 per cent too low in 1869, and about 4 per cent too low in 1879. However, we are only interested in Shaw's estimates of final product. Therefore, only the entries in line 6 which refer to industries that contributed to final product are relevant here. Eliminating the rest (entries b, c, e, f, and h) brings the totals listed under the Volume 24 heading to within 1 per cent and well within 3 per cent of the Shaw totals in 1869 and 1879, respectively. That is, the deficiencies of the Ninth and Tenth Manufacturing Censuses had insignificant effects on the aggregate data with which Shaw worked. We conclude that there is no clear evidence that the shortcomings of the first two manufacturing Censuses bias Shaw's or Kuznets' series importantly.[29]

In addition to the manufacturing Censuses, Shaw's main sources were various Department of Agriculture publications, which he used in estimating most of his final flows of unmanufactured commodities. With enough

[29] Milton Friedman believes that Kuznets' 1869 GNP estimate is low (and the 1879 estimate high), but the source of the problem is not necessarily the manufacturing Census (see below). See Milton Friedman, "Monetary Data and National Income Estimates," *Economic Development and Cultural Change*, April 1961, pp. 281–282. One step in Shaw's procedure tends to make the estimates for the early years too large relative to the estimates for the later years. He attempts to eliminate custom production from his series, but believes that his procedure includes relatively more custom production in the early years than in the later ones. See Shaw, *Commodity Output*, p. 80. Shaw's estimate of the value of custom production included in the 1869 manufacturing Census is about 2.5 per cent of the value of manufacturing output (*ibid.*, p. 200).

data, one ought to be able to determine whether agricultural outputs are consistent with Shaw's manufacturing data and his estimates of final flows of unmanufactured commodities. To be more precise, the drafts on farm output are as follows: (1) intermediate use on the farm (e.g., as animal feed); (2) consumption by final consumers (in unmanufactured form); (3) net exports; (4) consumption in manufacturing; and (5) inventory accumulation.

The Department of Agriculture data are net of the first draft and Shaw was obliged to estimate the second and part of the third. The fourth can be derived from Census data, sometimes in value terms only, but often in physical terms, and the elements of the third not supplied by Shaw (e.g., net exports of raw cotton) can be taken from Treasury publications. This leaves only the fifth draft, which must be derived as a residual. Presumably it should be small, relative to total output, and there should be no marked trend in this relationship over time. If the residual is large and if the relationship of the residual to total output shows a marked trend over time, then we may question the consistency of the agricultural data with Shaw's manufacturing data and his estimates of final flows of unmanufactured goods.

We attempted calculations of this kind for textile fibers, grains, and animal products. Outputs of textile fibers are very close to the totals of the first four drafts in every year. In the case of grains, there is always a positive residual and it is not small (e.g., in value terms, 10–20 per cent of the value of grain production). However, this is probably due in no small measure to the fact that we were unable to take into account the consumption of oats by nonfarm horses. Additionally, there seems to be no marked trend in the residual and the residual is small, compared with the value of commodities flowing to consumers (1–2 per cent). Therefore, if there are inconsistencies among the agricultural output, manufacturing, and final flow data they are not of much significance for present purposes.

In the case of animal products, however, the residual is very large in 1869 and falls sharply thereafter. As a percentage of gross farm income derived from animal products, the residual, in value terms, runs as follows:

1869	1879	1889	1899	1904	1909
86	53	29	29	24	24

As a percentage of Shaw's estimates of the value of finished consumer commodities, it runs:

1869	1879	1889	1899	1904	1909
28	9	4	4	3	3

These results are probably due to Shaw's failure to estimate the value of animal products flowing from retail slaughterers to final consumers. He measured only farm consumption of farm production and production by the manufacturing sector (i.e., production reported in the manufacturing Census, which excludes retail slaughtering). With the development and adoption of the refrigerator car in the 1870's and 1880's, large slaughtering and packing firms displaced small establishments. Presumably this is why the relative magnitude of the residual falls so markedly after 1869. Clearly the omission is a serious one which biases the rate of growth of commodity production and national product. Even though accurate data on production in retail establishments are not available, we were obliged to approximate the magnitude of the missing component.

We wanted as smooth a link at 1909 with the Kuznets series as possible. Compared with the total value of finished consumer commodities, the missing component is relatively unimportant in that year. Therefore, we adopted Shaw's 1909 estimate of the value of output of animal products destined for consumption (manufactured and unmanufactured) and extrapolated it backward to earlier benchmark years on a series which consists of the Shaw estimates plus the value of animal products (farm prices) in excess of the first four drafts. We substituted these estimates for Shaw's figures. The valuation of the second component of the extrapolator takes no account of the cost of transportation from the farm to the retail slaughtering firm (presumably a minor cost) or of value added by retail slaughter. Therefore, the estimates are low and the rate of change of the series has an upward bias, probably slight.

For the interbenchmark years, we interpolated the benchmark adjustments (the new estimates minus Shaw's original figures) on the Department of Agriculture aggregate series.[30]

Shaw intentionally omitted a second important flow, the value of firewood entering consumption, for lack of an adequate series. Since the publication of Shaw's book, Barger has derived estimates and incorporated them into his work on distribution.[31] Kuznets considered the estimates for inclusion in his series and rejected them on the ground that they appeared of dubious quality.[32] He compared Barger's firewood estimates with Shaw's food series and found that the ratio of the first to the second in 1869 was so large as to cast serious doubt on the firewood

[30] U.S. Department of Agriculture, Technical Bulletin 703, December 1940, gross income from animal products, less exports of live cattle and changes in inventory values, pp. 23 and 111.

[31] Harold Barger, *Distribution's Place in the American Economy since 1869*, Princeton for NBER, 1955, p. 128.

[32] Kuznets, *Capital in the American Economy*, pp. 516–517, footnote.

estimate. However, as just noted, Shaw's food estimate in 1869 is very much too low. Additionally, Barger valued his 1869 firewood consumption estimate by use of an 1879 price extrapolated to 1869 on what amounts to an index of coal prices. If one substitutes Dorothy Brady's firewood price index (prepared for this Conference) for the price extrapolator, the value of firewood consumed in 1869 drops by over 40 per cent and the relationship between the value of firewood consumed and the value of food flowing to consumers becomes more reasonable, compared with subsequent experience. For example, the ratio of the value of firewood consumed to the value of food flowing to consumers falls fairly gradually from .19 in 1869 to .04 in 1909; the ratio of the value of all fuel and lighting products flowing to consumers, less gas and electricity, to the value of food flowing to consumers falls from .23 in 1869 to .09 in 1909.

Barger's estimates rest ultimately on physical consumption estimates published by the U.S. Department of Agriculture, which are derived from regional per capita consumption data assembled by the Forest Service (1907, 1918, 1925–29, 1933) and the Tenth Census (1879).[33] The Department of Agriculture estimators associated the regional consumption data with climate, type of timber available, type of population in the region, housing conditions, alternative fuels available, and heating appliances in use (fireplaces, stoves). They then interpolated between benchmark years and extrapolated to years before 1879, regionally, on the characteristics listed above. No details of the estimating procedure are given in the publication, apart from those described above. However, the estimates appear to be carefully made and rest on appropriate considerations.

While the estimates are given as decade aggregates, they depend ultimately on Census year estimates, which can be quite simply derived from the decade data. The Census year estimates imply the following per capita consumption (in cords):

1819	1839	1859	1879	1899	1907
4.2	4.4	4.1	2.8	1.3	.9

The general downward drift of these figures, over time, seems reasonable and requires no extended comment. Additionally, the 1907 figure, as noted above, is based on Forest Service records and seems firm. A question remains as to whether the *rate* at which per capita consumption declines is appropriate. The answer depends in no small measure on the faith that can be put in the 1879 figure, an estimate (by states) produced by a Census forestry expert. The only piece of data from the Census

[33] U.S. Department of Agriculture, Circular 641.

enumeration which bears on this estimate is cordwood production on farms. Aggregate farm production amounted to about one cord per member of the total U.S. population.[34] Of course, farm production does not exhaust the universe. Additionally, there is reason for believing that cordwood might be one of the more poorly returned farm products, since the production of cordwood was not the major occupation of the farmer. However, the farm data do suggest that the U.S.D.A. figure for 1879 is more likely to be too high than too low.

Three scraps of data from the prewar period suggest that the U.S.D.A. figures for this period may be too high. The 1839 agricultural Census returned cordwood sold off farms. Assuming that this cordwood was sold to the nonfarm population and that the population was divided between farm and nonfarm as the labor force was, the per capita consumption implied by the Census return is roughly one cord per head. Stanley Lebergott has sent us an 1817 estimate of one cord per head from *Niles' Register*.[35] Finally, Seaman believed that consumption ran about one and a half cords for each free person and domestic servant (15 million out of a total population of 17 million, according to Seaman) in 1839.[36] But Seaman no doubt was influenced by the Census return.

All these prewar figures are surely much too low. We have a reliable figure of .9 cords per head for 1907, as noted above. Clearly, in an earlier era when wood was more plentiful and more easily acquired, when heating appliances were far less efficient, and when coal and other fuels were not used much for heating, wood consumption by final users must have been much higher than one to one and a half cords per head. On the other hand, it is hard to imagine that Seaman and Niles could have been as much in error as the U.S.D.A. figures suggest.

The U.S.D.A. figures, then, may be somewhat too high in the early years. Our use of them to derive estimates of the value of firewood consumption may make our early GNP estimates too large and the rate of growth of GNP too small. However, the broad trends described by the series are surely correct and firewood was too important an item of consumption for us to neglect it. Finally, one can generally assume that estimates of national product for early years are more likely to be too low than too high. Seen in this light, the probable deficiencies of the firewood series are not quite so serious. Therefore, we used the U.S.D.A. data in the estimation of the value of firewood consumed.

[34] Gallman in *Trends in the American Economy*, pp. 49–50.
[35] June 28, 1817, p. 278.
[36] Ezra C. Seaman, *Essay on the Progress of Nations*, 2nd ed., New York, 1852, p. 281.

TABLE A-3

GROSS CAPITAL FORMATION[a] (LESS CHANGES IN INVENTORIES), SINGLE-YEAR
ESTIMATES AND OVERLAPPING DECADE AVERAGES, CURRENT PRICES,
1860 PRICES, AND IMPLICIT PRICE INDEX, 1834-1908
(billion dollars)

Year or Decade[b]	Manufact. Durables (1)	New Construction (2)	Changes in Claims Against Foreigners (3)	Total (4)	Implicit Price Index[c] (5)
PANEL A: CURRENT PRICES					
1839	.032	.137	.031	.200	
1844	.048	.135	.004	.187	
1849	.076	.206	-.025	.257	
1854	.131	.423	-.013	.541	
1859	.140	.385	.007	.532	
1869-78	.389	1.07	-.095	1.37	
1874-83	.490	1.17	-.002	1.65	
1879-88	.591	1.57	-.040	2.12	
1884-93	.616	2.10	-.076	2.64	
1889-98	.637	2.21	.018	2.86	
1894-1903	.860	2.31	.190	3.36	
1899-1908	1.30	3.19	.221	4.70	
PANEL B: PRICES OF 1860					
1839	.027	.140	.033	.200	100
1844	.044	.146	.004	.194	96
1849	.067	.217	-.026	.258	99
1854	.124	.431	-.012	.542	99
1859	.133	.392	.007	.532	100
1834-43	.032	.120	-.010	.141	
1839-48	.045	.161	.011	.216	
1844-53	.074	.254	-.009	.319	
1849-58	.113	.379	-.018	.474	
1869-78	.441	1.00	-.070	1.37	99
1874-83	.685	1.07	-.001	1.75	94
1879-88	1.08	1.33	-.040	2.36	90
1884-93	1.47	1.93	-.077	3.32	80
1889-98	1.80	2.22	.023	4.04	71
1894-1903	2.30	2.22	.196	4.72	71
1899-1908	3.40	2.55	.214	6.17	76

Source: See text.

[a]Excludes the value of improvements to farm land made with farm
construction materials (Table A-4).

[b]1834-59 are Census years; 1869-1908 are calendar years.

[c]Col. 4 of panel A divided by col. 4 of panel B multiplied by 100.

TABLE A-4

VALUE OF IMPROVEMENTS TO FARM LAND MADE WITH FARM CONSTRUCTION
MATERIALS, VARIANT I AND VARIANT II, OVERLAPPING DECADE
AVERAGES, 1860 PRICES, 1834–1908
(million dollars)

Decade[a]	Variant I	Variant II
1834–43	133	92
1839–48	80	55
1844–53	72	50
1849–58	118	81
1869–78	147	105
1874–83	125	89
1879–88	102	72
1884–93	92	66
1889–98	96	68
1894–1903	95	67
1899–1908	89	63

Source: See text.

[a]1834–59 are Census years; 1869–1908 are calendar years.

TABLE A-5

VALUE ADDED BY HOME MANUFACTURING,[a] CURRENT PRICES, 1839–89
(million dollars)

	1839	1849	1859	1869	1879	1889
Baked goods	10	11	24	43	32	19
Animal products	51	58	105	132	26	3
Textiles	29	28	25	23	--	--
Clothing	47	48	64	77	43	67
Total	137	145	218	275	101	89

Source: See text.

[a]More precisely, value added (by home manufacturing) to materials
which would have been processed in factories had the structure of the
economy been the same as in 1899. See text.

Barger also added to Shaw's figures the value of federal alcoholic beverage taxes, which he believed were left out of the Census value of output.[37] The adjustment is minor, affects trend little, and we accepted it.

Trade Markups

Kuznets applied a constant trade markup to each class of commodities flowing to consumers. He reviewed Barger's finding that the ratio of value added by trade to the value of commodities flowing to consumers rose somewhat over time and expressed the view that the rise reflects a tendency for retail prices to rise relative to wholesale prices. Since his price deflators really measure the movement of wholesale prices rather than retail prices, he was faced with a choice. If he accepted Barger's results and adjusted his series, his current price series would be improved, but his constant price series would be biased. His prime interest was in the constant price series, so he chose to leave his estimates as they were and simply allow for the fact that the rate of change of the current price series may be biased in a downward direction. Since he believed that other factors tend to bias the rate in the other direction (see above), the possible bias arising out of the trade markup was not a source of great concern.[38]

Our position was different from Kuznets' in three ways: (1) We had Dorothy Brady's retail price indexes for deflators and therefore did not have to depend on wholesale price indexes. (2) We think we have located and eliminated the main causes of upward bias in the rate of change of the commodity flow series, as noted above. (3) Our series goes back three and a half decades farther than Kuznets', which makes the extrapolation of a constant markup a much more doubtful expedient in our case than in his. Therefore, we used Barger's data. In general, we attempted to follow benchmark flows of commodities through distribution and to compute value added by distribution for each class of commodities flowing to consumers.[39] We used these series to extrapolate Kuznets' figures for 1909, again, in order to maintain as close a link with the Kuznets series as possible.[40] We interpolated the benchmark estimates of flows in final prices on Kuznets' series to get interbenchmark estimates.

[37] Barger, *Distribution's Place*, p. 128.

[38] Kuznets, *Capital in the American Economy*, pp. 513–516.

[39] Barger, *Distribution's Place*, Tables 24, 25, B-3, B-4, B-5, pp. 81, 84, 130–140. Barger's margin data refer to types of outlets, not to types of commodities. We had to assume that all commodities handled by an outlet carried the same margin.

[40] Since Kuznets' trade markup incorporates an adjustment for changes in inventories of final goods, our trade estimates also incorporate this adjustment.

Services Flowing to Consumers

Kuznets estimated services flowing to consumers by deriving from budget studies the ratio of consumer expenditures on services to consumer expenditures on commodities in each benchmark year and multiplying his commodity flow estimate by this ratio.[41] Since we changed the commodity flow estimates, we had to change the service estimates proportionately.

Manufactured Producer Durables

We followed the procedure described above in connection with flows of commodities to consumers.[42]

Gross New Construction

The Kuznets estimates are extrapolations on constant price materials flows, marked up for distribution in the manner described above.[43] We used Barger's margin data, for the reasons given above. Additionally, we made our extrapolations in current prices for reasons given in the Volume 24 study.[44] Finally, at the suggestion of Albert Fishlow, we estimated railroad and nonrailroad construction separately. We derived estimates of new railroad construction from Ulmer.[45] We then extrapolated Kuznets' 1909 estimate of new construction, less the figure for new railroad construction, on materials flowing into construction (current final prices), less railroad construction materials.

Our gross new construction estimate differs markedly from Kuznets' figure in 1869 and less markedly in later benchmark years. The principal explanation for this is that Kuznets assumed that the value of construction is a constant ratio of the value of materials flowing into construction. But in heavy construction the value of construction is typically a larger ratio of the value of materials used than in building. In effect, Kuznets

[41] Kuznets, *National Product*, pp. 77, 104–105. See also Kuznets, *Capital in the American Economy*, p. 523. Again, the procedure is a little more complicated than the description indicates.

[42] The figures should be adjusted for sales of ships to foreigners, an adjustment Shaw failed to make. But the change called for is slight and we did not bother to make it.

[43] Kuznets, *National Product*, p. 100, and *Capital in the American Economy*, pp. 512–513.

[44] Gallman in *Trends in the American Economy*, pp. 60–61.

[45] Melville J. Ulmer, *Capital in Transportation, Communications, and Public Utilities*, Princeton for NBER, 1960, p. 256, "Gross Capital Expenditure, Excluding Land" minus the value of equipment (derived from Shaw, *Commodity Output*, pp. 56–57; *Historical Statistics*, 1960, Series E-214 and E-215; and Ulmer, *Capital*, p. 274, col. 2).

assumed that the construction mix changed little over time. In 1869 railroad construction was relatively much more important than in any benchmark year thereafter. Our procedure yields an estimate for 1869 much larger than Kuznets' estimate.

The estimates based on Ulmer are available annually for 1869–1909 and we used them. We interpolated the benchmark new nonrailroad construction estimates on Shaw's construction materials series, less railroad materials, for 1889–1909, and on Kuznets' construction series, for 1869–89.

The procedure proposed by Fishlow and followed here is also different from the procedure used in the Volume 24 study to derive the value of total construction.[46] The Volume 24 study contains two variants of the value of total construction. Both rest on the materials flows and markup data used in the present study. But Variant A is based on the assumption that value added by construction in current prices is equal to the value of materials flowing into construction; Variant B is based on the assumption of equality between value added and value of materials in *constant prices* (essentially the Kuznets assumption). Neither variant takes into account the changing composition of construction and, therefore, both are subject to the Fishlow criticism.

The following tabulation compares the Volume 24 estimates of the value of total construction with our new estimates of gross new construction (in million dollars, current prices, for major benchmark years):

	Value of Construction		*Value of Gross New Construction*	*Ratio of Col. 3 to Col. 1*	*Ratio of Col. 3 to Col. 2*
	Variant A	Variant B	Construction	to Col. 1	to Col. 2
	(1)	(2)	(3)	(4)	(5)
1839	150	132	137	.91	1.06
1849	220	206	206	.94	1.00
1859	456	436	385	.84	.88
1869	1,072	1,075	1,064	.99	.99
1879	1,180	1,180	953	.81	.81
1889	2,192	2,315	1,830	.84	.79
1899	2,576	2,813	2,090	.81	.74

The Volume 24 estimates are more comprehensive than the gross new construction estimates and therefore should exceed them. However, we are interested here in the movements of the series, not the levels of the estimates, or, more accurately, in the relative movements of the series, which are described by the ratios in columns 4 and 5. The effect of the Fishlow adjustment can be seen clearly in the ratios of column 4. The

[46] Gallman in *Trends in the American Economy*, pp. 60–64.

ratios in column 5 show the combined effects of the Fishlow adjustment and the extrapolation on current price materials flows. The new estimates of gross new construction imply a lower rate of growth for construction than do the Volume 24 estimates. Additionally, prior to 1879, the movements of the new series from one benchmark year to the next are quite different from the movements of the old series.

Changes in Claims Against Foreigners

Improvements of Kuznets' estimates of changes in claims against foreigners could probably be worked out from Matthew Simon's series on the balance of payments.[47] But in the context of national product, the improvements would probably be slight. We were unable to carry out the necessary calculations and therefore accepted the Kuznets estimates.

Changes in Inventories

Kuznets' estimates of changes in inventories are, in considerable measure, extrapolations on rates of change of output. Since we have altered these rates of change, the inventory figures should be adjusted. But Kuznets himself has limited confidence in the procedures he used.[48] Application of these procedures to pre-Civil War data would appear to be even more dubious, but no other method is presently available. Consequently, we decided to leave this component out of both the pre- and post-Civil War series.

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GROSS NATIONAL PRODUCT, FINAL PRODUCT FLOWS,
1869–1909, 1860 PRICES

</div>

The current price series on firewood and animal products rest on output estimates. Consequently, we produced constant price series by applying 1860 prices to the output estimates.[49]

Dorothy Brady has produced final price indexes on an 1860 base for the benchmark years 1869–99. The commodity price indexes refer to the narrowest classification provided by Shaw. We derived indexes for the broad classes of perishables, semidurables, durables, and manufactured producer durables in the following way. We deflated Shaw's detailed estimates of the value of final output; then we divided the aggregated

[47] Matthew Simon, "The United States Balance of Payments, 1861–1900," *Trends in the American Economy.*

[48] Kuznets, *Capital in the American Economy*, pp. 159–160. See also Kuznets, *National Product*, pp. 108–109.

[49] The 1879 firewood price was carried to 1860 on the Brady firewood index (see above). The Census year 1859 animal products prices underlying Table A-2 in Gallman (in *Trends in the American Economy*, pp. 46–48) were used in place of 1860 prices.

current price estimate for each broad class in each benchmark year by the appropriate aggregated constant price estimate.[50] The weighting scheme is not quite appropriate since the Shaw estimates used to derive weights are gross of exports and net of imports and are expressed in producer prices, while the indexes are applied to flows into domestic consumption expressed in final prices. However, this is not a serious shortcoming. The Brady indexes are, without question, the most comprehensive and best-designed nineteenth century indexes national income estimators have had to work with. The deflation of commodity flows in benchmark years is relatively strong.

TABLE A-6

REVISED ESTIMATES EXPRESSED AS RATIOS OF KUZNETS' VARIANT I ESTIMATES,
OVERLAPPING DECADE AVERAGES, CURRENT PRICES, 1869-1903

Decade	GNP Less Inventory Changes (1)	Perishables (2)	Semi-durables (3)	Durables (4)	Services (5)	Gross New Construction (6)	Gross Manu-factured Producer Durables (7)
1869-78	1.16	1.30	.92	.96	1.12	1.34	1.08
1874-83	1.10	1.20	.93	.95	1.06	1.21	1.07
1879-88	1.08	1.14	.93	.96	1.03	1.18	1.07
1884-93	1.04	1.10	.96	.95	1.00	1.11	1.06
1889-98	1.03	1.09	.96	.96	1.01	1.03	1.03
1894-1903	1.03	1.09	.98	.96	1.02	.97	1.02

Source: Revised series, see text; Kuznets series, *Capital in the American Economy*, pp. 522, 524.

The only Brady index referring to services is an index of rents. Ethel Hoover has published some price indexes of medical services (1869–80) and we used these also.[51] But the weights that could legitimately be given them were slight. The rent index dominates the services price index. Rents apparently accounted for about 45 per cent of the value of services during this period.[52]

With some hesitancy we used Ulmer's cost index to deflate the value of new railroad construction.[53] Building wage rates figure in the index, whereas the wage rates of common labor would be more appropriate. No doubt the index could be improved, but we have not been able to carry out the necessary research and calculations.

[50] The computations were actually carried out first at the minor group level.
[51] Ethel Hoover, "Retail Prices after 1850," *Trends in the American Economy*, p. 176.
[52] Kuznets, *National Product*, p. 144.
[53] Ulmer, *Capital*, p. 275, col. 8, shifted to the base 1860.

Dorothy Brady has two building price indexes (true price indexes), one referring to houses and churches, the other to factories and stores. We weighted them equally and used them to deflate nonrailroad construction.

Benchmark constant price estimates (except for firewood and animal products) were interpolated to interbenchmark years (and extrapolated from 1899 to 1909) on Kuznets' constant price estimates.

Changes in claims against foreigners were deflated by the implicit price index of GNP, excluding changes in claims against foreigners.

Table A-6 compares the revised estimates with the Kuznets Variant I estimates.

GROSS NATIONAL PRODUCT, FINAL PRODUCT FLOWS, 1834–59, CURRENT PRICES

Mrs. Brady has produced price index numbers for major benchmark years 1839, 1849, and 1859 and for minor benchmark years 1834, 1836, 1844, and 1854. Therefore, we had the means to build up both current and constant price (1860) national product estimates for all of these years.[54] We made the interbenchmark estimates in constant prices, since this was the easiest and most secure procedure. We did not have adequate interbenchmark price indexes and were unable to construct them in the time available. Therefore, we could not construct current price estimates for these years.

Manufactured Commodities Flowing to Consumers, in Producer Prices

Major Benchmark Years.[55] Our principal source of data on the value of manufacturing output was the federal Census. In connection with the study described in Volume 24 of this series, we had tested the federal decennial Censuses of 1839 through 1879, had made corrections where these seemed called for, and had classified the data according to the Standard Industrial Classification Manual (classification of 1945, two-digit groups).[56] Census data, especially after 1839, are available in great detail (631 industries are distinguished in the general tables for 1859). Once the data had been distributed among the two-digit groups, it was not an unduly difficult matter to construct industry series, at the lowest level of aggregation employed by Shaw, covering the Census years 1839 through 1869.

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[54] But we have not yet constructed complete current price GNP estimates for the first two minor benchmark years.

[55] The years are Census years (see Gallman in *Trends in the American Economy*, p. 15), as opposed to the calendar years of the postwar series.

[56] *Ibid.*, pp. 56–60.

The relationships between Census industry data and Shaw's commodity output estimates are described by the following schema:

1. Value of output of industry 1 (Census data)
2. *minus* value of intermediate output (unfinished goods) of industry 1
3. *minus* value of output of final commodity non-A by industry 1
4. *plus* value of output of final commodity A by industries 2, 3, etc.,
5. *equals* value of output of final commodity A.

Shaw's work is so detailed and lucid that it is possible to reconcile his estimates with Census data; i.e., one can work from Census data through entries (2) through (4) to the value of output of each final commodity. We attempted reconciliations for 1869 and, while we could not make a perfect reconciliation in every case, the disparities between the reconstructed data and Shaw's estimates were minor.[57]

In summary, then, the data available to us to construct prewar benchmark final commodity output estimates consisted of industry value of output series for 1839–69 and reconciliations between the 1869 members of these series and Shaw's estimates of final commodity output in 1869. Therefore, we were in a position to extrapolate the 1869 detailed final commodity output estimates to the prewar years on industry data. The form of the extrapolation depended, in each instance, on the values of entries (1) through (5) above and on the complexity of the relationships implicit in entries (2) through (4).

In a surprising number of instances, entries (1) and (5) were identical in 1869 and all other entries were zero; i.e., industry data were, in fact, final commodity output data. In these instances, we simply assumed that prewar data could be treated as final commodity output data, too. We will speak of these estimates as Class A estimates.

In a second important group of cases, entry (2) was large, the commodity flows measured by entry (2) could be traced to a limited number of user industries, and the estimation of entries (3) and (4) posed no very serious problems. In these instances, we estimated entries (2) through (4) and took entry (5) as a residual. We will speak of these estimates as Class B estimates.

We derived entries (3) and (4) from the limited product data reported in the Censuses[58] or, more often, by extrapolation from 1869 on entry (1)

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[57] The problem was complicated by Shaw's attempt to eliminate custom production, an attempt which we did not make for the prewar years. See footnote 29.

[58] All the Census volumes contain some product data, generally in tables in the introduction. In the case of the Census of 1839, many of the general tables carry product data, rather than industry data. Of course, where product data were available, the estimating procedure was less complicated than that described in the text.

or by a similar procedure. No very important errors could arise out of the estimation of entries (3) and (4), since these entries were usually very small in 1869 and, in any case, the estimating procedure often involved simply distinguishing among commodities belonging to the same minor commodity group (e.g., commodity non-A belonged to the same minor commodity group as commodity A). Since we do not propose to use levels of aggregation below the minor commodity group for general analytical purposes, errors affecting the classification of goods within minor commodity groups have no significance.

Entry (2) was estimated by extrapolation from 1869 on the value of materials consumed (value of output in 1839) by using industries. For example, Shaw gives the value of flows from the woolen and worsted goods industries into the manufacturing of furniture, hats and caps, and clothing. We extrapolated the value of each flow on the value of all materials consumed by the using industry and, in each prewar year, summed the resulting three intermediate flows to get the total intermediate flow of woolens and worsteds. The extrapolation assumes that the input mix of the using industry remained the same, in value terms, over the period of the extrapolation. In fact, there were surely changes. However, errors arising from this source frequently tend to cancel out within minor groups. Suppose that between 1849 and 1869 the input mix of the clothing industry shifted in such a way that relatively more cotton was used at the later date. Then our procedure understates woolen intermediate flows in 1849 and overstates cotton intermediate flows. But these errors tend to cancel out within minor group 6, dry goods and notions.

One other feature of this estimating procedure should be noticed. In general, it is easier to test Census returns of the early stages of manufacturing than of the later stages. The Census sometimes provides physical input data for industries in the early stages (e.g., textile industries) and these can be checked against supplies of raw materials implicit in agricultural output and Treasury foreign trade data in the manner described above for the postwar estimates. As a result of the testing we conducted, we have greater confidence in the data on the earlier stages of manufacturing than in those referring to the later stages. The procedure described above incorporates a partial hedge against errors in the returns of the later stages of production. For example, suppose that the returns of the clothing industries were short in 1849. Then our procedure results in an overstatement of the value of final output of the textile industries, which partially compensates for the underreturn of the clothing industries.[59] In

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[59] Any remaining underreturn of, e.g., the clothing industries should be compensated for by an overestimate of value added by home manufacturing.

this case, errors tend to cancel out within the major group (semidurables), but not within the relevant minor groups (6 and 7).

All of the remaining estimates of the value of final commodity output were made by extrapolation from 1869 on entry (1). We will speak of these as Class C estimates. We followed the Class C procedure when the case did not warrant the more involved operations of the Class B procedure (entry 2 or 5 was very small) or, less often, when these operations could not be carried out effectively (there was no very secure way of extrapolating entry 2 to the prewar years). The Class C procedure was used most often in estimating the value of final output of durables, for reasons which should be evident. Some durable goods industries produce both consumer and producer durables (e.g., carriages and wagons). Since we estimated value of final output by extrapolation on industry value of output from 1869, the prewar relationships between these consumer and producer goods are determined by the relationships of 1869, a point discussed in the Volume 24 paper.[60] This represents the chief weakness of the Class C estimates. Of course, it is a weakness affecting only the Class C estimates of certain durables.

Seaman's work on final commodity flows served as an extremely valuable check on our results for 1839.[61] Since our results were achieved principally by extrapolation, it was very important to have an independent set of prewar estimates for this purpose. Seaman was an exceptionally talented national income estimator. It is reassuring to find that, in the main, his work supports ours.

The following tabulation of the value of manufacturing output in 1849 (in million dollars) suggests the importance of the three classes of estimates described above.

Estimating Procedure	Intermediate Com- modities	Final Commodities					Total (col. 1 + col. 6)
		Perish- ables	Semi- durables	Consumer Durables	Producer Durables	Total	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Class A	0	54	73	10	1	138	138
Class B	82	153	51	1	0	204	286
Class C	104	22	58	51	63	194	298
Total	186	229	182	62	64	536	722

The entry under intermediate commodities for Class C is only roughly accurate, since the Class C procedure did not generate estimates of intermediate production directly. We derived the data by subtracting

[60] Gallman in *Trends in the American Economy*, pp. 65–67.

[61] Seaman, *Essay*, 2nd ed., pp. 274–284.

value of final product estimates from value of industrial output data and ignoring entry 3 (see above) unless it was important enough to figure explicitly in an estimate of final product (e.g., a distribution of a durable commodity between output destined for consumers and output destined for producers). Presumably errors arising from this source (minor, in any case) tend to cancel out in the aggregate. Additionally, in a few Class C cases it was necessary to use an industry series more or less comprehensive than the industry data with which Shaw worked in order to achieve a comparable extrapolating series from 1869 to 1849. Consequently, the value of industry output minus the value of final output, in these instances, is larger or smaller than the true value of intermediate product. Again, however, in the aggregate these discrepancies tend to cancel out.

Tables A-7 through A-9, which cover 1839, 1849, and 1859, reconcile Census data with the data underlying the manufacturing estimates in the Volume 24 paper and the latter with the data used in the present study. The value of intermediate commodities for 1849 in Table A-7 exceeds the corresponding figure in the text tabulation by the value of output of industries which produced only intermediate commodities and therefore did not figure in the estimation of the value of final product.

We have now described how the value of manufactured final domestic production was derived for the major prewar benchmark years. To move from final production to final flows, it is necessary to subtract the value of final goods exported (at producer prices at the plant), add the value of final goods imported (at port prices, including duties) and subtract net increases (add net decreases) in the value of inventories of final commodities. The inventory adjustment is comprehended in the estimate of the distribution markup discussed below.

In principle, the international trade adjustment should have been made at the industry level before final product was distinguished. However, it is possible to reduce the number of calculations and problems of classification significantly by reversing the procedure and making the international trade adjustments at a higher level of aggregation, the minor commodity group level. The losses occasioned by the reordering of the procedure are trivial. We lose the detail of final flows at the commodity level, but it would be impossible to put much trust in this detail in any case.

A slightly more serious problem is introduced by imports of "mixed commodities," i.e., commodities which flow in part to producers as intermediate goods and in part to consumers as final goods (such as textiles). In the main, Shaw's estimates of the value of domestic intermediate production are based on total consumption (or purchases) by

TABLE A-7

RECONCILIATION OF VALUE OF PRODUCT DATA UNDERLYING VOLUME 24 ESTIMATES OF VALUE ADDED BY MANUFACTURING AND VOLUME 30 ESTIMATES OF COMMODITY FLOWS, CLASSIFIED BY TWO-DIGIT INDUSTRY GROUPS AND MAJOR COMMODITY GROUPS, 1839[a]

(million current dollars)

S.I.C. No.	S.I.C. Title	Vol. 24 Total[b] (1)	Vol. 30 Corrections (2)	Commodity Flow Total[c] (3)	Perishables (4)	Semi-durables (5)	Consumer Durables (6)	Producer Durables (7)	Construction Materials (8)	Intermediate Commodities[d] (9)	Not Elsewhere Classified (10)
	Manufacturing Industries										
19	Ordnance and accessories	1.0		1.0		1.0					
20	Food and kindred products	119.0	+47.4[e]	166.4	135.0					31.4	
21	Tobacco manufactures	5.8		5.8	5.8						
22	Textile mill products	108.7		108.7		70.8	2.2			35.0	
23	Apparel, etc.							.7	9.1	33.8	
24	Lumber and wood products	43.7		43.7			.8				
25	Furniture and fixtures	7.6		7.6			6.5	1.0	.1	.1	
26	Pulp, paper, and allied products	6.2		6.2	.9					5.2	
27	Printing, publishing, and allied indus.	23.4		23.4	5.0		.8			17.6	
28	Chemicals and allied products	36.8		36.8	13.2				1.8	21.8	
29	Products of petroleum and coal	1.1		1.1	f					.4	.7[8]
30	Rubber products										
31	Leather and leather products	62.0		62.0		22.5		3.7		35.8	
32	Stone, clay, and glass products	18.2		18.2			2.1		13.7	2.4	
33	Primary metal industries	18.2		18.2			2.1		13.7	2.4	
34	Fabricated metal products	52.3		52.3			2.6	2.0	12.6[h]	35.1	
35	Machinery (incl. agric. implements)	11.0		11.0				8.7		2.3	
36	Transport. equipment	32.3		32.3			6.1	8.4		17.8	
37	Prof. instruments	1.3		1.3			.6	.4		.3	

(continued)

TABLE A-7 (concluded)

S.I.C. No.	S.I.C. Title	Vol. 24 Total[b] (1)	Vol. 30 Corrections (2)	Commodity Flow Total[c] (3)	Perishables (4)	Semi-durables (5)	Consumer Durables (6)	Producer Durables (7)	Construction Materials (8)	Intermediate Commodities[d] (9)	Not Elsewhere Classified (10)
	Manufacturing Industries										
38	Miscellaneous	18.0		18.0		2.0	3.6	.7	.2[h]	11.5[i]	.7[g]
	Total	548.2	+47.4[e]	595.6	159.9	96.3	25.2	25.5	37.5[h]	250.4	
	Nonmanuf., Nonagric. Indus.										
	Fisheries	4.5		4.5	4.5						
	Forest products	121.3		121.3	115.3[j]				6.0[k]		
	Grand total	721.4		721.4	279.7	96.3	25.2	25.5	43.5[h,k]	250.4	.7[g]

Source: Col. 1: Worksheets underlying Gallman in *Trends in the American Economy*, pp. 56-60; col. 2-10: Worksheets underlying Tables A-2 and A-3.

[a] Detail may not add to total due to rounding.

[b] The worksheets underlying the Volume 24 estimates do not contain complete estimates of value of product. Therefore, several of the entries in this column were derived by dividing value added in 1839 by the ratio of value added to value of product in 1849.

[c] Total of cols. 1-2 and also total of cols. 4-10.

[d] Partly estimated as residuals. See text.

[e] Underestimate of flour milling in Volume 24. The Volume 24 estimate of value added is about $10.4 million too low, which amounts to about 4.3 per cent of total value added by manufacturing in 1839.

[f] Less than .05.

[g] Manufactured gas.

[h] Excludes railroad rails. See text.

[i] Includes a large Census return of "miscellaneous" industries, some of which probably belong in other classifications.

[j] Consumption of firewood.

[k] Excludes railroad ties. See note h.

TABLE A-8

RECONCILIATION OF MANUFACTURING CENSUS, VALUE OF PRODUCT DATA UNDERLYING VOLUME 24 ESTIMATES OF VALUE ADDED BY MANUFACTURING, AND VOLUME 30 ESTIMATES OF COMMODITY FLOWS, CLASSIFIED BY TWO-DIGIT INDUSTRY GROUPS AND MAJOR COMMODITY GROUPS, 1849[a]

(million current dollars)

S.I.C. No.	S.I.C. Title	Census Industry Total (1)	Vol. 24 Corrections (2)	Vol. 24 Total (cols.1+2) (3)	Vol. 30 Corrections (4)	Commodity Flow Total[b] (5)	Perishables (6)	Semi-durables (7)	Consumer Durables (8)	Producer Durables (9)	Construction Materials (10)	Intermediate Commodities[c] (11)	Not Elsewhere Classified (12)
	Manufacturing Industries												
19	Ordnance and accessories	2.5		2.5		2.5		1.2			d	1.0	.3[e]
20	Food and kindred products	203.3	+.6[f]	203.9	+1.6[f]	205.5	177.0					28.4	
21	Tobacco manufactures	13.5		13.5		13.5	13.5						
22	Textile mill products	131.7		131.7		131.7		52.1	6.3	.3		73.1	
23	Apparel, etc.	84.5		84.5		84.5		65.6		1.3		17.7	
24	Lumber and wood products	75.3	+16.0[g]	91.3		91.3			2.0	.2	12.9	76.2	
25	Furniture and fixtures	19.5		19.5		19.5			16.6	2.5		.4	
26	Pulp, paper, and allied products	12.5		12.5		12.5	.9				.1	11.5	
27	Printing, publishing, and allied indus.	15.8	+27.6[h]	43.4		43.4	15.0		2.3			26.1	
28	Chemicals and allied products	46.5	-1.9[i]	44.6	+1.9[i]	46.5	21.9				2.5	22.0	
29	Products of petroleum and coal	1.9		1.9		1.9	.1		:			d	1.8[j]
30	Rubber products	3.0		3.0		3.0		1.1				1.9	
31	Leather and leather products	108.4		108.4		108.4		54.6	1.5	6.0		46.4	
32	Stone, clay, and glass products	16.5	+5.7[k]	22.1	+2.6[k]	24.7			3.8	.2	19.3[l]	1.3	
33	Primary metal industries	52.3		52.3		52.3					2.0[l]	50.3	
34	Fabricated metal products	46.8		46.8		46.8			8.4	6.3	12.9	19.3	
35	Machinery (incl. agric. implements)	36.7		36.7		36.7				28.6		8.1	
36	Transport. equipment	38.9	+10.8[m]	49.7		49.7			8.1	16.8		24.9	
37	Prof. instruments	2.4		2.4		2.4	d		1.2	1.0		.2	

(continued)

TABLE A-8 (concluded)

S.I.C. No.	S.I.C. Title	Census Industry Total (1)	Vol. 24 Corrections (2)	Vol. 24 Total (cols.1+2) (3)	Vol. 30 Corrections (4)	Commodity Flow Total[b] (5)	Perishables (6)	Semi-durables (7)	Consumer Durables (8)	Producer Durables (9)	Construction Materials (10)	Intermediate Commodities (11)	Not Elsewhere Classified (12)
Manufacturing Industries													
38	Miscellaneous	34.4	+58.9	34.4	+6.1	34.4	.5	7.7	12.1	.7	3.2[n]	10.2[n]	2.1
	Total	946.4	+58.9	1,005.3	+6.1	1,011.4	228.9	182.2	62.3	64.0	52.9$^\ell$	419.0	2.1
Nonmanuf., Nonagric. Indus.													
	Fisheries	10.1	-.6[f]	9.5	-1.6[f]	7.9	2.8					5.1	
	Forest products	.1				173.7	161.3[o]				12.4[p]		
	All other	62.6											
	Grand total	1,019.2				1,193.0	393.0	182.2	62.3	64.0	65.3$^{\ell,p}$	424.1	2.1

Source: Cols. 1-3: Worksheets underlying Gallman in *Trends in the American Economy*, pp. 56-60; cols. 4-12: Worksheets underlying Tables A-2 and A-3.

a Detail may not add to total due to rounding.

b Total of cols. 3-4 and also total of cols. 6-12.

c Partly estimated as residuals. See text.

d Less than .05.

e U.S. armories.

f Fish preserving and packing.

g Coopers.

h Periodical press.

i Salt. The Census combines mining and manufacturing components of the industry. The two were separated for the present study.

j Manufactured gas.

k Marble and stonework. The Census combines the quarrying and manufacturing components of the industry. The two were separated for the Volume 24 study and recombined for the present study.

ℓ Excludes railroad rails, not separately identified in the census. See text.

m Wheelweights.

n Includes a Census return of "miscellaneous" industries, some of which probably belong in other classifications.

o Consumption of firewood.

p Excludes railroad ties. See note ℓ.

TABLE A-9

RECONCILIATION OF MANUFACTURING CENSUS, VALUE OF PRODUCT DATA UNDERLYING VOLUME 24 ESTIMATES OF VALUE ADDED BY MANUFACTURING, AND VOLUME 30 ESTIMATES OF COMMODITY FLOWS, CLASSIFIED BY TWO-DIGIT INDUSTRY GROUPS AND MAJOR COMMODITY GROUPS, 1859[a]

(million current dollars)

S.I.C. No.	S.I.C. Title	Census Industry Total (1)	Vol. 24 Corrections (2)	Vol. 24 Total (cols.1+2) (3)	Vol. 30 Corrections (4)	Commodity Flow Total[b] (5)	Perishables (6)	Semidurables (7)	Consumer Durables (8)	Producer Durables (9)	Construction Materials (10)	Intermediate Commodities[c] (11)	Not Elsewhere Classified (12)
	Manufacturing Industries												
19	Ordnance and accessories	2.9		2.9		2.9		2.3			.3	.1	.2[d]
20	Food and kindred products	421.0		421.0	+2.6[e]	423.6	371.2					52.4	
21	Tobacco manufactures	30.9		30.9		30.9	30.9						
22	Textile mill products	226.1		226.1		226.1		88.1	11.0	.2		126.7	
23	Apparel, etc.	127.0		127.0		127.0		105.0		1.3		20.7	
24	Lumber and wood products	146.9	+20.2[f]	167.1		167.1			4.1	.5	30.5	131.9	
25	Furniture and fixtures	29.3		29.3		29.3			22.4	3.8		3.1	
26	Pulp, paper, and allied products	26.7		26.7		26.7	1.8	[g]			2.1	22.8	
27	Printing, publishing, and allied indus.	37.1	+46.9[h]	84.0		84.0	28.0	[g]	4.4			51.6	
28	Chemicals and allied products	83.3		83.3	+.3[i]	83.6	32.8				7.9	42.9	
29	Products of petroleum and coal	18.6		18.6		18.6	6.9						11.7[j]
30	Rubber products	5.6		5.6		5.6		2.0				3.6	
31	Leather and leather products	186.7		186.7		186.7		93.1	2.7	8.6		82.3	
32	Stone, clay, and glass products	46.8	-4.8[k]	41.9	+4.8[k]	46.8			7.2	.6	35.4[l]	3.6	
33	Primary metal industries	116.9		116.9		116.9			.2	.9	6.0[m]	109.7	
34	Fabricated metal products	63.0		63.0		63.0			21.0	7.4	24.8	9.8	
35	Machinery (incl. agric. implements)	82.8		82.8		82.8			3.0	66.1		13.7	

(continued)

TABLE A-9 (concluded)

S.I.C No.	S.I.C. Title	Census Industry Total (1)	Vol. 24 Corrections (2)	Vol. 24 Total (cols. 1+2) (3)	Vol. 30 Corrections (4)	Commodity Flow Total[b] (5)	Perishables (6)	Semi-durables (7)	Consumer Durables (8)	Producer Durables (9)	Construction Materials (10)	Inter-mediate Commodities[c] (11)	Not Elsewhere Classified (12)
Manufacturing Industries													
36	Transport, equipment	63.1	+12.4[n]	75.5		75.5			19.5	26.5		29.6	
37	Prof. instruments	5.5	-.4[o]	5.1		5.1			2.2	1.9		.8	
38	Miscellaneous	38.6		38.6		38.6	.8		18.1	.9		7.7	
	Total	1,758.6	+74.3	1,833.0	+7.7	1,840.7	472.4	301.4	115.8	118.7	107.4[l,m]	713.1	11.9
Nonmanuf., Nonagric.Indus.													
	Fisheries	14.4			-2.6[e]	11.8	5.9					5.9	
	Forest products	1.3				231.5	208.2[p]				23.3[q]		
	All other	111.5											
	Grand total	1,885.8				2,084.0	686.5	301.4	115.8	118.7	130.7[l,m,q]	719.0	11.9

Source: Cols. 1-3: Worksheets underlying Gallman in *Trends in the American Economy*, pp. 56-60; cols. 4-12: Worksheets underlying Tables A-2 and A-3.

[a] Detail may not add to total due to rounding.
[b] Total of cols. 3-4 and also total of cols. 6-12.
[c] Partly estimated as residuals. See text.
[d] Ammunition.
[e] Fish preserving and packing (+2.7); bottled liquors (-.1).
[f] Coopers.
[g] Less than .05.
[h] Periodical press.
[i] Estimate based on salt mining.
[j] Manufactured gas.

[k] Marble and stonework. The Census combines the quarrying and manufacturing components of the industry. The two were separated for the Volume 24 study and recombined for the present study.
[l] This represents a reduction of 5.7 from the Volume 24 total, due to the discovery of an error in the Volume 24 computations.
[m] Excludes railroad rails, not separately identified in the Census. See text.
[n] Wheelwrights.
[o] Watch repairing.
[p] Consumption of firewood.
[q] Excludes railroad ties. See note m.

domestic users of intermediate production.[62] Therefore, intermediate flows of "mixed" commodities are fully accounted for by domestic production and hence imports of "mixed" goods must be treated as final goods. Since some imported mixed goods certainly entered domestic production, the procedure understates final domestic output and overstates imports of final goods by a like amount. But we have no adequate data to apportion domestic consumption of intermediate mixed goods between domestic production and imports of these goods. Therefore, there is no way in which the error can be corrected.

We had understood that Shaw had followed the procedure described above in every case and we had made our prewar estimates on that assumption. But John Dales of the University of Toronto has pointed out in correspondence that, in fact, some of Shaw's estimates of the value of intermediate production were based on the shipping records of domestic producers of mixed commodities; i.e., they cover only domestic production of intermediate mixed goods, not domestic consumption of them. Shaw was, therefore, obliged to estimate in some cases the imports of mixed goods flowing into domestic intermediate uses and to subtract these estimates from total imports of mixed goods. Apparently only one minor commodity group (6) was involved, however.[63] Shaw divided group 6 mixed imports between final and intermediate classes in the same proportions as he had divided domestic product (group 6, mixed) between these classes.

The procedure is quite weak and produces nonsensical results if applied in the prewar years. An alternative would be to estimate the value of minor group 6 mixed intermediate imports by extrapolation from 1869 (in detail) on the value of materials consumed by using industries. Since Shaw gives little detail on imports, the method would require a substantial amount of work to reconstruct the data underlying Shaw's import estimates. Rough tests suggest that the results to be expected would not be worth the work. The minor group 6 estimates in major benchmark years would be changed by between 1 and 2.5 per cent at most. Additionally, as will become clear, other factors tend to compensate for whatever error is introduced by our failure to rework the estimates at this point. Consequently, we did not carry out these corrections. Of course, before the tests were made, it was by no means obvious what their results would be. Therefore, we are grateful to Dales for taking the trouble to apprise us of our misinterpretation of Shaw.

The data on exports and imports were taken from Treasury reports,

[62] Shaw, *Commodity Output*, pp. 186–199.
[63] *Ibid.*, p. 276.

which contain fiscal year data. Through 1842, the fiscal year ended on September 30; thereafter, on June 30. We made no effort to adjust the data to fit the Census year more closely.

Treasury data are classified by commodities. Where details are provided, we encountered no serious problems of classification. However, there are various N.E.S. (not elsewhere specified) categories which we were unable to distribute and which, therefore, we could not use. Further work in this area might lead to improvement of the estimates. For the major benchmark years, the N.E.S. export categories included values equal to between 4 and 14 per cent of the value of exports of final goods (including producer durables); the N.E.S. import categories included between 8 and 15 per cent of the value of imports of final goods. The problem on the export side is somewhat less serious than on the import side. A substantial fraction (about one-half in 1839, one-seventh in 1849, and one-third in 1859) of N.E.S. exports are classified as "raw" and therefore presumably are not importantly involved in final flows. Additionally, the value of N.E.S. exports is only equal to between one-third and one-tenth of the value of N.E.S. imports and therefore affects flows much less markedly than does the value of N.E.S. imports.

Three major N.E.S. import categories probably contained few items of final flow. One, which appeared only in 1859, covered imports from British provinces under the reciprocity treaty, probably mainly unfinished goods. The other two are "N.S. manufactures of iron and steel" and "N.S. articles paying duties of 1–5 per cent," which North classifies with raw materials and foods.[64] Eliminating these items, the remaining N.E.S. categories cover values equal to about 5 per cent of imports of final goods in 1839, 9 per cent in 1849, and 4 per cent in 1859. In the main, these are goods paying over 5 per cent in duties, presumably manufactured goods which might figure in final flows.[65]

Exports were valued at the port. Shaw estimated the differences between port and producer prices, by minor groups, and adjusted export valuations to the producer price level. The adjustments ran between 5 and 20 per cent of export values at port prices, but produced exceedingly limited modifications in minor group final flows.[66] We had no bases for carrying the adjustments into the prewar years and therefore did not make prewar adjustments. In the aggregate, the resulting overstatement of the value of exports compensates for the understatement arising from

[64] Douglass C. North, *The Economic Growth of the United States, 1790–1860*, Englewood Cliffs, 1961, p. 289.

[65] *Ibid.*

[66] Shaw, *Commodity Output*, p. 271.

our failure to use the N.E.S. categories and from reporting deficiencies (slight) noted by North.[67] There is no reason to believe, however, that there is appropriate compensation at the minor group, or even the major group, level.

Import valuations were net of shipping costs and duties. Shaw left out the former on the ground that the required adjustment is slight.[68] But North's data suggest that shipping costs ran between 6 and 9 per cent of the value of total imports.[69] Presumably shipping costs of final goods were relatively less important, although probably not much less. In any case, we had no basis for distributing shipping costs among minor groups. A case might be made for distributing them on the basis of import values; but we chose to disregard them altogether.

We computed duties from tariff schedules. This laborious procedure should perhaps be justified. Given the character of output and trade data and the manipulations to which they were subjected, a shortcut to the calculation of duties, which implied more limited claims to accuracy, might have been preferable to the procedure followed. However, we could devise no acceptable shortcut which reduced the number of computations significantly. Furthermore, historical reconstructions are never complete. They are always subject to revision. That being the case, it is reasonable to take as much care as possible at each step, even though this means ultimately combining the results of detailed and accurate procedures with the results of the crudest extrapolation. The crude extrapolation may some day be replaced by a better series.

The export estimates, in the aggregate, may measure fairly accurately the flows we attempted to measure. Factors making for underestimates are probably balanced by factors making for overestimates. In the case of imports, however, there is no such balancing. The estimates are clearly short. We failed to take into account the N.E.S. categories and shipping costs. Additionally, North thinks that imports were undervalued by about 2 per cent until 1846, and by about 4 per cent thereafter.[70] In the aggregate, the import estimates are probably no more than 20 per cent short, and perhaps much less. Suppose that the import estimates were, in fact, 20 per cent short, in the aggregate and for each of the major groups. Then our estimate of the final flow of consumer commodities (in producer prices) would be a little less than 2 per cent short in 1839,

[67] Douglass C. North, "The United States Balance of Payments, 1790–1860," *Trends in the American Economy*, p. 602.

[68] Shaw, *Commodity Output*, p. 272.

[69] North in *Trends in the American Economy*, pp. 607–608. The range in nonbenchmark years is from a little over 5 to a little under 12 per cent.

[70] North in *Trends in the American Economy*, p. 604.

and a little more than 2 per cent short in 1849 and 1859. For the major groups, the shortages would be roughly as follows (in per cent):

	1839	1849	1859
Perishables	1	1	1–2
Semidurables	4	6	7
Durables	3	3	3

The shortages may bias the trend of the series, but only very slightly.

Minor Benchmark Years. Domestic final flows were interpolated to the minor benchmark years 1844 and 1854 on the returns of state censuses, described in another publication.[71] Most of the flows were also extrapolated to 1836 on the returns of the Massachusetts Census and some of the important ones to 1834 on the returns of the New York Census.[72] (As noted above, we did not construct full current price GNP estimates for these two years.) The foreign trade adjustments were made in precisely the way in which they were made for the major benchmark years. However, the N.E.S. import categories in 1844 and 1854 were relatively more important than in the major benchmark years. After "N.S. manufactures of iron and steel" and "N.S. articles paying duties of 1–5 per cent" were deducted they were equal in value to 14 and 11 per cent, respectively, of imports of final commodities.

Unmanufactured Commodities Flowing to Consumers in Producer Prices

Estimates in current prices were made for the major benchmark years and for the minor benchmark years 1844 and 1854. Estimates of domestic final flows (except firewood) were extrapolated from 1869 on series appearing in the Volume 24 study.[73] The procedures followed to make the estimates were similar to those described for the estimates of manufactured commodities flowing to consumers. We used the Class B procedure principally.

The Shaw and Volume 24 series on the value of farm products rest, in the main, on the same sources and are largely consistent. However, Shaw has a series on the value of output of small fruits that is missing from the Volume 24 study. We extrapolated Shaw's 1869 estimate to the

[71] Gallman in *Trends in the American Economy*, pp. 56, 60. The states are Massachusetts, New York, and Connecticut (1844 only).

[72] *Statistical Tables: Exhibiting the Condition and Products of Certain Branches of Industry in Massachusetts for the Year ending April 1, 1837*, Boston, 1838; *Census of the State of New York for 1835*, Albany, 1836.

[73] Gallman in *Trends in the American Economy*, pp. 46–47.

prewar years on the value of output of orchard fruits. Additionally, Shaw's estimates of the value of farm and market garden produce are larger than the Volume 24 estimates. Therefore, we adjusted the Volume 24 prewar figures upward. Finally, our postwar estimates of nonmanufactured animal products rest on series consistent with the Volume 24 animal products series. However, as noted above, we adjusted the basic series downward to make a smooth link with Kuznets' estimates at 1909. Consequently, it was necessary to adjust the prewar Volume 24 animal products estimates downward also, before these estimates were used to derive final flows. The following tabulation (in million dollars) compares the adjustments we have made in the prewar Volume 24 series for the major benchmark years with the Volume 24 estimates of aggregate value of output of agriculture (excluding firewood, improvements to farm lands, and home manufactures, all treated separately below):

	1839	*1849*	*1859*
1. Value of output of agriculture, excl. value of firewood, farm improvements, and home manufact.	631	738	1,377
2. Adjustments to component series:			
a. Small fruits	+2.5	+2.7	+7.0
b. Farm and market garden produce	+6.5	+7.2	+31.5
c. Animal products	−32.6	−38.3	−68.4.
d. Lines a + b + c	−23.6	−28.4	−29.9
3. Ratio of line 2d to line 1	.037	.038	.022

The adjustments, in the aggregate, are of quite limited significance.

The value of firewood consumed was estimated directly from consumption (physical quantity) and price (see the earlier discussion of the postwar estimates). The 1879 price was carried to the prewar years on Dorothy Brady's firewood price index. We made no prewar estimates for other nonmanufactured fuels flowing to ultimate consumers. The omission is quite unimportant, but serves to offset, at least to a limited extent, the probable overestimate of firewood consumption.

Trade Markups

Postwar estimates of the shares of output flowing into distribution and distributive spread,[74] at the minor commodity group level, were

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[74] Defined here as the ratio of value added by distribution (including transportation of finished goods) to the value of goods entering distribution, in producer prices.

extrapolated to the prewar years and checked against Seaman's 1839 estimates. In the main, Seaman's work confirms our results:[75]

	Minor Groups	*Distributive Spread (per cent)*	
		Seaman	Extrapolation
1a, 1b	Food and kindred products	50	62
2	Cigars, cigarettes, tobacco	50	53
6–9, 14	Dry goods and notions; clothing and personal furnishings; shoes and other footwear; semidurable and durable housefurnishings	39	39

Marburg estimated income originating in trade in 1839 from figures on employment, capital stock, wage rates, and rates of return on capital.[76] He also estimated the relationship between spread and income originating, so that, one can derive value added by distribution (including the trans-portation of finished goods) from his data.[77] According to Marburg's figures, value added by trade was $203 million in 1839. Our estimate is well within 10 per cent of this figure.

Services Flowing to Consumers

Perhaps there are, somewhere, usable budget studies for the prewar period which might be used to work out service estimates along the lines of Kuznets' procedure, but we have not come across them. There are various series related to services which could enter into an extrapolator: the stock of residential units (available back to 1850, but easily carried back to 1840), state and local government tax receipts (back to 1849), the value of the stock of churches (back to 1860), estimates of the labor force attached to the service sector. Flow estimates depending on labor force or capital stock figures have less analytical value than estimates inde-pendently made. But we could not dispense with both the labor force and capital stock series. We chose to depend exclusively on the latter, partly because this seemed the more secure procedure and partly because we

[75] Seaman, *Essays*, 2nd ed., pp. 278, 280, 283. The spread for food and kindred products refers only to domestically produced goods. Apparently Seaman believed that the spread on imported goods was much greater (*ibid.*, pp. 279–280). In another place (*ibid.*, pp. 458–459), Seaman provided different estimates, but apparently he intended that they measure only income originating in trade, not distributive spread. See Gallman in *Economic Development and Cultural Change*, April 1961, pp. 403–406, which also discusses Seaman's estimates of flows into distribution. These also tend to confirm our results.

[76] Theodore F. Marburg, "Income Originating in Trade, 1799–1869," *Trends in the American Economy*, p. 322.

[77] *Ibid.*, p. 321.

believed that the immediate analytical losses would be less serious than if we used labor force figures. However, the choice was not much more than a matter of taste, as will become clear.

The estimates were made in 1860 prices and were then adjusted to current prices, since the form of the data made this the simplest and most reasonable method. As in the case of the postwar period, we had price indexes representing rents and medical services, the latter only back to 1851. The two indexes are almost identical; therefore we did not bother to combine them and used only the rent index. The construction of the constant price estimates is described below. Here we consider only the tests of the estimates.

Seaman's estimate of the value of rents to the free population (including imputed rents of owner-occupied houses) in 1839 comes to $90 million.[78] Assuming that the value of per capita consumption of shelter by slaves was half that of free persons, the value of rents for the entire population would be $96 million, substantially below our estimate of $166 million.

Seaman's procedure involves the estimation of average family rent and average family size, the latter presumably standing for the average number of persons per dwelling. Average family size is taken to be seven, which may be too large. The ratio of population to dwellings, according to Gottlieb's data, is under 6 to 1 in 1850 and about 5.6 to 1 in 1860 (including slaves),[79] while our estimate of the stock of dwellings in 1840 (derived from Gottlieb's data) implies a ratio of 5.3 to 1 in that year. Were Seaman's estimate of average family size the same as our estimate of average number of persons per dwelling, his rental estimate would be $128 million, closer to, but still below, ours.

Seaman's rent estimate was made in the context of a national product estimate. The share of rents in Seaman's estimate of the flow of goods to consumers (excluding nonrent services) is very close to the share implied by our work (in per cent):

Seaman, Unadjusted	Seaman, Adjusted for Slaves and Family Size	Gallman
10	14	12

According to E. W. Martin, rents accounted for perhaps 17 per cent of the expenditures of families of urban working men in the 1850's.[80] Presumably

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[78] Seaman, *Essay on the Progress of Nations*, 1st ed., New York and Detroit, 1846, p. 305.

[79] Manuel Gottlieb, *Estimates of Residential Building, 1840–1939*, NBER Technical Paper 17, New York, 1964, p. 44; *Historical Statistics*, 1960, Series A-1.

[80] Edgar W. Martin, *The Standard of Living in Chicago in 1860*, Chicago, 1942, pp. 396–397. However, the evidence on which the judgment rests is not impressive.

this share would be well above the average for all families and, consequently, Martin's judgment provides a modicum of support for the distribution of final flows shown by Seaman's work and ours.

In his second edition, Seaman estimated the value of residences (including land and associated outbuildings) in 1840 at ". . . over a thousand million dollars . . . ."[81] Assuming that Seaman intended to exclude slave dwellings from his estimate of residences, then annual rents amounted to about 9 per cent of the value of residences; assuming that he intended to include slave dwellings (unlikely), then rents probably amounted to under 10 per cent of the value of residences. Our estimate of rents comes to about 8 per cent of our estimate of the value of residences. Goldsmith's work implies a ratio of between 7 and 8 per cent in 1850.[82]

It is fairly clear, then, that the relationships among rents, totals flows to consumers, and the value of residences are roughly the same in Seaman's work and ours. Additionally, other scraps of evidence suggest that these relationships are appropriate. The difference between us has to do with the levels of the various aggregates. Seaman puts forward smaller values than we do.

In his first edition, Seaman estimated the value of nonrent services, ". . . ordinary domestic labor, medical and professional services, education, religious instruction, amusements, and . . . the expenses of government and the administration of justice . . . ," at $310 million.[83] In his second edition, the list of items covered is slightly different and perhaps more inclusive: ". . . housekeeping, the labor of domestic servants, all professional business, teaching of all kinds, all matters of pleasure and amusement, official labor, military services, and the administration of justice."[84] The estimate is very much lower than in the first edition—$150–$200 million—and is fairly close to our figure of $200 million. But our estimate excludes the value of the services of housewives, whereas Seaman's may include it. If that is the case, then Seaman's estimate less the value of the services of housewives would be lower than our figure, and perhaps substantially lower. It is possible that, as in the case of rents, Seaman's estimate may bear roughly the same relationship to other components of final flow, within his framework, as our estimate bears to components of final flow in our framework. The first edition estimate, however, seems far out of line. It implies that nonrent services accounted for over three-quarters of

[81] Seaman, *Essay*, 2nd ed., p. 282.

[82] Raymond W. Goldsmith, "The Growth of Reproducible Wealth of the United States of America from 1805 to 1950," *Income and Wealth of the United States*, p. 319.

[83] Seaman, *Essay*, 1st ed., p. 305.

[84] Seaman, *Essay*, 2nd ed., p. 284. See also Gallman in *Economic Development and Cultural Change*, April 1961, pp. 409–410.

the flow of services to consumers, compared with something over 50 per cent in the postwar years. Surely the share of nonrents in services must have risen, not fallen, between 1839 and the postwar years. (This is the pattern of change which our estimates show, incidentally.)

A second test of the nonrent component can be best conducted in terms of the constant price estimates. The following tabulation compares rates of change of our constant price series with rates of change of the labor force attached to the service sectors (in per cent):

	1839–59	1859–79	1879–99	1839–99	1859–99
Nonrent services	111	105	52	555	210
Number of teachers and free domestics[85]	180	93	34	626	159
Number of workers attached to the service sectors (less trans., pub ut., trade, and fin.)[86]	126	60	98	617	218

The movements of the final flow series are broadly similar to the movements of the labor force series and the degree of correspondence in the prewar period is at least as close as in the postwar period. There is a suggestion that the rate of growth of the final flow series may be too small—surely there were some improvements in the productivity of the service industries over the period. However, the service sector is heterogeneous and shifts in the composition of the sector need not always promote higher output per worker for the sector as a whole. For example, Lebergott's data show that the number of free domestics increased faster than the number of teachers between 1839 and 1859. Presumably this development tended to reduce output per worker in the service sector.

Manufactured Producer Durables

The estimating procedures are described above on pages 37 and 43.

Gross New Construction

We followed the procedure and used the materials flow series described for the postwar estimates. Fishlow made available to us his new railroad construction series.[87] We also estimated canal construction separately, using Cranmer's figures for this purpose.[88] We had no figures on the value

[85] Based on preliminary estimates by Stanley Lebergott, transmitted by letter dated July 18, 1960.

[86] *Historical Statistics*, 1960, Series D, 66–70.

[87] Typescript supplied by Albert Fishlow, June 22, 1964.

[88] H. Jerome Cranmer, "Canal Investment, 1815–1860," *Trends in the American Economy*, pp. 555–556.

of materials flowing into canal construction and simply assumed, arbitrarily, that the ratio of materials used to value of construction was .30, or slightly higher than the ratio of materials used in railroad construction to the value of railroad construction.

Our estimate of new, nonrailroad, noncanal construction in 1839 is $108 million. The Census return of the value of houses constructed, which Seaman and Gottlieb regard as roughly accurate,[89] is $42 million, leaving $66 million for all other construction. Seaman has a series of estimates (in million dollars) which bear on the residual:[90]

Draining and other improvements made on agricultural land, except land newly cleared	6
Increase of manufacturing, milling, mechanical, and mining capital . . .	16
Increase in capital employed in commerce, retail trade, navigation, transportation and fisheries . . .	15
Increase in other public property, such as roads, bridges, churches, national, state, and county buildings, forts, harbours etc. . . .	10
Total	47

Seaman's estimates are apparently of net investment, whereas our figures refer to gross new construction. Additionally, Seaman has no estimate for farm, nonresidential building. On the other hand, Seaman apparently includes changes in the value of nonagricultural inventories and net investment in nonagricultural manufactured producer durables, items missing from our figure, of course. The impression conveyed by these data is that our construction estimate may be a little high.

Changes in Claims Against Foreigners

We used North's estimates of annual net balance.[91]

Summary Appraisal

The data underlying the estimates of the value of output of final consumer and producer commodities have been tested in a variety of ways and we believe them to be strong. The data on highly fabricated manufactures are more difficult to test than those on the early stages of manufacturing, but the procedure for estimating final flows incorporates hedges against errors in these data. Unfortunately, we cannot give a quantitative

[89] Seaman, *Essay*, 2nd ed., pp. 282, 456; Gottlieb, *Estimates*, pp. 51–57. Gottlieb is more interested in, and more impressed by, the Census count of houses built than the returns of the value of houses built.

[90] Seaman, *Essay*, 2nd ed., p. 284.

[91] North in *Trends in the American Economy*, p. 581.

allowance for error in the aggregates or the major components. Census procedures improved over time and one would expect that each Census was more complete than the one preceding it. But we have worked with the Census materials in detail, adjusting where it could be shown that the data were deficient. We doubt that the final series is significantly biased.

The foreign trade estimates are weaker than the value of output estimates. Without question, they understate the value of the net flows of foreign final goods into domestic consumption, conceivably by as much as 20 per cent, or something less than 2 per cent of GNP.

The estimates of value added by distribution are weaker than the value of output estimates, but probably at least as strong as the foreign trade estimates.

Of all the estimates, the poorest are those of the value of services flowing to consumers. We do not know what margin for error to assign to these figures. If they are in error, the chances are that they are too high. Services account for roughly one-quarter of GNP in the prewar years. Consequently, an error as large as 20 per cent in the service component would throw GNP off by only 5 per cent.

The construction estimates are probably at least as strong as the estimates of value added by distribution. The tests suggest that the 1839 estimate may be high—at a guess, perhaps as much as 10 per cent high, that is, less than 1 per cent of GNP.

The estimates of changes in claims against foreigners are strong. In any case, the component is so small that errors in it would have an exceedingly limited effect on GNP.

GROSS NATIONAL PRODUCT, FINAL PRODUCT FLOWS,
1834–59, PRICES OF 1860, BENCHMARK YEARS

We used Dorothy Brady's price index numbers to deflate all components which had been originally estimated in current prices, except for firewood, some components of unmanufactured food, and railroad and canal construction. The index numbers were briefly discussed in connection with the postwar estimates. Two areas of weakness should be mentioned. First, there are no nonrent service deflators, as noted above. Second, there are gaps in the coverage of manufactured producer durables which had to be filled by interpolation and extrapolation on the few continuous series. However, all of the interpolations and extrapolations were made within the prewar period; i.e., no price index had to be extrapolated from the postwar period.

A few estimates, such as those for firewood, were based on physical output series. Where we had an appropriate 1860 price, we produced the

constant price series directly, rather than by deflation. We used Fishlow's price index to deflate railroad construction and his index of wage rates of common labor to deflate canal construction.

As noted above, the service estimates were made in constant prices and then inflated. The constant price estimates are extrapolations from the postwar period. The principal extrapolator was a series on the value of residences in 1860 prices, weighted .1 to approximate the value of rents.[92] The remaining extrapolators were a series on tax receipts of state and local governments[93] (running back to 1849), deflated by use of the rent price index, and a series on the value of churches (running back to 1860), deflated by use of the price index of houses and churches and weighted .1.[94]

We derived the series on the value of residences by valuing the estimates of the stock of dwellings. We used Gottlieb's stock data for 1850 and 1860, associating each with a rental estimate for the Census year.[95]

The stock of nonfarm dwellings in 1840 was calculated by subtracting Gottlieb's estimate of housing production in the 1840's from his figure for the nonfarm stock in 1850.[96] We estimated the farm increment of the 1840's by extrapolation from the 1850's on the nonfarm increment and derived the 1840 farm stock by subtracting the farm increment of the 1840's from the 1850 farm stock. We checked our results by comparing the ratio of farm stock to agricultural labor force with the ratio of nonfarm stock to nonagricultural labor force in 1840, 1850, and 1860. The test suggests that our estimate for 1840 may be slightly high.

We used Goldsmith's 1850 unit values,[97] divided by Brady's price index of houses and churches, to value the stock estimates. We then raised the values by 20 per cent to take into account the value of land.[98]

The three extrapolators were then combined and the value of services in 1860 prices was extrapolated from the postwar years to 1859. The 1859 estimate was then extrapolated to 1849 on the sum of the two extrapolating series available, and the 1849 estimate was extrapolated to 1839 on the one remaining extrapolator. The tests of the estimates have been discussed in a preceding section.

Several components of the 1834 and 1836 benchmark GNP estimates were produced in constant prices only. The procedures used are described below with the nonbenchmark year estimates.

[92] See, e.g., Goldsmith in *Income and Wealth*, p. 319.
[93] *Census of 1890*, Vol. 15, Part II, 1892, p. 61. Compendium of the Census of 1850.
[94] *Historical Statistics*, 1960, Series H-530.
[95] Gottlieb, *Estimates*, p. 44.
[96] *Ibid.*, pp. 44 and 61.
[97] Goldsmith in *Income and Wealth*, p. 319.
[98] *Ibid.*

GROSS NATIONAL PRODUCT, FINAL PRODUCT FLOWS,
1834–59, PRICES OF 1860, INTERBENCHMARK YEARS

The interbenchmark estimates of changes in claims against foreigners are North's figures (see above, benchmark estimates), deflated by the implicit GNP price index, interpolated or extrapolated from benchmark years on the Warren and Pearson all commodities wholesale price index.[99]

The benchmark construction estimates were interpolated on the Fishlow, Gottlieb, and Cranmer series (deflated), described above (see the benchmark estimates), and extrapolated to the pre-1839 years on the Fishlow and Cranmer series, together with the lumber series described in Table A-10.

Gottlieb's stock and flow data, together with our 1840 stock estimate, were used to derive annual housing stock estimates, 1840–60. Gottlieb's flow series was extrapolated to 1836 on the lumber series of Table A-10, and annual stock estimates were than derived for the years 1835–39. The benchmark service estimates were interpolated and extrapolated to non-benchmark years on the housing stock series.

Table A-10 describes the derivations of all other interbenchmark estimates. The table is intended to show the exact weighting schemes of the interpolating series and is, therefore, a little complicated. For example, benchmark estimates of perishables were interpolated and extrapolated on annual estimates for various minor groups, among them Minor Group 1a. The Minor Group 1a annual estimates, in turn, were interpolated and extrapolated from benchmark years on annual estimates of various components of Minor Group 1a, among them domestic production of flour and bread flowing to domestic consumers and net imports of manufactured and unmanufactured food (see Table A-10, item 1a). The latter series was assembled from Treasury reports, but the former was produced by interpolation of benchmark estimates on a flour trade series or a series measuring wheat or wheat and corn flowing into domestic production (see Table A-10, item 1a, 1).

The following general points concerning the interpolators and extrapolators should be noticed:

1. Net imports receive relatively too much weight, since the annual series relating to net imports exhaust the universe (except for the N.E.S. categories, see above), whereas the series referring to domestic flows do not. This is especially important in the case of semidurables and accounts for our willingness to use the relatively weak leather series in the 1834–42 interpolations. Over this period net imports oscillate fairly widely. We

[99] *Historical Statistics*, 1949, Series L-2.

INTERPOLATING AND EXTRAPOLATING SERIES, COMMODITY FLOWS TO
CONSUMERS AND MANUFACTURED PRODUCER DURABLES,
1860 PRICES, 1834-59

Component Interpolated or Extrapolated	Interpolating and Extrapolating Series	Years[a]	Sources
1. Perishables, less firewood & un-manufactured animal products	*Minor Group 1a* Manufactured food & kindred products *Minor Group 1b:* Unmanufactured food & kindred products *Minor Group 5a:* Manufactured fuel & lighting products		

1a. Minor Groups 1a & 1b	Domestic production flowing to domestic consumers:
	  Bread & other bakery products
	Flour
	Clean rice
	Meat products
	Rum, whiskey, & other distilled products
	Liquors, malt
	Canned fish & oysters, smoked, salted, & pickled fish
	Confectionery,
	  Sugar, granulated, refined, & brown
	Salt		

	Imports of coffee	1834-38 1840-43 1845-48 1850-53 1855-58	*Historical Statistics* (1960) Series U-95
	Net imports of manufact. &[b] unmanufact. food (less coffee)	1835-37 1837-38 1840-43 1845-48 1850-53 1855-58	Treasury Reports
1a.(1) Bread & other bakery products Flour	Bbls. of flour rec. at tidewater (N.Y.)	1835 1837-38 1840-46	*Hunt's Merchants' Magazine* (Vol. 28, p.481)
	(Wheat prod.[c] plus imports less exports) times .85 times 1859 price of wheat plus (corn prod. plus imports less exports) times .20 times 1859 price of corn	1841-45 1847-48	Prod.: Annual Reports of the Patent Office[d] Exports & imports: Treasury Reports
	Wheat prod. plus imports less exports	1850-53 1855-58	e

(continued)

Component Interpolated or Extrapolated	Interpolating and Extrapolating Series	Years[a]	Sources
1a.(2) Clean rice	Rice prod. less exports	1834-38 1840-43 1845-48 1850-53 1855-58	U.S.D.A. *Circular 33* (1912)
1a.(3) Meat products	Pork prod. at Cincinnati	1834-38 1840-41	T.S. Berry[f] *Western Prices before 1861* (1943, p. 223)
	Pork prod. in the West	1842-43 1845-48 1850	
	Pork prod.[g] in the West times 1859 price of pork plus beef prod. in Chicago times 1859 price of beef	1851-53 1855-58	*Hunt's Merchants' Magazine*[h] (Vol. 40, p.230)
1a.(4) Rum, whiskey, & other distilled products	Corn prod. plus imports less exports	1841-43 1845,47 1848	See item 1a.(1)
1a.(5) Liquors, malt	Barley prod.	1841-43 1845,47 1848	Annual Reports of the Patent Office[d]
1a.(6) Canned fish & oysters, smoked, salted, & pickled fish	Mackerel catch	1834-35 1837,38 1840-43 1845-48 1850-53 1855-58	*Historical Statistics* (1949) Series F-164
1a.(7) Confectionery, sugar, granulated, refined, & brown	Louisiana sugar prod. less exports	1834-35 1837-38 1840-43 1845-48 1850-53 1855-58	Prod.: L.C. Gray, *History of Agriculture in the Southern U.S. to 1860* (1933, Vol. II, p. 1033)
1a.(8) Salt	Salt made at the Onondaga Springs	1834-38 1840-43 1845-48 1850-53 1855-58	*Transactions of the N.Y. State Agricultural Society* (Vol. XIII, 1853, pp. 172-173)
1b. Minor Group 5a	Sperm oil prod. x 2 plus whale oil prod.	1834-35 1837-38 1840-43 1845-48 1850-53 1855-58	G.B. Goode, *The Fisheries & the Fishing Industry of the U.S.* (1884-87, Vol. 2, p. 168)
2. Firewood	Straight-line interpolation	1834-38 1840-43 1845-48 1850-53 1855-58	

Component Interpolated or Extrapolated	Interpolating and Extrapolating Series	Years[a]	Sources
3. Unmanufactured animal products	Domestic prod. flowing to domestic consumers: Beef Pork	i	i
4. Semidurables	*Minor Group 6:* Dry goods & notions *Minor Group 8:* Boots & shoes Net imports of nonfood consumer goods	1835,37,38 1840-43 1845-48 1850-53 1855-58	Treasury Reports[j]
4a. Minor Group 6	Domestic production flowing to domestic consumers: All other cotton woven goods Woolen & worsted woven goods, except shawls, blankets & carriage equipment		
4a.(1) All other cotton woven goods	Consumption of raw cotton by manu.	1835,37 1838 1840-43 1845-48 1850-53 1855-58	U.S.D.A. Office of the Experiment Stations *Bulletin 33* (pp. 41-42)
4a.(2) Woolen & worsted woven goods	Raw wool prod. plus imports	1835,37 1838 1840-43 1845-48 1950-53 1855-58	k
4b. Minor Group 8	Leather inspections in New York	1835,37 1838 1840-42	*Hunt's Merchants' Magazine* (Vol. 30)
5. Consumer durables	*Minor Group 12:* Household furniture *Minor Group 20c:* Passenger vehicles, horse-drawn *Minor Group 13a:* Heating & cooking apparatus *Minor Group 14a:* Floor coverings *Minor Group 14b:* Miscellaneous Housefurnishings		
5a. Minor Groups 12 & 20c	Lumber trade: Bangor	1834,35 1837,38 1840-43 1845-48	*Hunt's Merchants' Magazine* (Vol. 18,p.518)

Component Interpolated or Extrapolated	Interpolating and Extrapolating Series	Years[a]	Sources
	Bangor, Chicago Albany	1850	*Ibid.* (Vol. 40, p. 229)
	Chicago, Albany	1851–53	*Ibid.*
	Chicago, Albany Baltimore, Florida	1855–56	*DeBow's Review* (Vol. 27, p. 105, Florida)
	Bangor, Chicago Albany, Baltimore, Florida	1857	
	Straight-line interpolation	1858	
5b. Minor Group 13a	Crude iron consumed by the domestic iron industry	1840–43 1845–48 1850–53 1855–58	R. W. Fogel, Railroads and American Economic Growth (1964, p. 192)
5c. Minor Group 14a	Raw wool prod. plus imports	See item 4a.(2)	
5d. Minor Group 14b	Consumption of raw cotton by manufact.	See item 4a.(1)	
6. Manufactured producer durables	Production of sewing machines *Minor Group 27:* Farm equipment *Minor Group 30:* Locomotives *Minor Group 31:* Ships & boats *Minor Group 32:* Business vehicles, horse-drawn, & railroad cars	1855–58	*DeBow's Review* (Vol. 28, p. 236)
6a. Minor Group 27	Production of agricultural machinery	1850–53 1855–58	Unpublished series received from Paul David
6b. Minor Group 30	Production of locomotives	1834–38	Unpublished series received from Albert Fishlow
	Railroad investment in equipment	1839–59	*Ibid.*
6c. Minor Group 31	Prod. of ships less sales of ships to foreigners	1835,37 1838 1840–43 1845–48 1850–53 1855–58	Prod.: *Historical Statistics* (1949) Series K-120 Ship sales: North (*Trends in American Economy*, pp. 619–621)
6d. Minor Group 32	Lumber trade (see item 5a)	See item 5a	

[a]These are years for which estimates were made by interpolation or extrapolation on the series listed. They are Census or fiscal years, identified by the first of the two calendar years over which the Census or fiscal year runs. Calendar year series were converted to approximations to Census year series by running two-year moving averages.

[b]See the discussion of the benchmark year estimates. Deflation was carried out by use of North's price indexes, shifted to the base 1860 without reweighting (North, *Economic Growth*, pp. 281-282). For imports, we used the index for manufactured foods. We deflated the two components of exports separately by the indexes for raw foods and processed foods.

[c]We assumed that about 15 per cent of wheat output and 80 per cent of corn output was used for seed and animal feed. See Gallman in *Trends in the American Economy*, p. 52. See *ibid.*, p. 50, for a discussion of the prices used.

[d]For an appraisal of the Patent Office estimates, see Robert E. Gallman, "A Note on the Patent Office Crop Estimates, 1841-1848," *Journal of Economic History*, June 1963, pp. 185-195.

[e]Pieced together from the following sources: David A. Wells, *The Year-Book of Agriculture*, Philadelphia, 1856, pp. 375, 377 (which includes estimates for the crop year 1855 from the *Cincinnati Price Current*, the *New York Herald*, and the *New York Times*, and estimates for crop years 1839-55 by Charles Cist); the *New York Times* for Sept. 22, 1855 (the original source of the Cist estimates, cited above, which also contains estimates for the crop year 1855 by the *Courier and Enquirer* and the *Economist); DeBow's Review*, Vol. 18, pp. 467, 471; Vol. 25, p. 575; *Hunt's Merchant's Magazine*, Vol. 41, p. 252; Vol. 43 (which contains estimates for the U.S. for each year of the decade, together with estimates for 1853-57 for Ohio and Indiana from Vol. 40, p. 762, the former evidently taken from the Annual Reports of the Auditor); *Annual Report of the Auditor of the State of Ohio*, 1860, p. 86 (data for Ohio for each of the years of the decade, collected by tax assessors); *Transactions of the California State Agricultural Society*, 1859, p. 325 (data for 1852, probably Census data, 1855-59). The estimates for 1855 vary widely, mainly because the estimators differ with respect to the output of Ohio (see Cist's article in the *Times*). Subsequently, the returns of the Auditor became available and, with these data in hand, it is simple enough to settle the issue. A second difference of some importance has to do with output in Indiana. The data later appearing in Hunt (see above) appear to be official, although we have been unable to locate the official source. If the official Ohio and Indiana data are substituted for the estimates, and if we assume that the Hunt U.S. total includes the official Ohio and Indiana data, the range of the estimates narrows to 140-160 million bushels. The Price Current estimates for the main producers suggest an even lower national total (perhaps about 130 million bushels), but there is no question that the Price Current estimates are low. For example, the Iowa Census of 1856 returns almost 5.5 million bushels for the crop year 1855, while the Price Current estimate is only 2.5 million. In addition, the Price Current gives Michigan only 6 million bushels, whereas the state produced a million more than this two years previously (Michigan Census of 1854). For the remaining years, the various sources are roughly consistent. Our estimates are as follows (in millions of bushels):

1850	107	1855	145
1851	118	1856	153
1852	122	1857	153
1853	135	1858	148

[f]Berry's series gives the number of hogs slaughtered. We assumed that live weight per hog was 200 pounds in "normal" years, 210 pounds, in years in which the hog crop was large, and 190 pounds, in years in which it was small. See Gallman in *Trends in the American Economy*, p. 49.

[g]The prices are those used in *ibid*.

[h]We assumed that live weight per animal slaughtered was 1000 pounds probably a little too high, but the rounding simplifies calculations and does not affect the interpolator adversely.

[i]We assumed a constant rate of change in the output of beef between between benchmark years, on the basis of postwar experience. As a test, we estimated beef production in 1870-79 by assuming a constant rate of increase between 1869 and 1880. The ratios of our estimates to actual production are:

1870	1.001	1875	1.041
1871	1.003	1876	1.052
1872	1.005	1877	1.054
1873	1.018	1878	1.033
1874	1.022	1879	1.017

That is, our maximum error was 5.4 per cent. (Actual production was taken from Frederick Strauss and Louis H. Bean, *Gross Farm Income and Indices of Farm Production and Prices in the United States, 1869-1937*, U.S. Department of Agriculture Technical Bulletin 703, Washington, 1940.) In the postwar years pork production fluctuated from year to year in the same direction as, but much less pronouncedly than, commercial production. The pattern can be approximated by a series composed of a component growing at a constant rate, weighted 2, and a component following the path of commercial production, weighted 1. We use such a series as our prewar interpolator and extrapolator.

^{j}See the discussion of the benchmark year estimates. We used North's export price index for manufactures and import price index for manufactures and semimanufactures to deflate (see note b).

^{k}Imports (amounting to between one-fifth and one-third of the total consumption of raw wool in American wool manufacturing) are from Chester W. Wright, *Wool Growing and the Tariff*, Cambridge, Mass., 1910, p. 340. Benchmark estimates of production were interpolated and extrapolated on the following series: imports of raw wool (1834, 1835, 1837, 1838), deflated estimates of output of the woolen industries (1840, 1841, from *Niles Register*, Vol. 66, p. 387), raw wool carried on New York and Pennsylvania canals (1842, 1843, 1845-48, from Wright, *Wool Growing*, p. 145), the number of sheep in Ohio (1850-53, 1855-58, from *Annual Report of the State Board of Agriculture*, 1865, p. 292), Illinois (1855-58, *Transactions of the Department of Agriculture*, Illinois, 1876), and California (1855-58, *Transactions of the State Agriculture Society*, 1859, p. 345).

attempted to dilute the effect of these oscillations by bringing the leather series into the interpolator.

2. While we have brought together a fairly large number of interpolating series (even more could have been used, but none could have borne a very heavy weight), in fact one or a few dominate the interpolating series for each major group: the flour series, perishables (less firewood and unmanufactured animal products); the cotton and woolen series, semidurables; the lumber series, consumer durables; the lumber and ship series, producer durables. This is especially true of the perishables and semidurables series, but is quite appropriate in these cases since flour and textile production do, indeed, dominate the final flows of these major groups. Many series carry some weight in the interpolation and extrapolation of the two durables major groups. However, important components of these groups—notably, industrial equipment—are inadequately represented. Additionally, the lumber series, a prominent member of the interpolating and extrapolating series, is probably not an especially good estimator, for a number of reasons.[100] However, one should bear in mind that the two durables groups are relatively much less important than the perishables and semidurables groups.

3. Estimates of flows of materials into production dominate the interpolators and extrapolators (e.g., wheat, corn, raw cotton and wool, lumber).

The above remarks will serve as general warnings. Lest they raise too many doubts, bear in mind that the interpolations and extrapolations generally carry over only four years, and frequently fewer years than this. The estimates produced are only used in decade averages. We use them to reduce our dependence on benchmark year estimates to establish prewar levels of performance. For this purpose they appear to be adequate.

VALUE OF IMPROVEMENTS TO FARM LAND, 1860 PRICES

Our construction estimates (except for railroad and canal construction) are limited to projects carried out with nonfarm materials. They do not cover farm building and the clearing, fencing, and draining of agricultural land carried out with farm materials. These agricultural construction activities were important. Martin Primack's work provides most of the material necessary to determine how important they were.[101] Our summary

[100] But it may not be a bad indicator of the domestic lumber trade. According to the Secretary of the Treasury (*Finance Report*, 1846) Maine, Maryland, and Florida accounted for about 76 per cent of the domestic trade in 1845.

[101] Martin Primack, "Farm Formed Capital in American Agriculture, 1850 to 1910," unpublished Ph.D. dissertation, University of North Carolina, 1962.

estimates appear in Table A-4. For convenience, we refer to them as estimates of the "value of improvements," but the reader should understand by that term the "value of improvements to farm land carried out with farm materials."

Primack's most important estimates are of the number of acres of land cleared and broken, distributed among the categories of virgin forest, abandoned forest, prairie, and plains; the number of rods of fence put in place, by type of fence (Virginia rail, post and rail, board, stone, hedge, straight-wire, barbed-wire, woven-wire); and unit (acre, rod) labor requirements for clearing and breaking the various types of land and constructing the various types of fence. The series cover the period 1850–1910. Labor requirements are given at decade intervals (1850, 1860, etc.). The estimates of land cleared and fence constructed are regional, decade (1850–59, 1860–69, etc.) estimates.

With Primack's data, one can compute total labor requirements of clearing and fencing for each decade. Labor was virtually the only input and, therefore, one can approximate the total cost of these improvements by valuing labor requirements. We were interested in constant price estimates. Therefore, we valued (regional) labor requirements by use of 1860 (regional) wage rates.[102] Additionally, the labor requirements we used were labor requirements *under 1860 techniques*.[103] That is, we estimated (for example) the cost of constructing the improvements of 1900–09 with 1860 techniques and wage rates. This is as close as we can presently come to the value, in 1860 prices, of improvements constructed during 1900–09. One should note that unit values of, for instance, clearing implicit in the estimates vary from decade to decade with changes in the distribution of cleared land among types of land (forest, prairie, etc.) and among regions, and only for these reasons.

We also derived the value of irrigation improvements to rice land and the value of construction carried out with farm materials on new farms. Neither of these series is quantitatively important. We assumed that irrigation cost $25 per acre, using 1860 techniques. Primack has data on the number of acres irrigated each decade. We assumed that frontier methods of farm building were used only in new farm creation in the southeast, south central, prairie, southwest, mountain, and Pacific regions. Primack has data on new farms created in each decade. We

[102] We produced two variants (see Table A-4). In Variant I, the wage rate includes the value of board; in Variant II, it excludes the value of board. The wage rates are from the agriculture volume of the *Census of 1860* (p. 512). We assumed that board was worth $.25 per day (see *Historical Statistics*, 1949, Series E-67 and E-68).

[103] Board and wire fence was constructed with manufactured materials and therefore did not figure in the estimates.

assumed that building costs (1860 prices) ran $100 per farm in all but the last three regions. In these regions we assumed costs of $150, $50, and $120, respectively. These judgments cannot be defended in detail here. They rest mainly on our interpretations of data in Primack's study.[104]

Primack's data do not extend back beyond 1850. In a previous study, we had estimated the number of acres cleared in the decade 1840–49, but we had no estimate of the regional distribution of this land nor of the magnitudes of the other components of improvements.[105] However, the principal factor influencing the average value of improvements per acre is the distribution of cleared acreage between virgin forest and all other land. According to Primack, 82 per cent of the land cleared in the decade 1850–59 was forested. Presumably a larger share was forested in 1840–49; we assumed 90 per cent, and estimated the value of improvements per acre cleared in 1840–49 by use of the following formula:

$$\frac{F^a \cdot Mf + N^a \cdot Mn}{F^b \cdot Mf + N^b \cdot Mn} \cdot \frac{V^b}{A^b},$$

where F^a is the share of forest land in cleared land for 1840–49; F^b is the same for 1850–59; N^a is the same for all other land in 1840–49; N^b is the same in 1850–59; Mf is man-days per acre to clear forested land, 1860 techniques; Mn is the same for all other land; V^b is the value of improvements made in 1850–59; and A^b is the number of acres cleared in 1850–59.

Since we wanted to run overlapping decade estimates, it was necessary to distribute the decade estimates among years.[106] The annual series used for this purpose were as follows: for 1840–50, federal land sales, two-year moving averages of calendar year data;[107] for 1850–60, federal land sales less graduation sales, two-year moving averages of two-year moving averages of fiscal year data;[108] for 1869–1909, homestead final entries, set back in time five years, two-year moving averages of fiscal year data.[109]

To get annual estimates for years before 1840, we extrapolated the estimates of the 1840's on two-year moving averages of calendar year

[104] Primack, "Farm Formed Capital," Chapters III, VI.

[105] See Gallman in *Trends in the American Economy*, p. 49.

[106] To get decade averages for 1844–53, 1874–83, etc.

[107] Benjamin H. Hibbard, *A History of Public Land Policies*, New York, 1939, pp. 103–106. Hibbard lists his data as fiscal year data, but apparently they really refer to the calendar year. See *Historical Statistics*, 1960, p. 233. The calendar year data were averaged to approximate Census year values.

[108] Hibbard, *Public Land Policies*. Graduation sales were associated with speculation. See Gallman in *Trends in the American Economy*, pp. 70–71. The averaging is intended to smooth out any remaining effects of speculation on the series.

[109] Hibbard, *Public Land Policies*, pp. 396–397. Presumably improvements were made when land was first entered, i.e., five years before final entry. The fiscal year data were averaged to approximate calendar year values.

federal land sales data.[110] Sales for the years 1835 and 1836 were heavily influenced by speculation. Therefore, we substituted interpolated estimates for the Land Office data for these years.

In a previous study, we had estimated the value of improvements in 1879 prices by multiplying the number of acres improved by the cost per acre of improvements in 1879.[111] Primack's work makes clear the fact that this procedure is defective. Nonforest land required much less labor to improve than did forest land. The composition of cleared land changed markedly over time. The cost of improvements per acre in 1860 prices (Variant I) declined from about $24 in the decade 1850–59 to $12 in 1870–79 and to roughly $9 in the full period 1880–1909. Consequently, the estimates we had previously put forward for the prewar period were too low, while the estimates for the postwar period, after the 1870's, were too high.

VALUE ADDED BY HOME MANUFACTURING

During the nineteenth century, the location of various kinds of manufacturing shifted from the home or the small establishment to the factory. One evidence of this process is the changing allocation of certain commodity flows between final and intermediate production. For example, over time, the ratio of flour that is final product to flour that is intermediate product declines. Flour flowing into the home is treated as final product, since the processing it receives in the home is not measured in the national product. Furthermore, flour flowing to small retail bakeries whose product is omitted from GNP, intentionally or otherwise, is also treated as final product, since the flow cannot be identified as intermediate (and should not be, as long as the product of retail bakeries is not counted in national product). A transfer of baking to factories would then reduce the share of flour going directly to final uses.

The transfer of activities from sectors whose product is not counted to sectors whose product is counted gives the GNP measure a rate of growth higher than that of the total product of the society, of course. It would be useful to know the extent to which the two rates of growth differ from each other. We have attempted to judge this by estimating the value added to so-called final product in benchmark years before 1899 by activities conducted in the home or in small establishments before 1899 but transferred to factories by that year. That is, we have not attempted to estimate all value added by home manufacturing in, e.g., 1879, but only the value added to that part of final product which would have flowed into factories had economic organization been the same in 1879 as in 1899.

[110] See footnote 107.
[111] Gallman in *Trends in the American Economy*, pp. 46–51.

The procedure is simple and can be explained best by an example—baking. We calculated the ratio of the value of flour flowing to factory baking to the value of the total flow of flour (final plus intermediate) in 1899. For each of the major benchmark years before 1899, we multiplied the value of the total flow of flour by this ratio and we subtracted the value of flour flowing into factory baking from the result. This gave us the value of final product that would have been intermediate product had the economy been organized along the lines of 1899. We then multiplied the result by the ratio of value added to value of flour consumed in factory baking. This gave us an estimate of value added by home and retail baking which was displaced by factory production by 1899.

The procedure obviously works best where production is largely confined to the processing of a single commodity and the flows of that commodity are readily traced. For example, we were able to make estimates relating to baking, slaughtering and packing, and clothing production (see Table A-5). But we were unable to do anything with certain activities which may have been important, at least relative to factory production of the same goods, but which involved operations on several commodities or on commodities whose flows were not easily traced. For example, we could not derive estimates of the production of tools, furniture, wagons, harness, etc., carried out in the home or by practitioners of hand trades which might not be adequately covered by the Censuses. However, our estimates do cover the activities which were of greatest quantitative importance.[112]

From 1839 through 1869, the Census returned value added by home manufacturing (perhaps value of output in 1839). The treatment of the item by contemporary observers (e.g., Seaman) suggests that the returns covered mainly textile production. However, virtually all raw wool and cotton available for processing was apparently used in factory production. No doubt flax and similar fibers were worked up in the home, but the magnitudes involved were probably smaller than the magnitudes implied by the returns of home manufacturing. It seems possible, then, that the Census covered home production of furniture, harness, etc., and perhaps even some components of the home manufacturing which we have measured

[112] Some components of "home production" are covered, of course, in series previously discussed. For example, farm construction on new farms carried out with farm materials is included in the "farm improvements" series. The gross new construction series is based, in part, on flows of construction materials and therefore includes gross new construction carried on outside the market, e.g., the construction of a shed by a home-owner or of a barn or fence by a farmer. The value of home production of intermediate goods (e.g., pot and pearl ashes, rags) is included in the value of final product (soap, paper), insofar as these intermediate goods were sold to commercial producers of final product.

through the commodity flow method. Nonetheless, we were anxious not to understate the significance of home manufacturing and, therefore, accepted the Census returns as accurate measures of value added by home textile production. We also included the value of textiles produced in the home in the input into home clothing manufacture. It appears likely, then, that if our estimates are in error they are too large, rather than too small. This is especially true in the case of the 1839 figure, since we have treated the Census return as though it referred to value added, whereas, as noted above, it may refer to value of output.

The estimates described above use commodity flow procedures (in the main) to measure value added by activities neglected by the GNP measure, manufacturing in the home and in small establishments. However, there remain other activities which are missed even by the commodity flow procedure. Among the most important is surely the raising of horses and mules for sale to commercial enterprises (producer durables) or to consumers (consumer durables) and the production of hay and other feeds for horses owned by consumers (consumer perishables).[113] However, the magnitudes missed are very small. For example, the value of all hay sold to nonagricultural sectors (i.e., including intermediate product) remained near, and generally below, 1 per cent of GNP during the full period.[114] According to Seaman, the total value of horses and mules sold to consumers and nonagricultural businesses plus the value of the increase of inventories of horses and mules amounted to about $14 million in 1839, or less than 1 per cent of GNP.[115]

COMMENT

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Robert Gallman's paper, like his previous one in Volume 24, provides a summary report on research in progress since 1953. The magnitude of his contribution, present and potential, is suggested in the brief but fascinating analysis contained in the first part, and the temptation to take up the issues touched on there is great. But my task, as I understand it, is to deal with the hard facts of life in the appendix. Since his work is unfinished, I trust I am spared the necessity of a definitive appraisal of the estimates (aside from the question of adequacy for the task), but the thought is a disturbing one, and in the end I shall come, if not to an appraisal of

[113] Kuznets, *Capital in the American Economy*, p. 516.
[114] Gallman in *Trends in the American Economy*, p. 46.
[115] Seaman, *Essay*, 2nd ed., p. 453.

Gallman's estimates, at least to the issue of the criteria appropriate for such an appraisal.

I should like first, however, to make a few comments specifically on the estimates, chiefly regarding possible further tests and areas of weakness. Regretfully, my remarks are confined almost wholly to the benchmark year estimates in current prices.

<div align="center">FLOW OF COMMODITIES</div>

The Underlying Detail

In the estimates published in the present paper, the detail is confined to the major components of commodity flow. In itself, this is a major contribution, filling an important gap in our knowledge of midnineteenth century American development as well as suggesting important revisions of accepted views on the ensuing period up to World War I. However, I should like to point up also the immense potential value of the underlying industrial and commodity detail pieced together by Gallman in the construction of the estimates, but not published in the current paper. The nature of the detail is suggested by Table 1, which illustrates Gallman's estimating procedures. For the present purpose, the point to be noted is that Gallman worked with as many as 631 industries (1859) and forty classes of farm output in the process of establishing comparable classifications for each Census date in the period 1839–69 and developing distributions of output by type like those in the table. Indeed, the table understates the amount of underlying detail because, following Shaw, not six but around forty classes of commodity output were recognized. In addition, imports and exports as given in Treasury reports were allocated among these same commodity classes to obtain estimates of domestic consumption as well as production. One can only surmise the obstacles and discouragements surmounted by Gallman in this undertaking, but the time and effort consumed are self-evident and clearly have a bearing on the issue of appraisal.

Crude as these detailed estimates are—and they are significantly less reliable than the large aggregates since, as Gallman notes, errors due to misclassification often cancel out in the process of summation—they are of significant analytical interest. They give at least a rough idea of the degree to which different industries were sensitive to various classes of final demand. They provide also an important first step toward an inter-industry flow table (which would further require distributing the estimated output of intermediate products according to industry of destination). Finally, these estimates, or more precisely, the detailed structural framework which they embody, provide an explicit link between recent work in

TABLE 1

VALUE OF PRODUCTS OF MANUFACTURING, BY TYPE
AND INDUSTRY GROUP, 1869
(million dollars)

| | | FINISHED GOODS | | | | |
| | | Consumer Goods | | | | |
Industry Group	Value of Products (1)	Perishables and Semidurables (2)	Durables (3)	Producer Durables (4)	Construction Materials (5)	Intermediate Products (6)
All manufacturing	3,794	1,446	245	296	320	1,486
Food and kindred products	692	606				85
Textiles and products	717	370	33	4		310
Iron and steel	600	7	26	147	115	305
Lumber and its manufactured products	419	5	68	12	108	226
Leather and its products	375	185	7	18		165
Paper and printing	158	28	8		2	120
Liquors and beverages	109	74				36
Chemicals and allied products	179	65				96
Stone, clay, and glass products	115		16		18	36
Metals other than iron and steel	123	1	38	3	60	69
Tobacco manufactures	72	72			15	0
Vehicles for land transportation	96	2	2	35	48	12
Miscellaneous	138	32	12	64	3	27

Source

Col. 1: Sum of cols. 2–6. Closely approximates group totals from Census shown by Shaw in *Commodity Output*, p. 200.
Cols. 2–5: *Ibid.*, pp. 108–135. Detailed entries under each major commodity group were classified by industry group according
   to the industry group number for each entry shown by Shaw.
Col. 6: *Ibid.*, pp. 138–151.

economic history emphasizing broad magnitudes of economic analysis and earlier research on individual industries and firms. Using this detail, the researcher at the microlevel can trace in rough fashion some of the connections between his special area of study and the economy as a whole. A significant feedback advantage for the income estimator himself will be noted subsequently.

Consistency Tests of Commodity Flow Data

An important part of Gallman's work involved testing whether estimates of farm output in physical terms derived from the agricultural Census were consistent after allowance for other uses with returns on materials consumed in the manufacturing Census. He reports that these tests were generally reassuring, but there was one big exception. In 1869, estimates of the uses of animal products developed by Shaw chiefly from the manufacturing Census fall far short of exhausting the farm output total. This is less true for Shaw's 1879 estimate and thereafter the check works out fairly well. Gallman infers that, with the adoption of the refrigerator car in the 1870's and 1880's, there was a major shift in slaughtering from the retail sector not covered in the industrial Censuses to large packing firms which were covered. This view seems plausible, but it would be strengthened if Gallman could show that the pre-Civil War Censuses exhibit the same inconsistency as those for 1869.

The significance of this testing procedure for assessing the reliability of the data in the industrial Censuses should be underscored. The midnineteenth century Censuses have been written off by some as virtually worthless. While inspection of such charges often shows them to be grounded on slim and (for the present case) irrelevant evidence, it is nonetheless reassuring to find that the returns from the nation's farmers check out fairly well with manufacturers' reports. Similar testing of mutual consistency might be attempted against data from the transport sector, especially for the earlier years when channels of commerce were fewer, but I am not sufficiently familiar with the source materials for transportation to evaluate this possibility.

In principle, outputs and inputs of different manufacturing industries can be checked against each other in the same way, but Gallman found this difficult with the data available. Hence his testing of and confidence in the estimates for the earlier stages of manufacturing is greater than for the later. However, even if such testing is not possible for individual industries and commodities in physical output terms, it may still be possible to develop a very rough test for entire industrial sectors in value terms. Such a procedure would add to Gallman's appraisal of the consistency

of reports on raw material flows an impression of the consistency of sector reports on product values, including not only raw materials but also fabricated items.

Table 2 is an attempt to develop such a test for Shaw's commodity flow estimates, which were readily available in full detail. (And here I should like to second Gallman's appreciation of Shaw's lucid presentation.) In effect, lines 1–7a apply the commodity flow procedure to entire sectors to derive an estimate of the value of output of finished manufactures and manufactured construction materials. Thus, from the output of the extractive industries (line 1) are deducted the flow into inventory (line 2a—estimates were available only for livestock), the flow of nonmanufactured finished goods and construction materials to ultimate consumers and abroad (line 2b), and the flow of intermediate goods abroad (line 2ci). The residual provides an estimate of the flow of intermediate goods from the domestic extractive industries to the manufacturing sector (line 2cii). To this are added imports of intermediate goods for domestic manufacturing (line 3) to obtain the total input into manufacturing of intermediate goods (line 4). Adding to this the value added in domestic manufacturing (line 5) and deducting the flow of manufactured intermediate goods abroad (line 6), one obtains an estimate of the output by the manufacturing sector of finished goods and construction materials (line 7a). Shaw's estimates of the same, obtained from Census returns detailing manufacturing output by type (not used in the present calculation), are shown in absolute amount in line 7b and as a percentage of the present estimate in line 8.

There is some reason to expect Shaw's results to be lower since he tried to confine his estimate to factory production. However, a glance through the notes describing how the present estimate was obtained and some of its imperfections warns against expecting very close correspondence.[1]

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[1] A partial check of the present procedure for one date is provided by the 1899 Census of Manufactures where separate returns on the raw materials and partly manufactured components of materials were obtained. See *Twelfth Census*, Vol. VII, Manufactures, Part I, p. cxxxvii. The estimate of $2,506 million obtained here (line 4) for the flow of raw materials to manufacturing is quite close to the direct report of manufacturers, $2,389 million.

It may be noted that Shaw used these 1899 Census figures to develop a check somewhat similar to the present one. See Shaw, *Commodity Output*, pp. 89–92. However, Shaw's check was only possible for the one date when the Census of Manufactures obtained direct reports on the value of raw materials consumed, while the present procedure develops the estimate of raw materials input from nonmanufacturing data and has the advantage not only that such data are to a substantial extent available throughout the entire period, but also of providing at the same time a rough test of the consistency of the Census returns for manufacturing with those for the extractive industries.

TABLE 2

ALTERNATIVE ESTIMATES OF OUTPUT OF FINISHED MANUFACTURES AND MANUFACTURED CONSTRUCTION
MATERIALS AT PRODUCER PRICES AND COMPARISON WITH SHAW ESTIMATES, 1869-1919
(million dollars)

	1869	1879	1889	1899	1909	1919
1. Gross value added of extractive industries	2,417	2,538	2,923	3,743	6,973	18,159
2. Drafts on output of extractive industries						
a. Changes in livestock inventory	47	70	43	133	-106	-214
b. Flow of nonmanuf. finished goods and construct. mater. to ultimate consumers and export	736	756	1,017	1,247	2,263	5,213
c. Flow of intermediate goods	223	452	374	469	532	1,782
i. To export						
ii. To domestic manufacturing (line 1 minus sum of lines 2a, 2b, and 2ci)	1,411	1,260	1,489	1,894	4,284	11,378
3. Imports of intermediate goods for domestic manufact.	262	520	538	612	980	3,299
4. Total flow of intermediate goods to domestic manufact.	1,673	1,780	2,027	2,506	5,264	14,677
5. Gross value added of domestic manufacturing	1,631	1,962	3,727	5,044	8,160	23,842
6. Exports of intermediate goods by manufacturing	34	99	85	299	401	1,551
7. Output of finished manufactures and manufact. construction materials						
a. Lines 4 and 5 minus line 6	3,270	3,643	5,669	7,251	13,023	36,968
b. Shaw	2,308	3,079	4,807	6,373	11,330	34,067
8. Ratio of line 7b to line 7a (per cent)	71	85	85	88	87	92

NOTES TO TABLE 2

Line 1: Sum of estimates for agriculture, mining, and fisheries derived
from sources below. Comparability with the scope of Shaw's final flow
estimates would be improved by addition of an estimate for forestry.
Agriculture
1869-99: *Trends in the American Economy*, p. 47. Forest products (esti-
mated at $100 million in 1889), improvements to land made by farm labor,
and home manufactures were excluded in order to improve comparability
with the scope of Shaw's final flow estimates.
1909,1919: Strauss and Bean, *Gross Farm Income*, p. 24. To improve compa-
rability, total in source was reduced by arbitrary estimates for forest
products of $150 million in 1909 and $300 million in 1919.
Mining
1869-99: *Trends in the American Economy*, p. 54. Comparability with Shaw's
final flow figures would be improved if estimates were added for precious
metals mining (omitted in source).
1909, 1919: *Historical Statistics*, 1960, Series M-4.
1869-1919: Figures derived as above were increased by value of production
of natural mineral waters as given by Shaw, *Commodity Output*, pp. 247-
248.
Fisheries
1869-1919: Shaw, *Commodity Output*, p. 252.
Line 2a, 1869-99: Strauss and Bean, *Gross Farm Income*, p. 23, by sub-
traction.
Line 2a, 1909, 1919: *Ibid.*, p. 24.
Line 2b: Sum of flows from agriculture (Shaw, *Commodity Output*, p. 247,
cols. 1-8), mining (Shaw, *Commodity Output*, p. 262, col. 9; p. 247,
col. 10; p. 264, cols. 3-4), and fisheries(*ibid.*, p. 252, col. 3).
Line 2ci: Exports of crude materials and crude foodstuffs (*Historical
Statistics*, 1960, Series U-62 and U-63) for fiscal years 1870, 1880,1890,
1900, and 1909-10 average, and for calendar year 1919 were multiplied by
a factor of 0.9 to place them on a valuation basis roughly comparable
with Shaw (*Commodity Output*, p. 271). Shaw's estimates of exports of
nonmanufactured food and construction materials (*ibid.*, pp. 30, 64) were
then deducted from these to obtain exports of unfinished nonmanufactured
goods.
Line 2cii: Line 1 minus lines 2a, 2b, and 2ci.
Line 3: Total imports (*Historical Statistics*, 1960 Series U-67) for same
dates as crude exports in line 2ci minus Shaw's estimates of imports of
finished commodities and construction materials (*Commodity Output*, pp.
62-65). Comparability with final flow figures would be improved if
estimates were added for duties on these imports.
Line 4: Sum of lines 2cii and 3.
Line 5, 1869-99: *Trends in the American Economy*, p. 56.
Line 5, 1909, 1919: *Historical Statistics*, 1960, Series P-8.
Line 5: Exports of manufactured foodstuffs, semimanufactures, and finished
manufactures (*Historical Statistics*, 1960, Series U-64, U-65, and U-66)
for same dates as crude exports in line 2ci were multiplied by a factor
of .85 to place them on a valuation basis roughly comparable with Shaw
(*Commodity Output*, p. 271). Shaw's estimates of exports of finished
manufactured commodities (*ibid.*, p. 62, less group 1b, pp. 30-31) and
construction materials (*ibid.*, p. 63) were then deducted from these to
obtain exports of unfinished manufactures.
Line 7a: Lines 4 and 5 minus line 6.
Line 7b: Shaw, *Commodity Output*, p. 152, sum of finished commodities and
construction materials.

It is encouraging, therefore, to find that for 1879–1919 the two totals do not differ drastically, and that the trend in this period is generally consistent with expectations based on a shift of manufacturing production into the factory. Moreover, the 1869 figures, which Gallman on the basis of his detailed testing of materials flows concludes are deficient, are shown by this test also to be seriously in question.

The results seem encouraging enough to warrant fuller investigation of this testing procedure. Clearly, it would be interesting to replicate the test for all the Census year estimates presented here by Gallman, and particularly to see how his pre-Civil War and revised 1869 estimates fall in line. It would also be informative if, to the extent possible, such a comparison were presented using the returns from the industrial Censuses *before* adjustment for comparability over time. In this way, one might form some over-all impression of the degree of processing to which the original data were submitted. Finally, it should be noted in passing that the data in Table 2 are of analytical interest too, providing in a very summary fashion a notion of the changing interdependence between the extractive sector, manufacturing, and the rest of the world.

Table 3 is an attempt to develop a similar test for the Census year estimates in the pre-Civil War period, using only the figures published by Gallman here and in Volume 24. The procedure is much cruder, involving among other things, only an over-all adjustment for international trade flows and different levels of valuation for the direct estimate of manufactures of finished commodities and construction materials (line 5) and the implied estimate derived from the industrial data (line 4). There is a suggestion that the 1839 figures may be somewhat out of line, either on the industrial or final product side, but without more experience with this procedure and a longer series, it is difficult to draw any firm conclusion. The procedure is less precise than that employed in Table 2 and is noted here only to suggest a cruder but simpler alternative, and to provide a link with a similar comparison presented below in discussing the service estimates.

One final point should be noted regarding Gallman's revision of the 1869 figures for the flow of animal products into domestic consumption. While the testing procedure presented in Table 2 provides general support for Gallman, it does not of course identify the particular source or sources of inconsistency. In Volume 24, William N. Parker expresses the view that the estimates of hog slaughter by both Gallman and Towne-Rasmussen— which check with each other quite closely—may in fact be high, and Albert Fishlow, in his review of the volume, supports this position with the opinion that Gallman's method yields an estimate that constitutes in

TABLE 3

COMPARISON OF ESTIMATES OF VALUE ADDED BY INDUSTRIAL SECTOR
WITH ESTIMATES OF FINISHED COMMODITIES AND
CONSTRUCTION MATERIALS, 1839-59
(million current dollars, producer prices)

	1839	1849	1859
1. Gross value added	907	1,239	2,276
a. Agriculture	658	775	1,427
b. Mining	9	17	34
c. Manufacturing	240	447	815
2. Exports	112	135	316
3. Imports	98	174	354
4. Line 1 adjusted for trade flows (line 1 minus lines 2 and 3)	893	1,278	2,314
5. Finished consumer commodities, producer durables, and construct. materials (buyer prices)	1,115	1,759	3,141
6. Ratio of line 5 to line 4 (per cent)	125	138	136

Source

Line 1: Sum of lines 1a, 1b, and 1c.
Line 1a: *Trends in the American Economy*, p. 47. To improve compara-
bility with the scope of estimates in line 5, improvements to land
made by farm labor and home manufactures were eliminated from value
added.
Line 1b: *Ibid.*, p. 54.
Line 1c: *Ibid.*, p. 56.
Line 2: *Historical Statistics*, 1960, Series U-61, figures for 1840,
1850, and 1860. Values as published were used.
Line 3: *Ibid.*, Series U-67 for same dates as Series U-61 in line 2.
Values as published were used.
Line 4: Line 1 minus lines 2 and 3.
Line 5: Gallman's Table A-2, cols. 2-4, plus his Table A-3, col. 2,
plus *Trends in the American Economy*, p. 63, Table A-10, lines 1
and 2.

effect an upper limit.[2] However, a comparison of meat consumption implied by Gallman's production estimate for 1849 with fragmentary direct information on consumption in 1848 seems to support the reasonableness of the level of the Gallman and Towne-Rasmussen estimates for that date.[3] But only about a dozen farmers' returns on consumption

[2] *Trends in the American Economy*, p. 284, editor's note. Albert Fishlow, "Trends in the American Economy in the Nineteenth Century," *Journal of Economic History*, March 1962, p. 78.

[3] See *Annual Report of the Commissioner of Patents for the Year 1848*, H. Exec. Doc. 59, 1849, pp. 660–663. Gallman's figures in pounds of live weight for hogs and cattle slaughtered were taken from his unpublished Ph.D. dissertation ("Value Added by Agriculture, Mining, and Manufacturing in the United States, 1840–1880," University of Pennsylvania, 1956, p. 346), converted to a per capita basis and then adjusted for the proportion that meat (and, in the case of hogs, lard) form of live weight. The estimates of these proportions, which Gallman kindly made available to me, were .625 for pork and .59 for beef. No attempt was made to adjust for international trade flows, which were relatively unimportant at the time.

provide the basis for this test and their comparability is uncertain; hence, not much confidence can be placed in it. The issue is a disturbing one since it is important quantitatively—Gallman's revision of Shaw's 1869 estimate on this score alone increases the value of finished consumer commodities by about one-fourth. It is to be hoped that further attention will be given to it by experts in the area.

Other Features

Brief mention should be made of additional aspects of the estimates on the commodity side, many of which draw considerably on other recent studies. In marking up output from producer to consumer prices in the period from 1869 on, Gallman utilizes margin data from Barger's recent work, not available when Kuznets first made his estimates. For the pre-1869 estimates, these margins are extrapolated and tested against related estimates by Seaman and Marburg for 1839. In the estimate of new construction, derived by marking up the input of construction materials, Gallman adopts a suggestion by Fishlow and makes separate estimates for (1) railroad plus canal building, using recent work by Fishlow, Ulmer, and Cranmer, and (2) all other construction. The materials-to-output ratio is significantly different for these two types of building and an important change is made in the 1869 estimate of new construction, a year in which the building "mix" involved a disproportionate representation of railroad building. Allowances for nonmarket activities typically excluded in conventional GNP estimates are made by using new estimates by Barger of firewood, and by Primack and Parker of land improvements by farmers. Also an ingenious estimate is developed by Gallman to test the significance of changes over the period in the relative importance of home and commercial manufacture. Figures for the annual net balance in the pre-Civil War period are obtained from North's work in Volume 24. Finally, in adjusting from current to constant dollars, Gallman uses new price indexes prepared especially for this purpose by Dorothy S. Brady plus some additional series developed by Hoover and Ulmer. I have the impression that the level of commodity detail at which the adjustment is carried out is significantly finer than that employed in the present official estimates.

FINAL CONSUMER SERVICES

As Gallman's own appraisal states, the service estimates, which account for somewhat more than one-fifth of GNP throughout the period, are the least reliable. Gallman accepts Kuznets' estimates for the period since 1869 and extrapolates them *in toto* to the pre-Civil War period, testing the result for 1839 against Seaman and also the movements during the period against Lebergott's labor force figures. He suggests that the 1839 estimate

of final services may be somewhat high. This may be, since there is some evidence that the farm sector grew slower than the nonfarm in the 1840's, not at an equal pace as Gallman assumes in pushing the figures for the 1850's back to 1839. But quite aside from this specific issue, it is difficult to place much confidence in the service estimates in their current stage of development for *any* of the dates shown. The very rough and aggregative approach followed here by Gallman contrasts sharply with his detailed work on the commodity estimates. And while Kuznets' estimates clearly involved much labor and ingenuity,[4] certain aspects of them make one uneasy. For example, the final estimate for nonrent services exceeds that for rent, although thirty-seven out of the forty expenditure surveys for the pre-1914 period—the basic data used by Kuznets—show the difference running the other way and usually by a substantial amount.[5] This result is not impossible, since the surveys relate to urban low-income groups, but the key element in adjusting these to obtain an estimate for the total population is the expenditure differential by population class in 1935-36. This was the earliest date for which sufficient information was available; it is also a date when "other services" included to an important extent items hardly relevant to much of the nineteenth century, such as auto service and repair, movies, telephone, electricity, and other household utilities. While Kuznets' estimates may ultimately prove to be sufficiently reliable—a result which would surprise no one who has come to appreciate his uncanny feel for the use of data—still it does seem that more can be done to explore alternative approaches, several of which have been opened up by the development of new data unavailable to Kuznets at the time.

A few suggestions may be ventured about these alternatives. First, it would seem worthwhile to distinguish the individual service sectors rather than working with a broad aggregate. That the composition of services changed substantially during this period is suggested by Daniel Carson's labor force estimates, which show the share of domestic service in the service industries declining from 58 to 25 per cent between 1870 and 1930.[6] Second, fuller use should be made not only of income and expenditure data, which have been worked up in varying degree now for sectors such as government and education, but also of factor input data such as Carson's and, in the present volume, Lebergott's. Gallman's reluctance to use such data because it reduces the analytical value of the resulting estimates imposes stricter constraints on his methods than are employed in the current official estimates, where the procedures for the service

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[4] See Kuznets, *National Product,* pp. 123–182.

[5] *Ibid.,* pp. 144, 132.

[6] *Studies in Income and Wealth, 11,* New York, NBER, 1949, p. 47.

sectors often preclude significant productivity change. Finally, not only factor inputs but also material inputs into the service industries warrant investigation. Conceivably, it might be possible to develop a procedure parallel to the commodity flow technique in which the flow of material inputs into the service sector is adjusted in the same fashion as shown for

TABLE 4

COMPARISON OF ESTIMATES OF VALUE ADDED IN SERVICE INDUSTRIES
WITH ESTIMATES OF FINAL CONSUMER SERVICES OTHER THAN RENT,
ANNUAL AVERAGES FOR SPECIFIED PERIODS, 1869–1948

Period	Net Value Added in Service Industries[a] (billion dollars) (1)	Final Consumer Services (2)	Col. 1 as Percentage of National Income[a] (3)	Col. 2 as Percentage of Net National Product (4)	Ratio of Col.2 to Col. 1 or of Col. 4 to Col. 3 (per cent) (5)
		PANEL A[b]			
1. 1919–28	8.4	13.0	11.4	18.0	155
2. 1924–33	9.2	15.2	13.0	21.7	165
3. 1929–38	8.3	14.3	13.6	23.3	172
4. 1934–43			12.1	19.4	160
5. 1939–48			10.5	17.8	170
		PANEL B[c]			
6. 1879–89			13.6[d]	12.8	94
7. 1899–1908			9.6	14.8	154
8. 1919–28			9.4	17.5	186

Source

Cols. 1, 3, lines 1–3: Simon Kuznets, *National Income and Its Composition, 1919–1938*, New York, NBER, 1941, p. 163, cols. 8 and 11.

Cols. 2, 4, lines 1–3: Kuznets, *National Product*, p. 144, col. 2, and p. 119, col. 5.

Col. 3, lines 4–8: Kuznets in *Income and Wealth of the United States*, p. 89, col. 7.

Col. 4, lines 4–8: *Ibid.*, p. 168 (col. 5) times p. 155 (col. 5).

[a]For panel B, col. 1, aggregate payments instead of net value added; col. 3, aggregate payments instead of national income.

[b]Kuznets' estimates for all columns.

[c]Martin's estimates for col. 3; Kuznets' for col. 4.

[d]Average for 1879 and 1889 only.

the commodity sector in Table 1 to obtain the output of final consumer services. Table 4 is a very rough effort to explore this possibility, using a treatment paralleling, not Table 2 which I would have preferred, but Table 3. In panel A, column 1 presents Kuznets' estimates of net value added in the service industries, and column 2 presents his estimates of final consumer services other than rent for three dates. The ratio of the two is given in column 5 and is extended to two additional dates using more readily available data on shares of these two components in the income

and product totals. Since, on the one hand, final consumer services includes the output of industries not covered in column 1 (such as public utilities), while, on the other, the industries in column 1 provide intermediate products to business as well as final services (e.g., legal services), one would not expect the levels of the two totals to correspond. But there is some basis for expecting correspondence in their movements, and, indeed, columns 3 and 4 of panel A show the percentage shares changing in rather similar fashion. However, this pattern does not appear in the figures for the earlier period in panel B, which compares Martin's industrial sector estimates with Kuznets' final product figures. Instead, the shares move in diverging fashion. The implication is that these two sets of figures may be seriously inconsistent in the earlier period. Faced with an immediate choice, one would certainly prefer Kuznets' estimates, which are the ones used by Gallman, to Martin's, but clearly the desirable course is a detailed re-examination of the estimates. The main point of the present illustration, however, is simply to suggest how it may be possible to test and perhaps develop estimates for the services following a two-pronged approach from both the industry and final product side.

GENERAL CONSIDERATIONS

In conclusion, I should like to offer three broader observations prompted by the general and understandable concern with the decline in basic data input relative to output as estimates such as these are extended back in time.

The first relates to the complementary nature of micro- and macroresearch in economic history. Mention has already been made of the manner in which the detailed structural framework underlying Gallman's estimates enables the microworker to relate his work to the economy as a whole. But the income estimator too may derive important gains from research at the microlevel. Obviously no estimator can have a comprehensive knowledge of an economy's operation, and as data become scarcer and sources more scattered, he must rely increasingly on the specialist and specialized studies for assistance. A number of examples of this in Gallman's work have already been given. I should like here merely to emphasize two obvious implications for income and wealth estimates. First, there is the need to present the estimates in full detail (I am not referring, of course, to summary reports of the type presented in this volume). The detail should be published (with appropriate warnings), even though crude and unreliable, because only in this way can the expert knowledge of the specialist be best brought to bear and improvements made. The other implication is that any historical income and wealth estimate is necessarily unfinished, for new knowledge will render

obsolete various parts of the estimate. An established view that these estimates, though useful, are imperfect and mortal would perhaps reduce the dangers of misuse and casual criticism.

The second and related observation is the need for wider recognition by users of the interdependence of the construction of estimates, on the one hand, and their possible analytical uses, on the other. This point, made a decade ago in an excellent article by Stanley Lebergott,[7] applies with special force to historical estimates, where resort to analytical models to supply figures for components not covered by the basic sources is more widespread. Proper analytical use of such figures requires knowing the analytical models used in their derivation. Otherwise the analyst may find himself proclaiming as a finding a relationship built in by the estimator.

Finally, there is the fundamental question which has haunted these remarks from the start—how does one appraise the acceptability of estimates such as Gallman's and others attempted here and in Volume 24? Even for the current period, it is difficult to assess the reliability of estimates of economic magnitudes. But as one pushes such figures back into periods when basic data sources are increasingly deficient and the use of analytical models to plug gaps rises correspondingly, the danger grows that the outcome will be no more than a house of cards. It is this concern, of which the best estimators themselves are only too well aware, which is voiced in several of the discussions in Volume 24 and in Fishlow's thoughtful review,[8] and which Parker expresses pointedly in his introduction to Volume 24 when he notes that "at some point the game goes beyond the bounds of good scholarship."[9]

As one reflects on this question, the lack of widely accepted rules for appraising estimates of economic magnitudes becomes increasingly apparent. It is curious that, while in recent years highly sophisticated methods have been developed for the analysis of data, relatively little systematic thought has been given even to procedures for the construction of estimates, let alone their appraisal. Current quantitative work on long-term growth only throws into bolder relief the need for developing more formal procedures for judging, if not the precise reliability of the estimates, at least whether the bounds of good scholarship have been exceeded. Such a development would doubtless be welcomed by the serious estimators themselves, since it would make for quicker rejection of

[7] Stanley Lebergott, "Measurement for Economic Models," *Journal of the American Statistical Association*, June 1954, pp. 209–226.

[8] Fishlow in *Journal of Economic History*, March 1962.

[9] *Trends in the American Economy*, p. 9.

ad hoc pseudoestimates which on occasion clutter a field. (It would have the added advantage of protecting the estimators against the frequent tendency of reviewers, uncurbed by the need to observe an established set of rules, to seize on weak points, honestly exposed to full view by the estimator himself, and so magnify them as to descredit the entire work.) Indeed, it is the estimators who have wrestled most with this problem and to whom one can turn for some initial guidance.[10]

In this connection, it is relevant to note features of Gallman's work, even in its present unfinished state, which strengthen one's confidence in it. Attention has already been given to his use of the commodity flow technique to test the consistency of different data sources. There is also his effort to test the results against other estimates of the same or related magnitudes. An example of this is the comparison of the 1839 estimate for distribution with the figures developed by Seaman and Marburg. Other possibilities that come quickly to mind are comparisons of the construction figures with building permits series and of some of the commodity estimates with Frickey's series on manufacturing production. In addition, Gallman identifies key assumptions and data deficiencies, and tries to evaluate their quantitative significance—an example is the underestimate of imports. Finally, Gallman gives attention to possible omissions and conceptual variants, as in the case of home manufactures and land improvements. All of these practices have merit and are applicable in varying degrees to other types of historical estimate.

One should not leave the question of appraisal without noting that in part, of course, it has always involved a matter of personal quality—the amount of thought and effort that has gone into Gallman's estimates is well known to anyone who has followed his work in the last ten years. When two agricultural experts such as Towne and Rasmussen go over Gallman's figures for agricultural income and arrive at quite similar results, it is a real personal tribute and furthers acceptance of other aspects of his work as well.[11] But as estimates and estimators multiply (as I hope they will), objective bases of appraisal, such as the procedures mentioned above, must necessarily grow in importance, and more systematic standards must be developed.

[10] In the income and wealth field, see, for example, *National Income: 1954 Edition*, U.S. Department of Commerce, Washington, 1954, Part III, and the National Bureau studies by Kuznets, Shaw, Fabricant, Kendrick, and others on national income and productivity.

[11] See *Trends in the American Economy*, pp. 259–314, esp. pp. 279–280.