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The Service Industries in the Nineteenth Century

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INTRODUCTION

This paper describes the level and composition of output of the service sector during the nineteenth century and the principal trends in both. It considers inputs into the service sector and arrives at conclusions, some very tentative, concerning relative levels of output per worker and trends in productivity. The quantitative series produced are of unequal reliability and while we have taken some pains to draw attention to this fact at various places in the text, the reader is further warned to examine the table notes and the long appendix with care before he uses any of these series in his own work.

OUTPUT

Table 1 contains two series, each measuring the output of the service sector, in current prices. The concepts, data, and estimating procedures underlying the two are somewhat different, and while the series are insufficiently independent to warrant regarding their comparison as a severe test of either, there is something to be gained from the process.

TABLE 1

Output of the Service Sector, Expressed in Current Prices, 1839–1899, Two Variants
(billions of dollars)

	Variant 1	Variant 2	Variant 1/ Variant 2
1839	0.68	0.65	1.05
1849	1.11	0.94	1.18
1859	2.01	1.75	1.15
1869	3.32	2.93	1.13
1879	4.34	3.87	1.12
1889	5.80	6.50	0.89
1899	8.14	8.91	0.91

SOURCE NOTES: **Variant 1:** Obtained by subtracting net income originating in agriculture and industry (manufacturing, mining and construction) from national income. National income was obtained by extrapolation on gross national product, the latter taken from worksheets underlying Robert E. Gallman, "Gross National Product in the United States, 1834–1909" in *Output, Employment, and Productivity in the United States after 1800*, Studies in Income and Wealth 30, New York, NBER, 1966, p. 26. The extrapolating ratio (.8884) was derived by dividing average net national product, 1899–1908, by average gross national product for the same decade (Gallman, p. 26). The net national product estimate is from Simon Kuznets, *Capital in the American Economy*, Princeton, N.J., 1961, Table R-11, p. 520 (Variant I). The concepts involved are National Bureau of Economic Research concepts; hence, the aggregate, net national product, is equivalent to national income.

Income originating in industry was extrapolated on value added by industry. The extrapolating ratio (.6556) was computed from manufacturing data for the years 1923, 1925, 1927 and 1929, taken from U.S. Bureau of the Census, *Historical Statistics of the United States*, Washington, D.C., 1960, series P-8, p. 409 (value added) and Simon Kuznets, *National Income and Its Composition, 1919–1938*, New York, NBER, 1954, Table 44, pp. 310–311. Additional available data for the years 1919, 1921, 1931, 1933, 1935 and 1937 were not used because the ratios in these years were affected by conditions which did not exist in the nineteenth century years to which the extrapolation was to be carried (reconversion from war, 1919; unusually deep or prolonged depression, 1921, 1931, 1933) or because the value added data were not entirely comparable with the nineteenth century value added data (1935, 1937—see the source). Had we used these data, however, the extrapolating ratio would not have been much different (roughly, .622).

Manufacturing data alone were used since adequate mining and construction data were not available. We did compute a mining ratio for 1919 (.7215) and it was very close to the manufacturing ratio for that year (.7165), suggesting that the extrapolating ratio used may be adequately representative.

Income originating in agriculture was extrapolated on value added by agriculture. The extrapolating ratio (.6525) was derived from data in Kuznets, *op. cit.*, Table 44, pp. 310, 311 (income originating) and technical Bulletin 703, Table 8, p. 24, column 1 for the years 1920 through 1929, years in which the ratio varied little. We did not use

The first series was produced as a residual, by subtracting net income originating in agriculture (including firewood production), manufacturing, mining and construction from national income (NBER concept). Presumably, then, it measures net income originating in all the remaining industries, virtually all of which lie in the service sector (exceptions: fishing, forestry except firewood production).

There is a very good chance that the *change* in the series over time is biased, and in a downward direction. The estimates of national income and sectoral income originating were all obtained by extrapolating the desired estimate backward in time from the twentieth century on a more comprehensive measure (gross national product; value added; gross income—see the notes to Table 1). The assumption was made that, e.g., the ratio of net income originating in manufacturing to value added by manufacturing was unvarying over time. But in view of the growing complexity of the economy, one would expect that, in fact, the ratio might *fall* over time.[1] Consequently, assuming a constant ratio may tend to produce an *upward* bias in the rate of change of income originating in commodity production and, therefore, a *downward* bias in the rate of change of the residual, income originating in the service sector.

Additionally, the GNP series underlying the national income esti-

[1] However, the twentieth century evidence does not describe such a movement.

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available data for 1919 and 1930 through 1937, for essentially the reasons given above, in the notes relating to industry. However, had we used these years the ratio would have been only very slightly different (.6540).

Value added by industry is the sum of value added by manufacturing, mining (both taken from Robert E. Gallman, "Commodity Output, 1839–1899" in *Trends in the American Economy in the Nineteenth Century*, Studies in Income and Wealth 24, Princeton for NBER, 1960, pp. 54 and 56, except that the estimate for the former in 1839 is adjusted upward from $240 million to $250 million, in the light of work underlying Gallman, "Gross National Product . . . ," p. 47, note "e" to Table A-7) and construction. Value added by construction is estimated as the difference between the value of gross new construction (*ibid.*, p. 38) and the value of materials consumed in construction (Gallman, "Commodity Output," *op. cit.*, p. 63, Table A-10, line 1 plus line 2). The estimates understate value added by construction.

Value added by agriculture is from Gallman, *ibid.*, pp. 46–48. However, the value of "improvements to farm land" and "home manufacturing" were omitted, to make the estimates conceptually comparable to the national income estimates. Additionally, the estimates of the value of "firewood consumption" which are components of the gross national product series were substituted for estimates of the value of forest products in *Trends in the American Economy in the Nineteenth Century, op. cit.*

Variant 2: See Appendix Table A-1.

mates was produced from the final flow side. The commodity estimates are more reliable than the service flows and the latter, in the early years, are somewhat more likely to be high than low.[2] Consequently there is a second reason for believing the trend of the first series in Table 1 to be biased in a downward direction.

The first series was estimated indirectly, as a residual. The second (Variant 2) was estimated directly and is composed of gross value added measures. It shares some significant common elements with the first series (see the notes to Table 1 and the appendix), but is independent in important ways, at least by the end of the century. Furthermore, while it has a few weak components (see the appendix), we regard it as a stronger series than the first.

The two series do tell roughly the same story. The level of output in 1839 ran, in current prices, something under $700 million. It had very nearly tripled by 1859 and between that date and the turn of the century, it expanded another four- or fivefold. As expected, the ratio of the first series to the second falls, presumably reflecting the previously alluded to bias in the first series. But the movement is not unidirectional, gentle or gradual. The ratio rose in the first decade, then drifted downward, more or less as we had expected, for three decades and then fell very sharply. The improvement of the new, Variant 2, series over the old, Variant 1, is surely reflected in these short-term deviations in the rates of change of the two series.

We may now drop Variant 1 and focus on Variant 2. According to Table 1, the value of the output of the service sector increased roughly fourteenfold between 1839 and 1899. We want to know how this compares with the pace of change in the rest of the economy. Table 2 represents the first step toward an answer to this question. It shows the distribution of the value of output (value added) between the commodity and service producing sectors. Trends in the shares reflect differential rates of change between the sectors.

In fact, there is little clear and convincing evidence that the two broad sectors grew at markedly different rates. It is true that the share

[2] Robert E. Gallman, "Gross National Product in the United States, 1834–1909," in *Output, Employment, and Productivity in the United States After 1800,* Studies in Income and Wealth 30, New York, NBER, 1966, pp. 56–62.

TABLE 2

The Distribution of Output, Expressed in Current Prices, Between the Commodity and Service Producing Sectors, 1839–1899
(per cent)

	Commodity Industries	Service Industries
1839	62	38
1849	61	39
1859	59	41
1869	63	37
1879	58	42
1889	54	46
1899	53	47

SOURCE NOTES: **Commodity Industries:** Value added by agriculture, manufacturing, mining and construction. See notes to Table 1. **Service Industries:** Value added by the service industries. See notes to Table 1.

of the commodity producing sector fell by 9 percentage points, from 62 to 53 per cent, between 1839 and 1899, while the share of the service sector rose from 38 to 47 per cent. However, this is not a very marked change, compared with the structural shifts going on over the same period within commodity production.[3] In 1839, agriculture's share of value added by commodity production was 70 per cent; industry's (manufacturing, mining, and construction), 30 per cent. By 1899, the positions of the two sectors were almost reversed. The share of agriculture had fallen to 35 per cent; the share of industry had risen to 65 per cent.

More important, the changes in relative importance of the commodity and service producing sectors are compressed into the last three decades of the century. Indeed, there is no real evidence of a significant trend in shares before 1889, and none thereafter. The measured share of the service sector jumped to an unprecedentedly high

[3] The movement would have been somewhat more pronounced, and also smoother, were the commodity sector estimates underlying the Variant II GNP series in the Volume 30 paper (*ibid.*) substituted for the estimates used here. But the broad conclusions outlined in this paragraph would remain.

TABLE 3

Price Indexes, 1839–1899, Base 1860

	1839	1849	1859	1869	1879	1889	1899
1. Commodity producing sectors [a] (implicit)	94	87	100	146	105	90	87
2. Service sectors, Variant 1 (implicit)	96	104	105	131	104	105	99
3. Rent (Brady)	80	95	101	147	122	139	143
4. Rent (Lebergott)			100 [b]	155	125		
5. Rent (Hoover) [a]		100 [c]	100	141	122		
6. Medical services [a]		100 [c]	100	166	151		
7. Distribution (implicit)	115	101	103	145	99	96	87
8. Shipping freight rates	87	112	79	82	89	60	53
9. Railroad passenger rates [a]	205	119	100	115	105	90	82
10. Railroad freight rates [a]	290	157	100	84	50	36	28
11. Average weekly wages of domestics [d]		81	100	149			234
12. Weighted index (lines 3, 6, 7, 8, 10)	95	101	99	129	91	78	70

SOURCE NOTES: **Row 1:** Value added by agriculture, manufacturing, mining and construction, in current prices, divided by the same, in prices of 1860. The sources of the current price magnitudes are described in the notes to Table 1.

The agricultural series was deflated by use of the implicit price index contained in Gallman, "Commodity Output . . . ," p. 43, shifted to the base 1859 without reweighting. Additionally, the price index was modified to reflect the alterations made to the agricultural series in the present study, and described in the notes to Table 1.

The mining series was deflated by the mining price index in Gallman, *ibid.*, p. 43, shifted to the base 1859, without reweighting.

The manufacturing series was deflated by the value of output price index underlying the value added price index contained in Gallman, *ibid.*, Table A-5, p. 56, shifted to the base 1859 without reweighting. The value of output price index was used in preference to the value added price index to maintain conceptual comparability with the deflators for the service sector. But as a practical matter, the index numbers in line 1 would have been virtually unchanged had we used the value added price index.

Value added by construction was deflated by the implicit price index of gross new construction, underlying Gallman, "Gross National Product. . . ."

Row 2: The estimates underlying Variant 1, Table 1, divided by the same, in prices of 1860. The latter were produced exactly as were the former, except, of course, that the extrapolations were carried out on constant price series: The constant price GNP series is the one underlying Gallman, *ibid.* The remaining constant price series are described above (Row 1). The extrapolating ratios are those of Table 1.

Row 3: Estimates supplied by Dorothy Brady and used in Gallman, *ibid.*

Rows 4 and 11: Derived from Stanley Lebergott, *Manpower in Economic Growth: the American Record Since 1800*, New York, San Francisco, Toronto, London, pp. 542, 549.

Rows 5 and 6: Derived from Ethel Hoover, "Retail Prices After 1850," in *Trends in the American Economy, op. cit.*, pp. 174, 176, 178.

Row 7: Implicit price index (final prices) of goods flowing through the distributive system, computed from worksheets underlying Gallman, "Gross National Product . . . ," *op. cit.*

level between 1879 and 1889, but the place of this movement in the long-term development cannot be established with the evidence contained in Table 2.

Table 2 rests on current price data. We now want to distinguish the separate roles of price and output changes in the formation of the ratios contained in Table 2. Table 3 contains some evidence bearing on the question.

In line 1 we have gathered implicit price index numbers relating to the commodity producing sectors. The basic sources of these index numbers are familiar and their use does not appear to raise any very serious problems.

The index numbers in line 2, however, constitute quite a different matter. They were derived by dividing the constant price Variant 1 service series (i.e., the residual) through the current price series. There are at least three reasons why they are suspect. First, one must always be uneasy with derivations from residuals. Second, in this particular instance each of the residuals was derived from estimates extrapolated into the nineteenth century on the assumption of fixed relationships between the extrapolating series and the estimate, an assumption that may not be warranted. Finally, we know the price series that went into the construction of the basic national product and commodity output series and therefore know, in principle, which components of the service sector are represented in the implicit deflation. We know that a rent index was the only deflator of services flowing to con-

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Row 8: Derived from Douglass C. North, "The United States Balance of Payments, 1760–1860" and Matthew Simon, "The United States Balance of Payments, 1861–1900," both in *Trends in the American Economy,* pp. 607, 608 (column 4, converted to base 1860) and 652 (column 2).

Rows 9 and 10: Derived from Albert Fishlow, "Productivity and Technological Change in the Railroad Sector, 1840–1910," in *Output, Employment, and Productivity, op. cit.,* p. 585.

Row 12: The indexes were divided through the appropriate components of value added by the service sector (see the appendix) to produce constant price estimates. The constant price estimates were summed and divided through the appropriate current price aggregate in each year to produce the index number. It was assumed that the medical price index was 100 in 1840 and 160 in both 1889 and 1899 and that the medical price index could satisfactorily represent all professional services.

[a] Index based on 1859.

[b] 1860.

[c] 1851.

[d] 1850, 1860, 1870, 1900.

sumers in the national product series.[4] Additionally, since the commodity production series are valued in (and deflated by) wholesale prices and the national product series is valued in (and deflated by) final prices, the implicit price index of the residual must reflect price movements relevant to distribution, including transportation of goods. Consequently, distribution and shelter are the only components of the service sector represented in the implicit price index of the residual.

Lines 3 through 11 contain a variety of indexes relevant to the service sector. Our search was not intensive and possibly other series could be assembled to fill out the record. But these lines contain virtually all the evidence we found.

Two features of these series are worth noticing immediately. First, the list is not much more comprehensive than the list of indexes represented in the Variant 1 implicit price index. But some new evidence does appear. Second, with the exception of the distribution price index, all of these indexes deviate quite markedly from the commodity output price index. The latter is rather stable, except for a sharp rise between 1859 and 1869 and a sharp decline between the latter year and 1879. But the service price indexes fall into two groups. One group, representing rents, personal and professional services, exhibits quite marked and persistent price increases. The second, representing transportation services shows extremely marked price declines.

Line 12 was prepared by weighting and combining the principal indexes contained in lines 3–10 (see the notes to the table). We did not use the data in line 11, since they do not consist of price index numbers. Consequently, the important component of the service sector, "personal services," is unrepresented in the composite price index, as are several other components which together account for between 21 and 25 per cent of service output. We suppose that these omissions tend to bias the changes in the composite price index over time in a *downward* direction.

The location of the price base also has an important effect on the movement of the price index over time. The component which changes most markedly is the index of railroad freight rates, which

[4] Gallman, "Gross National Product," *op. cit.*, pp. 40, 58.

falls by 90 per cent between 1839 and 1899. By the postwar years, the railroad industry is an important component of the sector. The earlier the price base, the larger the impact of the falling railroad freight rates on the aggregate price index, and vice versa. This, of course, is a common problem in index number construction. But we have it here in extraordinarily sharp form. The price base 1860 has at least the virtue of lying roughly midway in the decline (per cent) of the freight rates from the peak in 1839 to the trough of 1899.

Interestingly enough, the composite index of line 12 lies very close to the Variant 1 implicit price index in every year from 1839 to 1869. Thereafter, the effect of the sharply falling rail freight rates on the composite index is seen clearly. The composite index falls sharply, drops thirteen points below the Variant 1 index in 1879, 27 points, in 1889, and 29 points, in 1899. The broad trends of the Variant 1 index are much the same as those of the commodity price index, except that the latter shows a slight tendency to decline, relative to the former. But the composite service price index falls markedly and persistently, relative to the commodity price index after 1859.

Given the uncertainties surrounding the sector index numbers, meaningful real output estimates for the service sector cannot be produced. However, the data of Table 3 do have some value. For reasons previously given, the trend across time of the index numbers in line 2 is probably biased in an upward direction; that of the index numbers in line 12, in a downward direction. The two series bracket the index numbers relating to commodity production (line 1). Consequently, it seems proper to conclude that the long-term movements of the price levels of the commodity and service producing sectors probably did not differ markedly. Thus the broad conclusions concerning the relative speed of growth of the two sectors, based on the current price evidence underlying Table 2, are probably roughly relevant to real magnitudes, as well.

Table 4 distributes the output of the service sector (current prices) among the industries that compose the sector. The first three industries listed provide chiefly intermediate products; the last six, final products. Several features of the distribution are worth attention.

TABLE 4

Distribution of Output Among Service Industries, Current Prices, 1839–1899
(per cent)

	1839	1849	1859	1869	1879	1889	1899
1. Distribution	30	37	38	33	34	30	30
2. Transportation and public utilities	17	11	15	17	18	20	20
3. Finance	5	3	3	4	5	6	6
Subtotal	52	51	56	54	57	56	56
4. Housing	26	26	23	24	18	17	16
5. Professional	7	8	6	7	11	11	13
6. Personal	5	5	5	5	6	7	6
7. Government	4	3	4	2	2	3	3
8. Education	1	2	2	3	3	3	3
9. Repair hand trades	5	4	5	4	4	4	5
Subtotal	48	48	45	45	44	45	46
Grand total	100	99	101	99	101	101	102

SOURCE NOTES: Computed from Appendix Table A-1.

First, the distribution of output between industries producing intermediate and final product changed little over time. Industries primarily engaged in intermediate production accounted for roughly 55 per cent of the output of the service sector throughout; industries producing mainly final product, 45 per cent. The two types of industries were equally responsible for the growth of output of the sector, in current prices.

Second, three large industries—distribution, transportation and public utilities, and housing—dominated the sector, accounting for between two-thirds and three-quarters of output in every year. The share of the three in output declined over time, housing accounting for the entire decline. The share of housing in sector output fell from one-quarter to a little less than one-sixth. An increase in the share of transportation and public utilities only partly compensated for the drop.

The shares of two other industries, finance and professional services, rose noticeably. However, the former industry remained rela-

tively small throughout. The estimates relating to professional service are perhaps the weakest of all the output estimates and, consequently, one should not emphasize the changes in the share of this sector.

It is a simple enough matter to imagine the effects deflation would have on Table 4 (see Table 3). In constant prices, the share of transportation and public utilities would surely rise, and the share of housing fall much more prominently than in Table 4. The share of distribution would fall somewhat and the share of professional services perhaps remain constant, perhaps fall. Without much doubt, a table produced from constant price magnitudes would show that the output of industries producing chiefly intermediate services grew very much faster than the output of the entire sector. The changes in the transportation and public utilities industry would surely be reflected in the table in the most striking way.

LABOR INPUT AND PRODUCTIVITY

Table 5 contains three different sets of estimates of the labor force attached to the service sector. It will be seen that the estimates produced for this paper, Variant 3, are very close to the Variant 2, or Fabricant, estimates in the years 1869 through 1899. This is not at all surprising since both series in these years depend heavily on the work of Carson (see the appendix). For the years before the Civil War, however, the Fabricant series depends upon the pioneering, but now dated, study by Whelpton. The Whelpton aggregate labor force estimates are surely too low, before the war, and consequently it is not unreasonable to suppose that his service figures are also too low. Therefore, the current estimates should, and do, lie above the Fabricant figures in the prewar years.

The Variant 1, or Lebergott, figures were produced by us, not by Lebergott. We simply subtracted Lebergott's estimates of the labor force in agriculture, mining, fishing, manufacturing and construction from his aggregate labor force estimates. Lebergott, himself, has not attempted a full set of service labor force estimates.

The method by which we derived the Variant 1 series may explain the rather odd relationship between the Variant 1 and Variant 3 series. Before the war, the former stood typically 100 thousand or so higher than the latter, whereas after the war, it lay 400 or 500 thou-

sand below. Over the war decade, 1859–1869, the Variant 1 series actually fell by 300 thousand, a difficult decline to explain. Consequently, within the pre- and postwar periods, the two series described different *levels,* but roughly the same *rates of change.* Over the full period, 1839–1899, however, Variant 1 displayed a seven- or eightfold expansion, while the growth of the Variant 3 series was almost ninefold.

We now confine our attention to the Variant 3 series and ask how the growth of the service sector labor force compared with the growth of the aggregate labor force. The relevant data are contained in Table 6, which shows that the share of the service sector in the aggre-

TABLE 5

The Labor Force in the Service Sector, 1839–1899, Three Variants
(thousands)

Year [a]	Variant 1 (Lebergott)	Variant 2 (Fabricant)	Variant 3
1839	1,244	n.a.	1,180
1849	1,988	1,502	1,872
1859	2,975	2,309	2,806
1869	2,682	3,266 [b]	3,225
1879	3,959	4,568	4,384
1889	6,960	7,184	7,266
1899	9,124	9,658	9,618

SOURCE NOTES: **Variant 1:** See text for methods of calculation. The basic data are from Stanley Lebergott, "Labor Force and Employment, 1800–1960," in *Output, Employment, and Productivity, op. cit.,* p. 118.

Variant 2: Derived from *Historical Statistics of the United States, 1789–1945,* Series D47-61. The estimates of labor force in the hand trades in Appendix Table A-12 were added to the Fabricant service sector estimates to improve the comparability of Variants 1, 2 and 3.

Variant 3: Appendix Table A-12.

[a] Since the census data on which these series are based were collected in the summer of the following calendar year, the estimates are typically dated 1840, 1850, etc. We use the dating 1839, etc., to maintain consistency with the other tables in this paper.

[b] Comparable with the estimates for 1839–1859. The figure comparable with the estimates for 1879–1899 is 3,286.

TABLE 6

The Distribution of the Labor Force Between Service and Commodity Sectors, 1839–1899
(per cent)

	Commodity Sector	Service Sector
1839	79	21
1849	77	23
1859	75	25
1869	75	25
1879	75	25
1889	69	31
1899	67	33

SOURCE NOTES: Computed from Variant 3 series, Table 5, and the total labor force estimates of Lebergott, cited in the notes to Table 5. See text.

gate labor force increased from about one-fifth in 1839 to one-quarter just before the war. It remained at that level until 1879, when it again increased, reaching a level of one-third by the turn of the century.

The figures in Table 6 were derived from the Variant 3 series of Table 5, and the Lebergott aggregate labor force series. An alternative calculation, which substitutes the sum of the Lebergott nonservice and the Variant 3 service labor force for the Lebergott aggregate labor force, yields almost identical results. We can conclude, then, that the service sector labor force grew faster than the nonservice labor force in the prewar years and in the last two decades of the century. Over the middle two decades, the labor forces of the two broad sectors increased at the same pace.

We are now in a position to consider the level and growth of output per worker in the service sector. These matters are chiefly of interest as they relate to experience in the rest of the economy. Therefore in Table 7 we express output per worker in the commodity and service sectors as ratios of output per worker in the two broad sectors

TABLE 7

Relative Levels of Output Per Worker, Current Prices, Commodity and Service Producing Sectors, 1839–1899, Three Variants

	Variant 1		Variant 2		Variant 3	
	Commodity Sector	Service Sector	Commodity Sector	Service Sector	Commodity Sector	Service Sector
1839	.78	1.82	.86	1.50	.83	1.65
1849	.78	1.74	.87	1.42	.79	1.70
1859	.80	1.60	.88	1.36	.82	1.52
1869	.84	1.48	.92	1.27	.94	1.22
1879	.77	1.68	.83	1.50	.83	1.50
1889	.78	1.48	.84	1.34	.88	1.26
1899	.79	1.42	.85	1.31	.88	1.25

SOURCE NOTES: **Variant 1:** Column 1, Table 2, divided by Column 1, Table 6; Column 2, Table 2, divided by Column 2, Table 6.

Variant 2: Computed exactly as Variant 1, except that the output of the housing industry was omitted from the data underlying Table 2.

Variant 3: Computed exactly as Variant 2, except that property income was omitted from the output data. Property income was estimated at 8 per cent of all land, improvements, equipment and inventories used in production. The data on property are from worksheets underlying Table A-1 of Robert E. Gallman, "The Social Distribution of Wealth in the United States of America," International Economic History Congress, Munich, August, 1965. We assumed that half the inventories of manufactured goods were held by manufacturing firms and half by firms in distribution.

combined. For convenience, we will speak of the latter as average national output per worker. The entries for 1839 under Variant 1 in Table 7 mean, then, that in the commodity producing sector output per worker was 78 per cent of the national average; in the service sector, 182 per cent. Output per worker in the service sector in 1839, then, was more than twice as great as in the commodity producing sector. The margin between the two sectors narrowed continuously to 1869, widened sharply between 1869 and 1879, and then narrowed again to the end of the century.

The Variant 1 ratios are derived from the figures underlying Tables 2 and 6. The shares of the service sector in output (Table 2) markedly exceed the sector shares in labor force (Table 6). Consequently, the

results described in the first two columns of Table 7 are by no means surprising. But one explanation of the service sector's favorable showing is that the product of the sector includes the output of the housing industry, including imputed rents. But the product of this industry is almost exclusively the output of property. Consequently, the inclusion of the industry in the service sector inflates output per worker meaninglessly.

The Variant 2 ratios were computed, therefore, from data that excluded the housing industry. The service sector continues to have higher than average levels of output per worker, but the gap between the service and commodity producing sectors is narrowed. For example, the service sector level drops from more than twice to about one and two-thirds the level of the commodity sector in 1839. On the other hand, the Variant 2 series exhibits much less pronounced convergence over time. Indeed, one could argue that the data exhibit no long-term tendency toward the equalization of sectoral levels of output per worker.

The Variant 3 series represent the fruit of a more thorough-going, if crude, effort to remove property income from the numerators of our productivity ratios. By assuming that all property engaged in economic activity earned 8 per cent in every one of the years in the table, we have been able to make rough estimates of property income earned in the commodity and service sectors. We subtracted property income from gross value added and used the resulting data to compute the Variant 3 ratios.

Interestingly enough, the chief effect of the final adjustment is to produce a more marked convergence of sectoral levels of output per worker, *across time*. However, the convergence arose out of both a *widening* of the sectoral differentials in the early years, and a *narrowing* in the later ones. Presumably the capital stock grew, relative to the labor force, at a faster pace in the service than in the commodity producing sector. And one would guess that this development turned on the growth of the rail system.[5]

We turn finally to relative levels and trends of labor productivity

[5] See Robert E. Gallman and Edward S. Howle, "The Structure of U.S. Wealth in the 19th Century," paper given at the 1966 meeting of the Southern Economic Association.

TABLE 8

Relative Levels of Output Per Worker, Current Prices, Service Industries, 1839–1899

	1839	1849	1859	1869	1879	1889	1899
1. Distribution	2.08	2.60	2.19	1.79	1.51	1.37	1.33
2. Transportation and public utilities	3.15	1.46	1.76	1.40	1.35	1.11	1.15
3. Finance	13.10	11.35	4.71	4.38	4.38	3.06	2.47
4. Professional	1.81	1.80	1.33	1.61	2.06	2.00	2.20
5. Personal	.14	.14	.15	.16	.21	.27	.25
6. Government	1.56	1.29	1.92	.80	.70	.90	.58
7. Education	.53	.45	.48	.77	.58	.63	.87
8. Hand trades	.75	.79	.77	.75	.74	.88	.88

SOURCE NOTES: Computed from Appendix Tables A-1 and A-12.

within the service sector. Table 8 contains the same kind of information as Table 7, but now the standard of comparison is average output per worker in the service sector.

Several points are worth noticing: First, the range among industries is very wide indeed. Even discounting the levels in finance and personal services in the early years (the former improbably high and, in any case, relating to a very small industry; the latter depressed by slave servants and possibly too low for other reasons) the range from the lowest to the highest industry runs as high as one to six; that is, very much higher than the range between the service and commodity sectors.

Second, the relatively high ratios tend to be in industries which employed large amounts of property per laborer or used highly skilled labor, such as distribution, transportation and public utilities, finance and professional services, a finding by no means surprising.

Third, there is considerable evidence of convergence of ratios over time. The range from top to bottom was very much narrower in 1899 than 1839, especially if finance and personal services are taken into account, but even if they are not. Furthermore, the process seems persistent and steady. How the process of deflation would affect this finding is uncertain, although it appears likely that it would produce very much higher ratios for transportation and public utilities at the end of the century than Table 8 shows.

TABLE 9

Distribution of Labor Force Among Service Industries, 1839–1899
(per cent)

	1839	1849	1859	1869	1879	1889	1899
1. Distribution	20	19	22	24	27	26	26
2. Transportation and public utilities	7	10	11	16	16	21	20
3. Finance	[a]	[a]	1	1	1	2	3
4. Professional	6	6	6	6	6	7	7
5. Personal	51	49	46	37	33	30	28
6. Government	3	3	3	4	4	5	5
7. Education	4	4	4	5	5	5	5
8. Hand trades	9	8	8	7	7	6	6

SOURCE NOTES: Computed from Appendix Table A-12.
[a] Less than .5 per cent.

Fourth, if one compares Table 9 with Table 8, one will see that, by and large, the industries with high ratios at the beginning of the period experienced rates of growth of labor input higher than the average (i.e., their shares in the labor force increased), and vice versa. Presumably, then, the growth of output per worker in the service sector was due, in some measure, to the shifting composition of the work force. Industries with higher levels of output per worker received larger weights as time went on, and vice versa.

Finally, the process of convergence of levels of output per worker was one in which the industries with initially high levels of output per worker not only attracted workers at a higher than average rate but also experienced gains in output per worker at a *lower* than average rate. At least this is true if one deals with current price magnitudes.

SUMMARY

As of 1839, the level of service output (current prices) was slightly less than $700 million and by 1899 had risen fourteenfold, to approximately $9 billion. This picture is revealed by two different series, one measuring output directly, the other extrapolating service output backward as a residual. Of the two series the former is somewhat preferred and was the basis for further discussion.

The rapid rise of service output was reflected in an increase in that

sector's share of total output. Over the course of the period the service share of output (measured in current prices) increased from 38 to 48 per cent. This, however, is not such a marked change when compared with the structural shifts that occurred within the commodity producing sector. Significantly, the increase in relative importance of the service sector occurred entirely between 1869 and 1899.

Within the service sector, the distribution of output between industries producing primarily intermediate services and those producing primarily final output changed little over time. The former accounted for roughly 55 per cent of the output of the service sector throughout the period; the latter 45 per cent. The two types of industries were equally responsible for the growth of the sector's output in current prices.

The sector was dominated by three large industries (distribution, transportation and public utilities, and housing) which accounted for between two-thirds and three-fourths of total service output in every year. The combined share declined over time, due entirely to a relative decline of housing.

The number of gainful workers in service industries increased ninefold between 1839 and 1899. The service sector's share of the total labor force rose from 21 per cent in 1839 to 33 per cent in 1899.

The service sector labor force shares were smaller than the output shares and consequently we found that average output per worker in services was above the national average at each benchmark date. Three different output series (current prices) were used to produce series showing average output per worker over time. All three revealed that average output per worker in services converged toward the national average, but only one series, that which excluded property income, showed marked convergence. Presumably the capital stock grew relative to the labor force at a faster pace in the service sector than in the commodity producing sector.

Within the service sector we found an initially wide range of output per worker ratios, but a range which narrowed significantly over time. Those industries with initially high ratios experienced not only the most rapid gains in numbers of gainful workers, but also lower than average gains in productivity. It seems certain that the advance in sectoral output per worker was due largely to the shifting composition of the service work force.

APPENDIX

VALUE OF OUTPUT AND VALUE ADDED ESTIMATES

It would have been ideal to obtain, first, a value of output series for each industry and, then, a value added series. Paucity of data prevented us from obtaining value of output for each industry, but we did construct a measure of value added for each industry. However, the aggregate value of output series does not appear to be significantly incomplete. For those industries for which we measured value added directly we make certain qualifications. The measure in fact is one of income originating, but the nature of the industries (personal services, government, insurance, and part of professional services) is such that value added and income originating are virtually identical.

We have presented only one measure of output and one of value added for each industry, realizing fully that several different views are held as to the proper evaluation of certain services. In each case, the concept used was that which conforms to the Department of Commerce approach. The controversy concerning government is not quantitatively important in the nineteenth century. Indeed, Kuznets points out that his position becomes more relevant as government becomes increasingly important.[6] Thus the only serious controversy remaining concerns the evaluation of the product of financial intermediaries.

Table A-1 summarizes the estimates of value added.

CONSTRUCTION OF ESTIMATES BY INDUSTRY

Trade

Value added by trade was measured as the difference between the value of goods flowing to consumers through distribution channels in final prices and the value of these goods as they entered distribution, in producer prices.[7] No other deduction was made for the value of materials consumed in trade.

[6] S. Kuznets, "National Income: A New Version," *Review of Economics and Statistics,* Vol. XXX, August 1948, p. 158 fn.

[7] See Robert Gallman, "Gross National Product in the U.S., 1834–1909," in *Output, Employment, and Productivity.* The estimates in turn rely on the earlier efforts of Harold Barger, *Distribution's Place in the American Economy Since 1869;* and Simon Kuznets, *Commodity Flow and Capital Formation,* New York, NBER, 1938.

TABLE A-1

Value Added, by the Service Sector, U.S., 1839–1899
(millions of dollars, current prices)

Industry	1839	1849	1859	1869	1879	1889	1899
Trade	197.0	346.0	661.0	970.0	1,294.0	1,944.0	2,653.0
Transportation & public utilities	109.8	103.1	258.7	491.3	694.1	1,293.0	1,777.4
Finance	31.7	29.1	51.0	128.8	200.6	372.0	558.0
Professional	45.9	73.3	113.6	207.8	418.1	723.0	1,117.0
Personal	34.4	51.5	92.0	138.1	224.0	433.8	504.5
Government	24.8	30.4	67.1	72.4	94.9	215.7	231.9
Education	8.3	14.6	31.2	85.9	97.7	172.0	265.9
Hand trades	31.5	40.6	78.8	120.6	150.3	281.2	414.3
Shelter	166.0	248.0	395.0	711.0	697.0	1,074.0	1,390.0
Sector total	649.4	936.6	1,748.4	2,925.9	3,869.7	6,508.7	8,912.0

Conceptually, the series links with that of Kuznets in 1909. The extension to earlier years relies on Barger's evidence of trends in trade margins. Barger's trade margins refer to type of outlet, not to type of commodity. It was assumed that all commodities handled by an outlet carried the same margin.

The markups developed by Barger for the period 1869–1899 were extrapolated to 1839 and were checked in that year against Seaman's estimates.[8] Also the resulting value added by trade in 1839 is confirmed by Marburg's work. His income originating figure ($145 million) can be converted to a value added measure of $203 million.[9] This is only 3 per cent larger than the present estimate.

Two points should be noted. First, the value added measure has been confined to the distribution of finished goods, and excludes value added by distribution of unfinished goods.[10] Secondly, the value added measure includes the cost of transportation services between distributors and from the retailer to the consumer.[11]

Transportation and Public Utilities

Value added by this industry group is measured as the difference between the value of output (receipts) and the value of materials consumed.[12] The industry total is the sum of estimates for steam railroads, street railroads, foreign trade shipping, coasting and internal shipping, canals, telephone service, telegraph service, illuminating gas production, and electricity.[13] For most subindustries published data were reasonably abundant, although some missing links had to be esti-

[8] Gallman, pp. 56, 57.

[9] Theodore Marburg, "Income Originating in Trade, 1799–1869," in *Trends in the American Economy in the Nineteenth Century*, pp. 321, 322.

[10] The significance of this omission is not known. Distribution of unfinished goods may have been the function of the producer and consequently the omission with regards to trade may not be serious.

[11] Originally the estimates included transportation from producer to first distributor. This cost has been deducted from value added by trade in the present study.

The remainder of the spread that would be accounted for by transportation costs is probably not great, for the transportation would have been largely accomplished by facilities owned by the wholesalers and retailers.

[12] Except for telephones and telegraphs and canals, where materials consumed seemed so negligible that no estimate was made.

[13] No estimate was made for irrigation, express companies, nor for livery stables. These omissions do not appear serious.

mated. Value added by the coasting trade was largely estimated, but the results were roughly confirmed by the 1890 census.

Steam Railroads

Value added by steam railroads was derived largely from the work of Fishlow.[14] His receipt data for 1839 through 1869, and more official estimates for 1879–1899 [15] are used as the value of output in steam railroading.

The major intermediate good deducted to obtain value added is fuel, and Fishlow has estimated the value of fuel consumed.[16] The remaining intermediate goods were primarily lubricants and office supplies.

For 1879–1899 the value of these materials is available in the census and in ICC Reports, but for 1839–1869 estimates were required. The estimates were calculated as a percentage of the value of fuel. The percentages were derived by extrapolating the 1879 share backwards on the ratio of "other supplies" to fuel for selected roads.[17] The ratio changed very little (two percentage points) between 1879 and 1899, and the derived national ratios for the years before 1879 were confirmed by data found for several other companies at various dates.[18] If anything, our national ratios are high, but not significantly so. Substituting the lowest ratio found (.28 for the railroads in New York) would alter the value of other supplies so slightly that value added would be increased by less than 1 per cent in any year.

Street Railroads

Receipt data are available for 1889 and 1902 for almost all roads.[19] For earlier years, data are available on the passenger railroads in

[14] Albert Fishlow, "The Railroad Sector, 1840–1910," in *Output, Employment, and Productivity,* and *American Railroads and the Transformation of the Ante-Bellum Economy,* Cambridge, Mass., 1965.

[15] *Census of Transportation,* 1880 and 1890 and Interstate Commerce Commission, *Statistics on Railways,* 1900.

[16] Fishlow, *op. cit.,* pp. 618–626.

[17] The Pennsylvania Railroad (*Annual Reports*) and railroads in New York state (*Annual Reports of the N.Y.S. Engineer and Surveyor*) were the selected roads.

[18] The derived national ratios of "other supplies" to fuel are .39 in 1839 and 1849, .41 in 1859, .44 in 1869, .43 in 1879, .44 in 1889, and .45 in 1899.

[19] U.S. Census, *Special Report—Electric and Street Railways,* 1902.

Pennsylvania. In 1889 and 1902, Pennsylvania accounted for 11 per cent of total receipts, and approximately 9 per cent of mileage operated. We have assumed for earlier years that Pennsylvania's share of receipts equalled its share of mileage. For 1859, data were obtained directly from the census [20] while for intervening years we assumed that the shares changed linearly between the 11 per cent for 1889 and 37 per cent for 1859.[21]

Water Transportation

Value added in water transportation was measured as the difference between the value of output (receipts by U.S. shippers) and the value of intermediate goods. For shippers engaged in foreign trade, the earnings estimates were obtained from the work of North and Simon.[22] Indirectly, their data were used to calculate the earnings by U.S. ships engaged in the coasting trade.

Foreign Trade—Freight

For 1839–1859, North computed the earnings of U.S. ships engaged in the export trade and in the foreign carrying trade, and the earnings of foreign ships engaged in the U.S. import trade. His interest was the U.S. balance of payments, so he made no estimate of earnings by U.S. shippers engaged in the import trade. His other data, however, provide a basis for estimating earnings of U.S. ships engaged in the import trade. North derived earnings as a percentage of the value of imports carried by foreign ships. He obtained a base year percentage and calculated percentages for other years on the basis of changes in freight rates and import prices.[23] It seems reasonable to assume that the same indexes, and therefore earnings percentages, held for U.S. ships, since they were competing for similar goods in the same ports,

[20] U.S. Census, 1860, *Miscellaneous Statistics,* p. 332. Its share was 37 per cent.

[21] Even if we had assumed that its share in 1859 was as low as 11 per cent, the difference in receipts from the present estimate would be less than $7 million. In light of the enormous receipts by steam railroads and water transportation this difference becomes insignificant. It is less than 2 per cent of receipts by other divisions of the transportation industry.

[22] Douglass C. North, "U.S. Balance of Payments, 1790–1860," and Matthew Simon, "U.S. Balance of Payments, 1861–1900," both in *Trends in the American Economy in the Nineteenth Century.*

[23] North, *op. cit.,* Table B-2, and p. 610. The base year is 1859, during which freight earnings were 8 per cent of the value of imports.

TABLE A-2

Value of Output and Value Added, Steam and Street Railroads, U.S. 1839 to 1899
(millions of dollars, current prices)

	Value of Output		Value Added	
	Steam RR's	Street RR's	Steam RR's	Street RR's
1839	7.4	–	6.8	–
1849	29.3	1.3	27.2	1.0
1859	118.8	4.5	107.4	3.6
1869	369.9	15.1	333.6	12.1
1879	580.5	30.0	533.5	24.0
1889	1,074.1	100.0	981.5	92.0
1899	1,375.2	240.0	1,244.2	220.8

Value of Output—Steam Railroads: 1839–1869: Fishlow, *American Railroads* . . . , App. A., Tables 41, 42, 44; and vol. 30, Table 1, p. 585.

1879, 1889: *U.S. Census of Transportation*, 1870, p. 11.

1899: Harold Barger, *The Transportation Industries, 1889–1946*, N.Y.: NBER, 1951, App. B, Table B-1. This was a correction of ICC data, and is presented also in Fishlow, vol. 30.

Street Railroads: 1849: We assumed a capital-output ratio (2.5), the average for 1859–1889, and multiplied by the capital stock (Robert E. Gallman and Edward S. Howle, "Fixed Reproducible Capital in the U.S., 1840–1900," mimeograph).

1859–1879: Extrapolated on receipts by street railroads in Pennsylvania (*Reports of the Auditor General on Railroads, Canals and Telegraph Cos.*, 1859–1874; *Reports of the Secretary on Internal Affairs*, 1875–1903).

1889, 1899: U.S. Census, *Special Report, Electric and Street Railways, 1902*. Our 1899 figure is the reported 1902 value rounded downward.

Value Added—is the difference between value of output and materials consumed. The latter were derived as follows:

Steam Railroads: Fuel estimates obtained from Fishlow, vol. 30, Table 9, p. 620. Other intermediate goods were calculated as a percentage of fuel. See discussion of table for derivation of percentages, 1839–1869. For 1879 and 1889, data are from *U.S. Census of Transportation*, 1890, p. 12. 1899 data are from *ICC Report*, 1900, pp. 87, 88.

Street Railroads: Data for 1859 and 1869 indicate that materials consumed were equal to 20 per cent of receipts. We used this figure for 1849–1879. The Census of 1902 indicated 8 per cent, and we used this for 1889 and 1899 (*Pennsylvania Reports* cited above; U.S. Census, *Special Report, Electric and Street Railways*, 1902).

and would have been forced to return to the U.S. empty were their rates uncompetitive.[24]

For 1869–1899, Simon provides similar information. In fact the data he presents are based in part on North's work, and therefore provide a continuous series that is conceptually similar throughout.[25]

Foreign Trade—Passenger

Passenger receipts are less easily come by. For the period 1839–1859, North estimated that 60 per cent of the immigrants travelled on U.S. ships and, using an average fare of $25, he calculated the shipping earnings derived from transporting immigrants.[26] Neither we nor North estimated earnings from transporting tourists out of the U.S., because such departures were not numerous in the antebellum period.[27]

For the period 1869–1899, Simon provides data on the number of passenger departures and fares, but he apparently assumed that all departees and all immigrants used foreign ships.[28] Immigration data suggest that U.S. ships were being used and therefore we estimated receipts by U.S. ships.[29] Passenger receipts were more important,

[24] In fact, prior to 1861, U.S. ships handled more imports than foreign ships, suggesting that their rates may have been lower, and therefore our calculation may overstate their earnings.

[25] See Simon, *op. cit.*, pp. 646–654. Specifically he uses North's 1860 earnings rate as a base, and obtains rates for later years by using the same method employed by North to obtain earnings for foreign vessels engaged in U.S. import trade.

[26] New York immigration data revealed 60 per cent, in 1849. We have found that at Boston 51 per cent of the immigrants arrived in U.S. ships in 1860. Thus 60 per cent may be slightly high, but we have accepted it because its slight overstatement will compensate for the earnings derived from the tourist trades, for which we make no estimate. See North, *op. cit.*, p. 613; *Annual Report of the Board of Health, Lunacy and Charity*, Public Document No. 21, Massachusetts, 1861.

[27] Only 70,000 departures occurred annually between 1868–1872 (Simon, *op. cit.*, Table 13; p. 665). Also, North's estimates of tourist expenditures abroad suggest insignificant numbers of tourists. Approximately 27,000 U.S. tourists in 1859, 11,200 in 1849, and 8,400 in 1839, or relative to the number of immigrants, 18 per cent in 1859, 3 per cent in 1849, and 10 per cent in 1839. Since North's percentage of immigrants travelling on U.S. ships may be slightly high, and since all outgoing tourists did not use U.S. ships, it was decided to make no estimate of earnings from the tourist trade. In view of the magnitude of freight earnings, such an adjustment would be meaningless (North, *op. cit.*, Table B-3 and pp. 616, 617).

[28] Simon, *op. cit.*, pp. 664–668.

[29] Boston data show that 36 per cent of immigrants used U.S. ships in 1879, 19 per cent in 1889, and 7 per cent in 1899. New York data show 19 per cent in

relative to freight earnings, in the postbellum than in the antebellum years. Although U.S. ships were being used less, relative to foreign ships, passenger fares did not decline as much as freight rates, tourism increased, and immigration did not decrease.[80]

Coasting Trade

Data on any facet of the coasting trade are very scarce. Vessels engaged in this trade were required to be registered once each year, but they were not usually required to report to customs offices each time they entered or cleared port. There are no published data for the entire period on aggregate tonnage entered or cleared in coasting, nor on the value of merchandise carried. For a brief span, 1875–1880, entrance and clearance data were published. Data are available on the tonnage enrolled in the coasting trade, and some scattered evidence was found relating to freight rates and passenger fares.

This meagre conglomeration of data was used, along with the earnings already generated for foreign trade, to give a rough approximation of the earnings in the coasting trade. These earnings represent also the shipping earnings derived from the Western river and lake trade.

Earnings per coasting ton were derived from earnings per foreign trade ton, as follows, and then weighted by tonnage enrolled in coasting.

It was assumed that the tonnage enrolled in coasting carried goods similar to those carried in foreign trade. This is reasonable because coasting tonnage was engaged in distributing foreign imports that arrived at the major seaports, and delivering domestic goods to the major ports for eventual exportation. Coasting distances are shorter than foreign trade distances, consequently the earnings per ton ratio

1869, 8 per cent in 1889. The weighted percentage for 1889 was 9 per cent. The percentage travelling in U.S. ships apparently declined from 19 per cent in 1869 and 1879, to 9 per cent in 1889, and to 7 per cent in 1899.

Sources: Massachusetts, *Annual Report of Board of Lunacy and Charity,* for the relevant years, and *N.Y. Annual Report of the Commissioner on Emigration;* for 1870 and 1890. The same percentages are assumed to hold for departures from the U.S.

[80] See Thomas Weiss, "The Service Sector in the United States, 1839–1899," unpublished Ph.D. dissertation, University of North Carolina, 1967, pp. 185–187.

for tonnage registered for the foreign trade was modified by an activity factor for coasting trade and an index relating coasting rates to foreign trade rates.

The activity factor relates tons entered and cleared to tonnage enrolled.[31] These data are available for all years for foreign shipping, but only for 1875–1880 for coasting. The averages for this period reveal that each ton enrolled in the coasting trade handled 3.33 times as many tons of freight as did each ton registered in the foreign trade.[32] This factor, of necessity, was used for the entire period.

Passenger fares were found for both coasting and foreign trade for each year, while freight rates were found for all years except 1859 and 1899.[33] Since data on tonnage carried in the coasting trade by route and type of freight were not available, we had no way of weighting the rates that we did find. Instead, the index we have used measures changes in the rates for shipping cotton on the more popular routes.[34] The reasonableness of this proxy is confirmed by indexes

[31] Entrance and clearance data (port data) are recorded each time a ship enters or leaves a port, while enrolled or registered tonnage is recorded once a year and is thus the stock of tonnage engaged. Dividing the flow data (entrances and clearances) by the stock gives a ratio of tonnage "carried" per ton enrolled. If this is done for both coasting and foreign trade it can be seen how much more or less "active" each ton enrolled in coasting is, relative to each ton registered for foreign trade.

[32] Entrance and clearance data are from *Reports on Commerce and Navigation* for each year 1875–1880. Tonnage enrolled in coasting, and tonnage registered for foreign trade were obtained from *Historical Statistics,* series Q 165 for foreign trade, and Q 166. Tonnage on Western rivers (series Q 174) was deducted in calculating the ratios because the entrance and clearance data did not represent this trade. In computing these ratios, the average of the entrance and clearance data was used for coasting because each ship would have recorded its tonnage twice, once as it left a U.S. port and secondly as it entered a U.S. port on the same trip with the same goods. For foreign trade, the sum of entrances and clearances was used because each such entry and clearance reflected a different cargo. It should be noted that the entrance and clearance data for coasting relate only to ships carrying a certain amount of foreign goods, or a certain amount of liquor, or if they were passing from one coasting district to another. Obviously, not all ships met these criteria, and the coasting entrances and clearances are understated.

[33] If enough newspapers were examined one could eventually find rates for these years. However, the data that were found revealed that there was no trend in the *relationship* between coasting rates and foreign trade rates and that the index changed very little. Consequently, estimating indexes for the missing years posed no serious problems.

[34] Specifically, for foreign trade, cotton freight rates for New York to Liverpool, Bremen, and Havre were used. For the coasting trade, cotton freight rates for New Orleans to New York, Boston, and Baltimore were used.

for other commodities for which a coasting and foreign rate were found for the same port of origin.[35]

The 1890 census data confirm our estimate for that year.[36] Our estimate ($130 million) is below the census figure, but by less than 10 per cent. The discrepancy is explained by the understatement of the entrance and clearance data for the coasting trade [37] which results in a low activity factor for coasting relative to foreign trade.

There are two major intermediate products consumed in shipping—fuel and provisions. In 1889, the value of fuel was almost $17 million, or approximately 10 per cent of earnings.[38] We computed provisions to be equal in amount to the value of fuel. For years other than 1889 we calculated fuel and provisions as 80 per cent of total port costs, the share found to exist in 1889.[39]

Canals

Aggregate receipts by canal companies, public and private, are available for 1879 and 1889 in the census. Data on the more important companies are available for earlier years, and for 1899. Those companies for which we have data in other years accounted for 84 per cent of canal mileage in 1879 and 93 per cent of receipts.[40] Additionally in the earlier years we have information on two canals that had been

[35] For example, an index relating rice freight rates from Charleston to New York to rates from Charleston to Liverpool, or cotton freights from Mobile to New York and Liverpool revealed the same pattern.

[36] *U.S. Census Report on Transportation,* 1890, Part II.

[37] *Supra,* fn. 27, explains this understatement.

[38] *Ibid.,* 1890. We estimated fuel consumed by ships on Western rivers to be $300,000.

[39] The total of fuel and provision expenditures equals 20 per cent of earnings. Alternatively this would be approximately 80 per cent of total port costs. (Simon, *op. cit.,* p. 654, estimated port costs at 25.6 per cent of earnings.) We have used Simon's procedure to calculate total port costs, and then computed the value of fuel and provisions as 80 per cent of that estimate.

In 1850 we found evidence for a sailing ship indicating that 72 per cent of port costs (excluding nonrecurring repair expenses) was for provisions (Robert Albion, *The Rise of New York Port, 1815–1860,* Hamden, Conn., 1939, p. 414).

[40] Data are available for the Erie, the Pennsylvania canals, the Illinois and Michigan, the Delaware and Raritan (back to 1859), the Morris Canal (back to 1859), the Ohio canals, the Chesapeake and Ohio. Data for 1879 are from *Census of Transportation, 1880, Report on Canals,* pp. 1–21. In 1889, these canals accounted for 79 per cent of mileage, and 95 per cent of receipts. 1889 data from *Census of Transportation,* Part II.

abandoned by 1879, but prior to abandonment had been major sources of canal revenue.[41] Consequently, our estimates of canal receipts for the earlier years are the sums of the receipts for those canals for which we have data. To compensate for any possible understatement, we made no adjustment for materials consumed.[42] Thus toll receipts and value added by canals are identical in this study.

Public Utilities

Public utility industries, with the exception of gas manufacturing, were of little importance prior to 1879. Data were relatively abundant because the census conducted several special surveys of the telephone, telegraph and electricity industries. Some insignificant estimates were required.

The receipts of these industries (telephone, telegraph, gas manufacturing, electric power) were taken to be value of output.

The manufacturing census also contains figures on the value of materials used in gas production. These figures were used as published. As a percentage of output, the value of materials consumed in gas production in 1899 was identical to the 1902 percentage of electricity output accounted for by materials consumed (27 per cent). Therefore, for 1889 and 1899 we used the percentage derived from the data on gas production to determine the value of materials consumed in electric production.

The limited data available concerning telegraph companies indicate that materials consumed were negligible, so no estimate was made.

Finance

The value of banking output cannot be confined to service charge receipts due to the unreasonably low figures such an approach yields. Consequently, it is necessary to impute an additional measure of the

[41] They are the Wabash and Erie, abandoned in 1874, and the James River and Kanawha, abandoned in early 1880.

[42] The value of materials consumed could not have been very great, amounting primarily to hay for horses. The steam vessels that used canals were not largely owned by the canal companies. Freight earnings and value of materials by those vessels are accounted for under "coasting and internal." In our estimates, canal value added (receipts) represents primarily tolls for using the waterway. Only a minor fraction of receipts consists of freight earnings.

TABLE A-3

Value of Output and Value Added by Water Transportation, U.S. 1839–1899
(millions of dollars, current prices)

Year	Value of Output			Value of Materials Consumed	Value Added
	Foreign Trade	Coasting	Canals		
1839	36.5	83.6	3.1	20.2	103.0
1849	25.7	55.8	5.5	14.0	73.0
1859	52.1	104.5	5.7	27.3	135.0
1869	29.2	105.5	6.3	24.9	116.1
1879	23.2	81.7	4.3	19.6	89.6
1889	16.4	103.5	4.6	29.4	122.1
1899	15.2	144.8	1.1	33.1	128.0

Foreign Trade: Earnings by ships engaged in exporting and carrying trade were obtained from North, *op. cit.*, Table B-2, p. 608; Simon, *op. cit.*, Table 6, p. 650. Import earnings were calculated as a percentage of the value of imports carried in U.S. ships. Value of imports obtained from *Historical Statistics*, series Q 205; percentages from North, *op. cit.*, Table B-2; and Simon, *op. cit.*, Table 7. No estimates of earnings for the tourist trade were made for 1839–1859. For 1869–1899, a percentage of total departures was believed to have used U.S. ships. The number was distributed between cabin and noncabin class, and each class was weighted by European fares. Data are from Simon, *op. cit.*, Tables 13, 14, 15, and p. 667; and also *supra*, fn. 24. Earnings from transporting immigrants were calculated similarly, but with an estimate for 1839–1859 (North, *op. cit.*; Simon, *op. cit.*; and *Historical Statistics*, series C-88).

Coasting Trade: We computed an average earnings per documented ton in foreign trade for each benchmark, an index series relating coasting freight to foreign trade freight rates, an activity factor indicating how much more frequently a ton enrolled in coasting was used than a ton registered for the foreign trade (3.33), and we adjusted the enrolled tonnage for cumulated ghost tonnage. These four items were multiplied at each benchmark date and their product was the value of output for coasting (*Historical Statistics*, series Q-165, Q-166; col. 1 of present table; and various newspapers).

Canals: U.S. Census, *Special Reports on Transportation*, 1880, 1890 provided data for 1879 and 1889. In 1889 $500,000 of receipts were added as reported by the Delaware and Raritan Canal (*N.J. State Annual Report on Railroads and Canals*). For other years the value of output equals receipts by the Erie, Pennsylvania canals, Ohio canals, Delaware and Raritan, Morris Canal, Chesapeake and Ohio canals, Illinois and Michigan, James River and Kanawha and the Wabash and Erie. (N.Y. *Annual Report of the Comptroller on the Tolls, Trade and Tonnage of the Canals;* N.J. *Annual Report on Railroads and Canals;* Pennsylvania State Auditor, *Report on Canals;* D. C. North, *The Economic Growth of the United States, 1790–1860*, New York, 1966, p. 253; Ernest Bogart, "Financial History of Ohio," *Illinois Studies in Social Science*, vol. 1; Walter Sanderlin, "The Great National Project: A History of the Chesapeake and Ohio Canal," *Johns Hopkins University Studies in Historical and Political Science*, 1946, vol. 64; E. J. Benton, "The Wabash Trade Route in the Development of the Old Northwest," *Johns Hopkins University Studies . . .*, 1903, vol. 21; Wayland Fuller Dunaway, *History of the James River and Kanawha Co.*, Englewood Cliffs, 1948.)

TABLE A-4

Value of Output and Value Added by Public Utilities, U.S., 1849–1899
(thousands of dollars)

Year	Value of Output [a]	Value of Materials	Value Added [f]
1849	2,600	500 [b]	2,100
1859	16,400	3,700 [b]	12,700
1869	40,400	10,900 [b]	29,500
1879	59,100	12,100 [c]	47,000
1889	117,500	20,100 [d]	97,400
1899	226,100	40,900 [e]	185,200

[a] The sum of receipts by the telephone, telegraph, gas manufacturing and electric power industries.

Telephone: *Historical Statistics*, 1957, series R-17.

Telegraph: U.S. Census, *Special Report on Transportation*, 1880, presented data for all nonoceanic telegraph companies. Western Union receipts, available for 1869 to 1899, were used to estimate total telegraph receipts. Receipts in 1849 were estimated by multiplying receipts per mile, by the number of miles of telegraph line (U.S. Census, *Abstract, 1850*). The 1859 estimate was linearly interpolated between the 1849 and 1869 figures.

Gas Manufacturing: U.S. Census, 1870, *Industry and Wealth;* U.S. Census, 1900, *Manufactures*, vol. VII.

Electric Power: U.S. Census, *Special Report, Central Electric Companies*, 1902. Our 1899 estimate is 90 per cent of the reported 1902 value, because only 90 per cent of the companies reported in 1902 were in operation in 1899. Estimates for earlier years, back to 1879, were extrapolated on the data reported in U.S. Census, 1900, *Manufactures*, vol. VII.

[b] Data from *U.S. Census*, 1870, *Wealth and Industry* for gas manufacturing. We made no estimate of materials consumed by telephone and telegraph companies.

[c] We deducted 28 per cent of the value of products of gas and electricity producers. No data were available for 1879, so we used the average percentage that materials consumed represented of the value of products for the other years in which data were available.

[d] Twenty-five per cent of the value of products was consumed in production by gas companies. We assumed this held for electric companies, because the percentages for the two industries were identical in 1899.

[e] Twenty-seven per cent of the value of products of gas and electric companies. For gas companies the data are presented in the manufacturing census of 1900. For the electric companies, 27 per cent was found in 1902. U.S. Census, *Special Report Electric Companies*, 1902.

[f] Value of output minus value of materials.

Materials Consumed: Computed as 80 per cent of port costs, or the following percentages of earnings in foreign and coasting trade. 16.8 per cent in 1839, 17.2 per cent in 1849, 17.4 per cent in 1859, 18.5 per cent in 1869, 18.7 per cent in 1879, 20 per cent in 1889, 20.7 per cent in 1899.

value of output. Our imputation is that used by the National Income Division, and measures the value of output as total operating expenses. Value added then equals operating expenses other than supply purchases.

National Banks. Data are available on national banks. Data on gross earnings and current expenses are available for 1889 and 1899, so it remained only to deduct intermediate goods from gross earnings to obtain value added.[43] For 1869 and 1879, gross earnings were not available, but it was possible to construct them from the data available.[44]

Nonnational Banks. Income data are not available for nonnational banks in the nineteenth century. We devised an estimating equation from data relating income to stock variables for national banks and then applied the equation to the available nonnational bank stock variables.[45]

$$(Y_X = 7.7 + .0595X;\ s_X = 6.5)$$

Insurance

The value of output for the insurance industry cannot be taken as simply the value of premiums received, because some of these premiums represent savings by the policyholder and not payment for insurance services.

This is particularly true for life insurance premiums and conse-

[43] Approximately 37 per cent of current expenses would seem to be the maximum value of materials consumed. This evidence was found for the twentieth century (*Historical Statistics,* 1957, Series X-209). We calculated intermediate goods as 35 per cent of total current expenses.

[44] Specifically, gross earnings should be the sum of net profits (including dividends), current expenses, and charge-offs. Charge-offs reflect current income, because previous year losses were met out of undivided profits and this fund was replenished out of net current earnings. Charge-offs were reported only for 1879, but the Comptroller's Report that year implies that such losses were insignificant in 1869. The losses written off in 1879 were $14.7 million. Some were charged to the surplus account, but most were charged to current profits. *Annual Report of the Comptroller,* 1880, p. XLVII.

[45] Specifically, we related earnings to the sum of bonds, loans, and discounts ($\gamma = .95$).

The equation yielded a trend line such that all actual observations fell within $\pm 2s_X$ of that line. In computing the equation we used values at five year intervals from 1869–1899.

TABLE A-5

Value of Output and Value Added by Banks, U.S., 1839–1899
(millions of dollars, current prices)

Year	Value of Output: National Banks	Value of Output: Non-national [d]	Materials Consumed	Value Added [g]
1839	–	35.3	4.7 [e]	30.6
1849	–	29.4	3.9 [e]	25.5
1859	–	48.9	6.6 [e]	42.3
1869	75.8 [a]	17.3	12.9 [f]	80.2
1879	90.9 [b]	70.6	19.4 [f]	142.1
1889	145.0 [c]	164.1	38.1 [f]	271.0
1899	194.0 [c]	238.6	57.1 [f]	375.5

NOTE: National Banks did not exist prior to 1863.

[a] The sum of net profits and current expenses. Data from *Annual Report of the Comptroller of the Currency*, 1880.

[b] Sum of dividends, net profits, current expenses and losses charged to current accounts. We assumed the entire amount $14.7 million was charged to current account, but some was no doubt charged to surplus accounts. Data from *ibid.*

[c] *Historical Statistics*, series X-193.

[d] Values obtained by using the regression $Y_x = 7.7 + .0595X$, where X is the sum of bonds, loans and discounts. The X values are 463 in 1839; 364 in 1849; 692 in 1859; 161 in 1869; 1,057 in 1879; 2,629 in 1889; and 3,880 in 1899. For 1879–1899 the data are from *Annual Report of the Comptroller of the Currency*, and include state banks, savings banks, private bankers (unofficial estimates published by Comptroller) and loan and trust companies. For 1839–1859, the data are from *Annual Report of the Treasurer on the Condition of State Banks*. The data cover only state banks and include estimates by the Treasurer for some banks that did not report. The 1869 data are from *Historical Statistics*, series X-66, 67.

[e] 13.4 per cent of gross earnings was used to compute the value of materials consumed. 13.4 per cent is the average for the national banks for the period 1869–1899.

[f] For national banks the value was taken as 35 per cent of total current expenses, obtained from Comptroller's Reports. This value was then computed as a percentage of gross earnings, and the percentage was used to compute the value of materials consumed by nonnational banks.

[g] The total value of output, minus materials consumed.

TABLE A-6

Value of Output and Value Added by Insurance, U.S. 1839–1899
(millions of dollars, current prices)

	Value of Output		Value Added	
	Life Insurance	Fire & Marine Insurance	Life Insurance	Fire & Marine Insurance
1839	–	1.1	–	1.0
1849	–	4.3	–	3.6
1859	1.5	9.1	1.2	7.5
1869	33.5	31.7	23.1	25.5
1879	36.4	33.4	31.0	27.5
1889	68.0	54.1	56.7	44.2
1899	140.5	85.1	114.4	68.0

Value of Output: Life Insurance: Total disbursements less claims were obtained from N.Y. State *Reports on Insurance Companies.*

Fire and Marine: Output equals premiums less claims. 1879, 1889: U.S. Census, 1880, *Compendium,* p. 1481; U.S. Census, 1890, vol. 11, pt. 1.

1839–69, 1899 values were extrapolated on data for N.Y. (William Barnes, *Reports of Insurance Companies,* vol. I; *Annual Reports of Insurance Companies to N.Y. Insurance Department*).

Value Added: Equals value of output less materials consumed. The latter were derived as follows.

Life Insurance: 1869–1899 data indicate materials consumed equalled an average 20 per cent of total operating expenses (*N.Y. Reports*). We assumed 20 per cent held for the years for which we had no data.

Fire and Marine: The sources listed "other expenses" which we took to be the value of materials consumed. For years in which we had no data, we calculated other expenses as 7 per cent of U.S. premiums.

quently life insurance was handled in a manner similar to that used in calculating banking output. For life insurance companies, claims and premiums are disregarded and a service charge imputation is made. This imputation is equal to operating expenses and it converts operating expenses into final purchases by policyholders.[46]

Data are available for the period 1859–1899[47] for life insurance

[46] *National Income Supplement,* 1954, p. 48. Operating expenses are taken to include dividends withheld to policyholder accounts and profits, for stock insurance companies.

[47] Data are not available for 1849, but in light of the small values for 1859, the life insurance industry could not have been significant in earlier years.

companies in New York state and companies in other states doing business in New York state, apparently virtually all life insurance companies.[48] Indeed, the New York reports present larger aggregates in 1879 and 1889 than does the census, which purports to present U.S. totals. We have used the New York data to estimate output and value added. Value added by fire and marine insurance companies was measured as premiums received less claims paid and less purchases of supplies. No savings element is involved here, but claims are considered to be transfer payments among individuals.

The census contains data for all companies in 1879 and 1889, while for other years data were available for companies operating in New York state. From the N.Y. series we derived national estimates.

Professional Services

Value added in professional services is the sum of value added estimates for the medical profession, lawyers and engineers, the clergy, and an "all other" industry.

Value of output in the medical profession was measured as the value of consumer purchases of medical service. Per capita consumer expenditures were derived from budget data presented by various state and federal labor bureaus[49] and from data relating to expenditures for the maintenance of slaves.[50] These per capita values were

[48] Frederick Hoffman concludes that "it may safely be assumed that the N.Y. Insurance Department Reports, previous to 1880, represent fully 95 per cent of total U.S. business," *JASA*, vol. 12, 1910–11, p. 678. If the comparison with the census is any indication, the New York coverage would seem to be as complete in later years as well.

[49] The specific reports used are noted in Table A-7. For 1879 the data covered the budgets of 423 Illinois wage earners in forty different occupations. For 1889 the data related to 7,053 families (all wage earners), in thirteen states. Most of the budgets were gathered by the U.S. Labor Department and covered workers in nine industries. For 1899 the data were gathered by the labor bureaus of Kansas and Maine as well as by the U.S. Labor Department. In all the data related to 3,180 workers in thirty-three states.

[50] Slaves were an investment and unless properly cared for would have been unproductive assets. Indeed expenditures on slaves may have been higher than medical expenditures by rural whites. On the other hand expenditures by urban whites were probably greater. The expenditure per slave figure was taken to be a reasonable national average.

Used as a per capita weight the slave data produced total U.S. expenditures for medical care that in turn yielded average annual incomes for physicians of between $800 and $1,100 in both 1849 and 1859, a figure confirmed by the fact that Navy surgeons were earning $1,000 in 1848 (Lebergott, *Manpower in Economic Growth*, p. 330).

weighted by the U.S. population to obtain the industry total output.[51] The value of output in industries producing supplies for the medical profession was then deducted to obtain value added.

Twentieth century data indicate that value added per lawyer or engineer was very similar to that for physicians.[52] Consequently we obtained value added per worker in the medical profession for each decade benchmark and weighted it by the number of lawyers and engineers to obtain value added by those professions.

Value added by clergymen was measured by their annual salaries, with no deduction made for materials consumed.[53] The estimates of average annual salaries are rough, but the results show a long-term rise similar to that found for average annual value added by medical profession workers.[54]

Average clergy value added was used to weight the number of workers in "all other" professional services to obtain value added in those industries. Such an approach was used because alternatives were not available, and the size of the "all other" group did not warrant detailed consideration.[55]

Personal Services

Value added by personal service is the sum of three components. Separate estimates were made for photographers, for cleaners and

The per slave data we found ranged from $1.50 to $2.00. We assumed the variation occurred over time. (See notes to Table A-7 for source references.)

[51] For 1879 to 1899 we also calculated medical expenditures as a percentage of the flow of semidurables and obtained results similar to the per capita approach. Because the latter approach could be used for the earlier years we used the same method for the later period.

[52] Data for 1929–1940 indicate that average net income for nonsalaried lawyers was equal to that for nonsalaried physicians. The average for engineers is not known, but data for post-1894 indicate it was probably similar to that for physicians. David Blank and George Stigler, *The Demand and Supply of Scientific Personnel,* New York, NBER, 1957, Appendix A. William Weinfeld, "Income of Lawyers, 1929–1948," *SCB,* August 1949, p. 18, and "Income of Physicians, 1929–1948," *SCB,* July 1951, p. 11.

[53] Value added was measured by salaries for the period 1839–1879. For 1889 and 1899 budget data allowed computation of a per capita expenditure for religion and charity. The resulting average clergy output was almost identical to reported salaries for those years.

[54] Both series show a tripling of average value added between 1839 and 1899.

[55] This group accounted for less than 10 per cent of the professional service industry labor force prior to 1879, 14 per cent in 1879, 25 per cent in 1889, and 33 per cent in 1899. Value added shares are smaller.

TABLE A-7
Value Added in the Professional Service Industries

	Medical Professions	Lawyers & Engineers	Clergy	All Other Professions	Total Value Added
1839	24.2	–	–	–	45.9
1849	38.2	20.1	10.8	4.2	73.3
1859	59.0	31.8	15.2	7.6	113.6
1869	103.1	67.4	26.4	10.9	207.8
1879	194.5	141.2	52.0	30.4	418.1
1889	241.9	252.5	96.8	131.8	723.0
1899	354.9	331.2	146.9	284.0	1,117.0

Medical Profession: Includes the following occupations—physicians, surgeons, nurses, dentists and veterinarians. For each year value added is the difference between value of output and materials consumed. Value of output was obtained by weighting the U.S. population at each date by a per capita medical care expenditure figure for that date. Population data were from *Historical Statistics*. Per capita figures were obtained as follows. For 1839–1859, evidence indicated that plantation owners expended between $1.50 and $2.00 per slave per year. We assumed the variation occurred over time. (Lewis C. Gray, *History of Agriculture in the Southern U.S. to 1860*, Carnegie Institute of Washington, Washington, 1933, p. 544.) The 1869 figure was interpolated between the 1859 and 1879 figures. The rise of 50 per cent between 1859 and 1869 reflects the rise in Hoover's price index for medical services (Hoover, *op. cit.*, Table 1). The 1879 figure ($4.50) was obtained from the *2nd Biennial Report of the Illinois Bureau of Labor*, 1881–82, pp. 290–346. The 1889 figure is a weighted average ($4.50) derived from budget data presented in the following reports: *6th and 7th Annual Reports of the U.S. Commissioner of Labor*, 1890, 1891; *Annual Report of the Labor Departments* of the following states—Missouri, 1891; Kansas, 1887; and Indiana, 1891. For 1899 a weighted average ($5.80) was derived from the following reports—*18th Annual Report of the U.S. Labor Department*, 1903; *Annual Reports of the Labor Departments* of Kansas, 1899; and Maine, 1900.

The value of materials consumed is equal to the value of output of drugs, medicines and dental supplies. Data for 1849–1899 were obtained from *U.S. Census Reports on Manufactures*. The 1839 value was calculated as 6 per cent of the value of output, the average for 1849 and 1859.

Lawyers and Engineers: Value added per worker in the medical profession weighted by the number of lawyers and engineers, at each benchmark date. *U.S. Census, Special Report—Occupations*, 1900, pp. l–lviii.

Clergy: 1839–1879. Value added equals average annual salary times the number of clergymen. Average annual salary was $400 for the period 1839–1859 (Lebergott, *op. cit.*, p. 333). The 1869 salary was placed at $600, based on New York data. The New York census indicated a salary of $600 in 1865, and since New York was likely above average we assumed this average held nationally in 1869. The 1879 salary ($900) was based on New York data of $850 in 1875. For 1889 and 1899 output was derived from consumer expenditure data presented in the labor department reports cited earlier. The resulting average output per clergymen ($1,100 in 1889, and $1,300 in 1899) was almost identical to average salaries in those years ($1,100 in 1889, and $1,200 in 1899; Colorado Labor Department, *Annual Report*, 1899).

All Other Professions: Average value added per clergyman times the number of workers in all other professions.

Totals: For 1849 to 1899 the total is the sum of the preceding columns. For 1839 value added by the medical profession was taken to be equal to 65 per cent of the total for the medical profession and for lawyers and engineers. (65 per cent was the average share for 1849 to 1869.) This group combined accounted for approximately 67 per cent of the total professional service work force in 1849, 1859 and 1869. Thus one-third of the industry work force was assumed to have an average annual value added equal to $400 (clergy salary). These two totals were then summed: i.e., ($24.2 million ÷ .65 = $37.2 million) plus (65,000 workers × .33 times $400 = $8.7 million) = $45.9 million.

dyers, and for all other personal services. Conceptually, value added for the first two industries is the difference between values of output and of materials consumed. The data used were obtained from the manufacturing census reports.

The third component encompasses the remainder of the service industries and is composed primarily of servants. Value added is measured by wages received. Fortunately, wage rates for female servants were available for all years, except 1879. The wage rates were weighted by the number of servants, waiters, midwives, etc., to obtain the industry total of value added.[56] Weighting was accomplished on a disaggregated basis, with separate estimates being made for free males, free females and slaves.

Government

Value added by government is confined to the compensation of government employees.[57] In the present national accounts, government enterprises are included with business, not government, because they conduct operations that are essentially commercial in character. Because of the manner in which we estimated the government labor force employees of such enterprises were included, and therefore we have included value added by government enterprises with value added by general government.

For the federal government, employee compensations were obtained from published reports, while for state and local governments value added was estimated indirectly. Employee compensations were calculated as a share of total expenditures by state and local governments.[58] The share values used were taken to be equal to the share of total

[56] The wage rates were weighted by the total personal service labor force, less the number engaged as photographers and laundresses, as presented in the manufacturing census reports. The remainder includes certain occupations, such as hotelkeepers and barbers, whose value added is not accurately reflected by servant's wages. However, these groups account for only 5 per cent of the personal service labor force, so the industry value added total is not seriously affected.

[57] *National Income Supplement,* 1954, p. 53. Interest is excluded because for government such payments are subject to fluctuations that do not represent changes in the value of current production, p. 54.

[58] Estimates of state and local expenditures were constructed from Lance Davis and John Legler, "The Government in the American Economy, 1815–1902: A Quantitative Study," *Tasks of Economic History,* December 1966.

TABLE A-8

Value Added in Personal Services, U.S. 1839–1899
(millions of dollars, current prices)

	Value of Output		Value Added	
	Photography	Cleaning & Dyeing	Photography; Cleaning & Dyeing	Servants
1839	–	–	–	35.4
1849	0.3	–	0.2	51.3
1859	1.1	–	0.8	91.2
1869	3.6	–	2.6	135.5
1879	5.9	1.6	5.3	218.7
1889	15.5	5.3	15.8	418.0
1899	23.2	7.6	22.5	482.0

Photography, Cleaning and Dyeing: All data were obtained from *U.S. Census of Manufacturing* for relevant years.

Servants: Value added equals the sum of annual wages received by free females and free males, and an imputed value for slave domestics. Annual wages for women were obtained by assuming a fifty week work year, and weighting the weekly wage by fifty. (Servants did receive room and board but we have not included this.) Weekly wages were found in Stanley Lebergott, *Manpower in Economic Growth*, pp. 282–284; J. D. B. DeBow, *Statistical View of the U.S.*, 1854, p. 164; U.S. Census, *Miscellaneous Statistics*, 1860, p. 512; Edward Young, "Special Report on Immigration," 42nd Congress, 1st Session, 1870–71, House Executive Documents No. 1, p. 216; Lucy Salmon, "A Statistical Inquiry Concerning Domestic Service," *JASA*, 1892, p. 99; Gail Laughlin, "Domestic Service," *U.S. Industrial Commission Report*, vol. XIV, p. 748.

The 1879 annual wage ($130) was assumed to be equal to the average for 1869 and 1889.

Male annual wages were calculated as 195 per cent of women's, for 1839–1879, 225 per cent in 1889, and 165 per cent in 1899. Data from Salmon, *op. cit.*, p. 99 and Laughlin, *op. cit.*, p. 754.

Slave annual wages were imputed to be 80 per cent of the U.S. free female wage rate. This may be low, because the 80 per cent is DeBow's assertion that the hiring out wage for slaves was 80 per cent of free female wages in southern states, and southern states were slightly higher than the national average.

These annual wages were then weighted by the number of servants in each wage group (*infra*, Table A-12).

TABLE A-9

Value Added by Government, U.S. 1839–1899

Year	Value Added By Federal Gov't ($000's)	Value Added By State and Local Gov'ts [c] ($000's)	Total Gov't Value Added [d] ($000,000's)
1839	4,500 [a]	20,340	24.8
1849	7,100 [a]	23,280	30.4
1859	16,600 [b]	50,470	67.1
1869	32,500 [b]	39,931	72.4
1879	42,500 [b]	52,425	94.9
1889	66,000 [b]	149,650	215.7
1899	88,600 [b]	143,330	231.9

[a] Computed as 18 per cent of total federal government ordinary and postal expenditures for the respective years 1839, 1849 using the total expenditures as presented in *Treasurer's Annual Report on Finances*, 1929, pp. 406, 407. 18 per cent is the average share of total government expenditures accounted for by compensation expenditures for the period 1859–1899.

[b] Obtained from *Treasurer's Accounts of Receipts and Expenditures*, and *Annual Reports of the Postmaster General* for the relevant years.

[c] Total state and local expenditures were obtained from Davis and Legler *op. cit.* Value added (wages and salaries) was calculated as a share of this total. The share values are those that exist for the Federal data at each date. The shares for the different levels of government were quite close in the twentieth century. (The averages were 20.9 per cent for state and local and 21.3 per cent for federal.)

The total expenditures for state and local governments were obtained by weighting per capita values by the population. The per capita values were supplied by John Legler. They are three year moving averages centered on 1840, 1850, 1859, 1871, 1880, 1890, and 1899.

[d] The sum of the preceding columns.

federal expenses accounted for by federal civilian employees' wages and salaries.[59]

Education

Value added in education is defined in this study as the difference between income received by schools, from all sources, and purchases

[59] Twentieth century shares for the two levels of government are remarkably close, averaging 21.3 per cent for federal and 20.9 per cent for state and local. (*Historical Statistics*, series Y-224, Y-228, Y-255, Y-547; and S. Kuznets, *National Income*, vol. 2, Table G-2.) Years involving large war expenditures were omitted.

Some state data available for the nineteenth century confirm the assumption concerning equality of shares.

TABLE A-10

Value of Output and Value Added by Education, U.S., 1839–1899
(millions of dollars, current prices)

Year	Value of Output	Value of Materials [d]	Value Added [e]
1839	9.2 [a]	0.9	8.3
1849	16.2 [b]	1.6	14.6
1859	34.7 [b]	3.5	31.2
1869	95.4 [b]	9.5	85.9
1879	108.6 [c]	10.9	97.7
1889	191.1 [c]	19.1	172.0
1899	295.5 [c]	29.6	265.9

[a] Income per pupil in 1849 multiplied by number of pupils in 1839, as reported by the census.

[b] U.S. Census, 1870, *Statistics on Education*, p. 426.

[c] Expenditure data presented in Albert Fishlow, "American Investment in Education," *Tasks of Economic History*, vol. 26, 1966, p. 420, adjusted to income on the basis of data in the *Biennial Survey of Education*, 1916–1918, vol. III. It was found that expenditures were 98 per cent of income in 1889 and 1899, for public elementary and secondary schools.

[d] Annual State reports for various years indicated that the value of materials equalled approximately 10 per cent of income. Reports were for N.Y. 1879, 1889, 1899; Massachusetts for 1889; Michigan for 1879, 1889, 1899; Illinois, 1869; Iowa for 1849–1899; Maryland 1869–1899.

[e] Value of output minus value of materials.

of intermediate goods. Income was derived almost entirely from government sources or from tuition, and only small amounts were derived from property income.[60] Consequently, total school income represents the sale of services directly to the consumer, via tuition, and indirectly to the consumer, via government funds. Further, since property income would be due largely to endowment funds, it is not entirely unconnected to a measure of the value of output and inclusion of the small amounts of income derived from this source should not distort the measure of service output.

For 1849–1869, income figures were published in the census, for

[60] Endowment income was 5.5 per cent in 1849, 6.3 per cent in 1859, 3.8 per cent in 1869. For those schools for which data are available in later years (colleges, universities, public elementary and secondary schools), the percentages were 7.6 per cent in 1889, and 6.2 per cent in 1899. (See notes to Table A-10 for sources.)

both public and private schools. For 1879–1899, Fishlow has made estimates of expenditures by schools [61] and we have converted these to income figures on the basis of income-expenditure relations for public elementary and secondary schools in 1889 and 1899.[62]

The materials consumed were stationery, fuel and textbooks.[63] A sample of state reports indicated that the value of materials consumed equalled 10 per cent of income.[64] No trend was evident in the combined data, so 10 per cent was used for all years.[65]

Independent Hand Trades [66]

Value added by this industry is the sum of value added by three components—smithing trades, boot and shoe repairing, and tailoring. For each of the components value added has been measured as the difference between the value of output and the value of materials consumed. Data were obtained from the manufacturing census reports. To overcome deficiencies in the reported totals of output and materials,[67] the census data were used only to compute a value added per worker figure for each benchmark. This per worker value was then weighted by the number of workers engaged in that trade.

[61] Fishlow used published figures for public elementary and secondary schools and made estimates for private elementary and secondary, normal schools, universities, colleges, professional, and private commercial schools. Albert Fishlow, "American Investment in Education," *Tasks of Economic History,* vol. 26, 1966, p. 420.

[62] In 1889 and 1899, expenditures were 98 per cent of income for these schools. Data from *Biennial Survey of Education,* 1916–1918, vol. III, p. 54. The percentage in 1879 for New York, Michigan and Iowa schools was 95 per cent. Data from *Annual Reports of School Superintendents* for those states.

[63] Textbooks were used for more than one year, but they were not distinguishable from stationery in several state accounts.

[64] The estimate is probably a maximum, because the expenditure categories we have used to derive it included some other expenses, such as maintenance wages. The percentages for 1889 and 1899 were higher for public schools (16 and 19 per cent) but included much more than supplies and fuel.

[65] Most of the observations were for 1879 and 1889.

Sources were the *Annual Reports of Superintendent of Public Instructions,* or *Annual Reports of the Secretary of the Board of Education* for New York, Massachusetts, Michigan, Illinois, Iowa and Maryland.

[66] The results are presented in Table A-1, and are not reproduced here.

[67] The 1860 census reported only 15,720 blacksmith establishments, a decline of 10,000 from the total reported a decade earlier. The aggregates appear deficient. In that case, while the value of output is deficient, so also is the value of materials consumed and the number of employees. Consequently, value added per employee might still be representative.

Data were readily available for the smithing trades,[68] but not for the others. The census did report boot and shoe custom work, 1879–1899, and it was assumed that value added per worker in custom work would be similar to value added per worker in repair work.[69] A stable relation between value added per worker in custom work and in factory production was the basis for estimating value added for boot and shoe repair work, 1849–1869, and for the tailoring trade, 1849–1899.[70]

The 1849 data were used to obtain a weighted value added per worker figure for the entire hand trade industry. This value ($286) was weighted by the hand trade workforce in 1839 to obtain value added for the industry in that year.

Housing

The data are from the worksheets underlying Gallman, "Gross National Product. . . ." [71] The estimates were made in constant prices and inflated by a rent index. They represent the value of the services of shelter flowing to consumers and are therefore somewhat more gross than value added estimates.

The discussant of the paper notes that the 1839 estimate may be too high "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 figure for the 1850's back to 1839" (p. 86). But this is a misunderstanding. The estimating procedure involved the assumption that the *differential* between the growth of the farm and nonfarm sectors was the same in the 1840's as in the 1850's (p. 63), not that the two sectors grew at the same rate.

GAINFUL WORKER ESTIMATES

The labor force series measures the numbers of gainful workers, distributed by industry. The series is a revision and extension of work

[68] The 1880 census included wheelwrights with blacksmiths. This inclusion biased downward value added per worker. Because wheelwrights could not be distinguished, we placed value added per smith at $700.

[69] In custom work, the value of output might be higher than in repair work, but so also would be the value of materials consumed.

[70] Value added per custom worker was a steady 90 per cent of value added per factory worker from 1879–1899.

[71] *Op. cit.*, see pp. 57–60, 63.

TABLE A-11

Value of the Services of Shelter, 1839–1899
(millions of dollars)

1839	166
1849	248
1859	395
1869	711
1879	697
1889	1,074
1899	1,390

SOURCE: See text.

prepared by Daniel Carson.[72] Carson's estimates were chosen because he distributed the workforce by industry, according to the Standard Industrial Classification, and provided benchmark figures on six service industries for the entire period 1869 through 1899. Also his estimates are based on census data, and therefore can be integrated with a census-based series for earlier years.

Several alternatives were considered before selecting the Carson series for use in the later years. These alternatives (viz. Stanley Lebergott's,[73] P. K. Whelpton's,[74] Alba Edwards's,[75] and Ann Miller and Carol Brainerd's[76]) were rejected for one or more of the following reasons: incompleteness in time; incompleteness of estimates for the service industries; aggregativeness of the service estimates; distribution of workers by occupations rather than industries.[77]

The present series is composed of estimates for three time periods, 1839; 1849 and 1859; and 1869 to 1899.

The estimates for the period 1869 to 1899 are derived largely from Carson. We have treated education as a separate industry, and there-

[72] "Changes in the Industrial Composition of Manpower since the Civil War," *Studies in Income and Wealth,* 11, New York, NBER, 1949.

[73] "Labor Force and Employment, 1800–1960," *Output, Employment and Productivity in the U.S. After 1800.*

[74] "Occupational Groups in the U.S., 1820–1920," *JASA,* September 1926.

[75] *Comparative Occupation Statistics for the U.S., 1870–1940,* Washington, D.C., 1943.

[76] Everett Lee, *et al., Population Redistribution and Economic Growth, 1870–1950,* Part I, Washington, D.C., 1957.

[77] For a more detailed explanation see Weiss, *op. cit.,* pp. 44–47.

fore deducted public school teachers from Carson's government total, and private school teachers from his professional service estimate. We have transferred restaurant and saloon keepers and employees from personal services to trade,[78] and also included in trade an estimate of workers in manufacturers' sales branches and service establishments.[79] Further, we included the independent hand trades in the service sector,[80] whereas Carson placed this group in manufacturing. Finally, we estimated laborers, not otherwise specified, 1869–1899, and gainful workers in railroading in 1869 differently from Carson.

For 1849 and 1859 the industrial divisions were made as comparable as possible to those for the period 1869 to 1899. The method of estimating was also similar. That is, the gainful worker total for each industry is composed of characteristic occupations and repeater occupations. The characteristic occupations are those found primarily, if not entirely, in one industry. For example, merchants and dealers would be found almost exclusively in trade. The characteristic occupations are composed of two groups, the trend-generating characteristics, and the "other" characteristic occupations. The former are those that are most typical of an industry, that did not require extensive estimation in determining the number of gainful workers with each occupation, and that therefore were used to distribute among industries the number of workers with repeater occupations. The "other" characteristic occupations are those that are typical of an industry, but that required a large degree of estimation in determining the number of gainful workers with each occupation. Because of the potential error involved in estimating the number of workers with these occupations, they were not used to distribute the workers with repeater occupations. The repeater occupations are those that are found in many industries.

[78] This was in keeping with changes in the Standard Industrial Classification that have occurred since Carson's work appeared.

[79] The adjustments rest on Harold Barger's work, "Income Originating in Trade, 1869–1929," *Trends in the American Economy in the Nineteenth Century*, p. 327.

[80] This industry includes hand craftsmen who would have been primarily engaged in production, as well as those engaged primarily in providing services (repair work). The service sector should exclude the former, but they are included in the present study because it proved difficult to distinguish the repair craftsmen from the producing craftsmen. Additionally, the craftsmen engaged in production have been excluded from Gallman's commodity output study, and it is desirable that their contribution be recorded somewhere.

The third period of estimation is 1839. For most industries the 1839 estimate is an extension of the estimates for 1849 through 1899.

Table A-12 presents the final estimates for each industry. The estimates are based primarily on the census counts of gainful workers. The published census data required our making some general adjustments. The 1849 census count omitted slaves, women, and age group 10–15 years, while the 1859 count omitted slaves and the age group 10–15 years. The omission of slaves was important in only the personal service industry. The omission of women was of some significance for several occupations, again those found primarily in personal services. The omission of age group 10–15 years was of little consequence in either year, nonetheless adjustments were made. In addition to these general adjustments, the census counts of gainful workers in certain specific occupations required adjustment. Most of these occupations were of little significance within an industry. Those adjustments that were significant are noted immediately following Table A-15.

Estimate of Error

For any industry, the greatest potential source of error is the estimate of the number of workers with repeater occupations. As an indication of the potential error we examined the service industries for the share of the total comprised by the repeater occupations. We have presented detailed results only for 1849 and 1859. No such occupational distribution exists for 1839, and for later years we have used Carson's data, and his work contains an assessment of his distribution.

In the aggregate the number of workers with repeater occupations is not a serious problem. The combined characteristic occupations account for 88 per cent of the total in 1849, and 86 per cent in 1859. Carson states that the characteristic occupations accounted for over 80 per cent of his estimates for 1869–1899.[81] Thus the repeater occupational estimates are not a significant source of error in the aggregate.

When we consider the individual industries, however, the repeater occupations become more important in some instances. This is to be expected because certain repeater occupations are more prominent in one industry than in another. Again, specific data are available only for 1849 and 1859, but Carson gives evidence showing that the re-

[81] Carson, *op. cit.*, pp. 75, 76, 133, 134.

TABLE A-12

The Service Labor Force by Industry, United States, 1839–1899
(thousands of gainful workers)

	1839	1849	1859	1869	1879	1889	1899
Total	1,180	1,872	2,806	3,225	4,384	7,266	9,618
Trade	232	360	614	781	1,161	1,855	2,527
Transportation & public utilities	86	193	304	506	715	1,513	1,918
Finance	5	7	23	43	63	163	302
Professional	65	113	163	181	275	470	658
Personal	598	915	1,286	1,205	1,456	2,175	2,718
Government	38	59	73	121	189	331	504
Education	45	83	119	170	228	347	446
Hand trades	110	142	219	218	297	412	545

TABLE A-13

Occupational Structure of the Service Sector, U.S., 1849 and 1859
(per cent)

Year	Trend-Generating [a] Characteristic	Other [b] Characteristic	Repeater [c]
1849	61	27	12
1859	64	22	14

[a] Excluding the hand trades, which accounted for 7.8 per cent of the total labor force in 1859, and 7.6 per cent in 1849.

[b] Virtually all of this group (90 per cent in 1859, and 95 per cent in 1849) is accounted for by slaves in personal services.

[c] Laborers, not otherwise specified, account for approximately 38 per cent of the group in 1859, and 42 per cent in 1849.

peater occupations are less important in later years.[82] Because "other" characteristic occupations are significant in only personal services, we have presented in Table A-14 only a division between characteristic and repeater occupations.

The extent of repeaters in certain industries is, of course, determined by the nature of the repeater occupations. As expected, 99 per cent of the repeaters in finance are accounted for by agents, collectors, clerks and bookkeepers. In transportation and public utilities approximately 30 per cent of the repeater share is accounted for by draymen, hackmen and teamsters. In trade, a major share of the repeaters is accounted for by clerks and deliverymen.[83] These are occupations that one would expect to find in large numbers in these industries. Thus the potential error in the estimates is much less than would seem to be indicated by the large number of workers with repeater occupations.[84]

[82] *Ibid.*, for the period 1869–1899, characteristic occupations account for over 80 per cent of the total for each industry except transportation.

[83] If these two groups were combined with the characteristic occupations, the total would be over 90 per cent of the industry work force.

[84] One case that is not explained by this factor is that of government. There is no repeater occupation that one would expect to find as a large part of the entire government work force. Yet, workers with repeater occupations account for 60 per cent of the government total in 1849, and 65 per cent in 1859. However, the resulting totals of characteristic and repeater occupations are confirmed by the published estimates of federal government employees.

While the repeater occupations account for almost all of the estimation involved in constructing our series, it should be noted that the trend-generating characteristic occupations in trade were substantially adjusted. It was necessary to estimate salesmen and clerks in stores. In 1849 this meant that the unadjusted census figure was increased by 42 per cent, and in 1859 by 50 per cent (explained below).

In education an adjustment was required for women omitted by the census in 1849. This estimate accounts for 63 per cent of the industry, but is obviously a justifiable adjustment. The census count of teachers was also adjusted in 1869, as explained below.

Less than 5 per cent of the trend-generating characteristic occupations were estimated in the other industries, with the exception of professional services in 1859 (6 per cent).

The following section presents more of the detail concerning the derivations for 1839 through 1859. Specifically, the total number of gainful workers with characteristic occupations in each industry in 1849 and 1859 is presented in Table A-15. Immediately following the table the major adjustments are explained. The derivation of the in-

TABLE A-14

Occupational Structure of the Various Service Industries
1849 and 1859
(per cent)

Industry [a]	1849		1859	
	Characteristic	Repeater	Characteristic	Repeater
Trade	77	23	77	23
Transportation & public utilities	65	35	60	40
Finance	60	40	56	44
Professional	98	2	97	3
Personal	98	2	98	2
Government	40	60	35	65

[a] No distribution is possible for the hand trades. By definition, they are a repeater group, but the industry totals include no other repeater occupations.

No distribution is possible for education. By assumption, they are 100 per cent characteristic.

TABLE A-15

Number of Gainful Workers with Characteristic Occupations, Distributed by Service Industry, U.S., 1849, 1859

Industry	1849		1859	
	Unadjusted Census Count	Adjusted Count	Unadjusted Census Count	Adjusted Count
Trade	195,048	277,135	314,400	471,061
Transport & public utilities	118,533	125,512	164,942	180,981
Finance, etc.	4,478	4,478	12,663	12,663
Professional service	104,527	110,221	158,011	158,011
Personal service	53,286	894,345	677,281	1,255,717
Government	23,081	23,081	25,429	25,429
Education	30,810	83,144	118,874	118,874
Totals	529,763	1,517,916	1,471,600	2,222,736

SOURCE: Census Count—U.S. Bureau of Census, *Twelfth Census of the United States: 1900. Special Report, Occupations*, pp. liii–lxiii. Adjusted Count—see text.

dustrial distribution of the workers with repeater occupations is then presented. Following that, the derivation of the estimates for the independent hand trades is presented. Finally, the estimates for 1839 are explained. The reader is referred to Carson's work for details concerning the period 1869 to 1899.

GENERAL ADJUSTMENTS

In 1849 the census counts had to be revised to account for women, and age group 10–15 years, while in 1859 only the latter group had to be estimated. The adjustments were made by assuming that in 1849 and 1859 each of these groups comprised the same share of the occupation total as it did in 1869. No adjustment was made if the 1869 share was less than 1 per cent.

Major Specific Adjustments by Industry

Trade. An estimate of salesmen, clerks, and other store workers accounts for almost the entire adjustment (85 per cent) in both 1849 and 1859.

Data were available for merchants and dealers for the entire period

1849 to 1899.[85] Data on salesmen, clerks, etc. were available for only 1869 to 1899.[86] A ratio of salesmen, clerks, etc. to merchants and dealers was obtained for 1869–1899 and extrapolated to 1849.[87] This ratio was then applied to the number of merchants and dealers in 1849 and 1859 to obtain the estimate of salesmen, clerks, etc.

Transportation and Public Utilities. Very minor estimates were required to derive the total number of gainful workers with characteristic occupations in transportation and public utilities. The original census figures were adjusted by only 5.9 per cent in 1849 and 9.7 per cent in 1859.

The two major components, gainful workers in railroading and ocean navigation, were checked against alternative measures. Specifically, for 1839 to 1869 the census counts of workers with characteristic occupations in ocean navigation compared favorably to estimates of the maximum number of sailors engaged by U.S. ships.[88] The maxima were obtained using the procedure derived by Lebergott,[89] but with one improvement. We substituted a ratio of sailors per 1,000 *gross* tons [90] for Lebergott's ratio of sailors per 1,000 *net* tons, and for each benchmark date, weighted the new ratios by the documented tonnage [91] (gross tons) at that date, to obtain the maximum employment in that year.[92]

[85] *Twelfth U.S. Census, 1900, Special Report, Occupations,* pp. l–lxiii.

[86] *Ibid.,* for 1889 and 1899 the number of salesmen, etc. was obtained from Daniel Carson, "Labor Supply and Employment," Research Project, NBER (mimeograph), p. 47.

[87] The ratio rose steadily from .599 in 1869, to .706 in 1879, to .799 in 1889, to .909 in 1899. The value was placed at .496 in 1859 and .393 in 1849.

[88] The census counts came within 5 per cent of the maxima in each year except 1859. The disparity in 1859 is explained largely by the fact that the 1859 maximum is too high, considering the economic conditions. The arguments are presented elsewhere. (Weiss, *op. cit.,* pp. 88–92.)

[89] Stanley Lebergott, "Labor Force and Employment, 1800–1960," *Output, Employment, and Productivity.*

[90] The ratios were derived by weighting an average gross tonnage per ship by the average number of ships entered and cleared, and dividing through the number of sailors employed on those ships. The average gross tonnage per ship was estimated from ship construction data presented in the *Annual Reports on Commerce and Navigation.* Our average tonnages were compared to other data and appear reasonable. If anything, our average tonnage is low and therefore our ratios and the maxima estimates are slightly high.

[91] Documented tonnage was obtained from *Historical Statistics,* 1957.

[92] The estimates are maxima for the following reasons. The ratios of sailors per 1,000 gross tons are based on actual voyage data. Since the size of the crew would

The estimates of workers with characteristic occupations in railroads could not be checked directly. Indeed it would be pointless because the census counts of "employees of railroads" are obviously in error. Instead, an alternative series was derived to use as a check on the industry total obtained by summing the workers with characteristic occupations and repeater occupations. This alternative series was confirmed by Fishlow's estimates.[93] The Fishlow series was not used directly in our estimates because his figures were implicitly based on productivity measures, and we hoped to derive a series that would permit further analysis relating to productivity. It would have been possible to use his series as a check, and also the estimates by Lebergott. In fact our alternative series arose out of an attempt to reconcile the differences between the estimates by Fishlow and those by Lebergott. Briefly, it was found that Lebergott understated employment in region II in 1859 and 1869, and overstated employment slightly in 1839 and 1849. Our alternative series, based on census figures and on the improved Lebergott data, conforms closely to Fishlow's, and provides a series that in turn confirms our gainful worker estimates, obtained by the characteristic-repeater occupation procedure.

The two major components of the transportation and public utilities industry are therefore felt to be quite sound. Since combined they account for over 60 per cent of the industry gainful worker total, the industry totals are reasonable.

Professional Services. No adjustments were made in 1859, and only minor adjustments in 1849. The largest estimate required in 1849 was that for nurses. The figure was placed at 5,900 by extending a trend found for 1859 to 1879. As a result in 1849, nurses accounted for 5.2 per cent of the industry's workers with characteristic occupations, the same share they comprised in 1859.

Personal Services. Major adjustment of the census data was required to obtain the number of gainful workers in personal service, because

be dependent largely on the amount of sail the ship used, the ratio should be highly invariant to unused capacity. The ratio includes foreign sailors and those under 15 years of age. By applying the ratio to the total documented tonnage we are assuming that there were no idle ships *and* that the same seamen were not being employed by two different vessels.

[93] Albert Fishlow, "Railroad Sector, 1840–1910," *Output, Employment, and Productivity.*

the census omitted women in 1849 and slaves in 1849 and 1859. Women were important in two occupations, as laundresses and domestics, while slaves were important in the domestic occupation.

The number of laundresses in 1849 was estimated as 50 per cent of the 1859 figure. This relative position was that which was found to exist over time from 1869 through 1899.

The census reported only free male domestics in 1849. The data for later years suggests that free males approximated 7 per cent of the total of white domestics, over 15 years of age. The census count of 22,243 was first adjusted for those under age 15, and then inflated to 100 per cent. The result was 397,142 free domestics and waiters in 1849.

The final significant estimate is that for slaves. It was assumed that the number of slave domestics would be related to the number of slaves owned. (A rank correlation between these variables was significant at the .01 level.) An estimating equation was derived ($Y_x = .525 + .0835X$; $s_x = 2.5$), and used to compute the number of domestics per owner for each size category of slaveholdings.[94] The results were 447,000 slave domestics in 1849, and 518,580 in 1859.

How reasonable are these figures? For one, they mean that slaves comprised 49 per cent of the personal service gainful worker total in 1849 and 40 per cent in 1859. This is not much above the 33 per cent of the industry accounted for by Negroes in 1899, forty years after the dissolution of slavery. The estimate for 1849 is below Seaman's estimate of 487,000 in 1839.[95] However, his figure is the residual after the field slaves and children are deducted from the total slave population. His measure could, and probably does, include not only domestics, but also all other urban slaves, and possibly some rural slaves engaged in other nonagricultural activities.

Education. The 1850 census count of teachers is for males only. The share of males to total teachers declined between 1869 and 1899, sug-

[94] Size distributions of slaveholdings were obtained from U.S. Bureau of Census, *Eighth Census of the United States, 1860, Agriculture,* pp. 247, 248. The data concerning the number of domestics per size category were obtained from a variety of sources, both primary (plantation records) and secondary (works of U. B. Phillips, Lewis C. Gray, Frederick Law Olmsted and J. Carlyle Sitterson), too numerous to list here.

[95] Ezra Seaman, *Progress of Nations, 1852,* p. 274.

gesting that the 1849 share was higher than in later years. It was placed at 36.7 per cent on the basis of an absolute change of 1.5 per cent per decade between 1849 and 1869. This was the change found to have occurred between 1869 and 1879. Our result, 81,400, is almost identical to Lebergott's figure.[96]

The 1870 census total was adjusted because it appeared very low relative to the number of teachers in 1859 and 1879. The adjustment is Lebergott's.[97]

DISTRIBUTION OF THE GAINFUL WORKERS WITH REPEATER OCCUPATIONS

There are certain occupations that do not belong exclusively to one industry. Examination of the data for 1849 and 1859 revealed that eight such repeater occupation groups were large enough to warrant special consideration. These are: laborers, not otherwise specified; agents and collectors; clerks, copyists, bookkeepers, accountants, and cashiers; draymen, teamsters and hackmen; messengers and officeboys; firemen and engineers (stationary); weighers, gaugers and measurers; and packers and shippers.

We have produced an industrial distribution of laborers, n.o.s. (not otherwise specified), for the entire period because we needed to adjust Carson's estimates for the period 1869 to 1899 to bring them into line with our estimates for 1849 and 1859. In an attempt to avoid the problems posed by agricultural laborers, we have adopted Lebergott's method of estimating urban laborers, n.o.s., as a starting point for the service distribution.[98] Such an estimate should include virtually all *service* laborers, with the exception of some performing personal services in rural areas. Then, by deducting an estimate of laborers, n.o.s., engaged in manufacturing and construction from the urban total we obtain the number of laborers, n.o.s., in service.

The procedure is to obtain a ratio of urban labor, n.o.s., per 1,000 urban population, for those cities for which data are presented in the census.[99] Applying this ratio to the U.S. population in cities of 2,500

[96] Lebergott, *op. cit.*, p. 118.
[97] *Ibid.*, p. 201.
[98] Stanley Lebergott, in *Output, Employment, and Productivity*, pp. 159 ff.
[99] The 30 largest cities are available in 1869, 60 cities in 1879 and 1889, and 160 cities in 1899.

or more yields an estimate of urban labor, n.o.s., for the U.S. In fact, the ratio is obtained for the census cities, excluding New York, Chicago and Philadelphia, with a separate count of laborers, n.o.s., then added for these cities. The ratios for these three cities were excluded from the calculations deriving the ratio for the other cities because these large cities had significantly different ratios. Since they would have had a large weight they would have biased the ratio for the other urban population.

We have checked this procedure using 1909 data. By applying a ratio of urban laborers, n.o.s., to the urban population, we obtained a total of 2,332,735 urban laborers, n.o.s.[100] A count of workers in selected characteristic occupations was made for manufacturing and for services, for those cities enumerated in the census for the period 1869–1899.[101] For 1909, 61.1 per cent of the characteristic occupations were in manufacturing and 38.9 per cent in services. Dividing the estimated total of urban laborers, n.o.s., in these same proportions yielded 907,000 laborers, n.o.s., in services in 1909. The actual count was 886,000,[102] a difference of only 2.3 per cent. It was assumed this simple procedure would work for earlier years as well. The number of laborers, n.o.s., in services and their distribution by industries is presented in Table A-16. As a first approximation to the distribution among service industries [103] it was decided to distribute them according to each industry's 1909 share of labor, n.o.s., in services, modified by the change in the urban characteristic occupations for that indus-

[100] A ratio of 55 urban laborers, n.o.s., per 1,000 urban population was obtained for cities over 100,000. This ratio was applied to the total urban population, excluding New York, Chicago and Philadelphia. A separate count was then added for these cities. A sample of smaller cities altered the ratio by less than 1 per 1,000. Data are from *Thirteenth U.S. Census, 1910,* vol. 4. Urban population is from *Historical Statistics,* 1957, p. 14.

[101] For manufacturing the group is the total of the urban labor force in manufacturing and mechanical industries, less any labor, n.o.s. For services it includes steam railroad employees, street railroad employees; telegraph and telephone employees; boatmen and watermen; merchants and dealers; salesmen and women; servants; launderers and laundresses; and government officials.

[102] *Thirteenth U.S. Census, 1910,* vol. 4, Table VI.

[103] On the basis of the 1909 data it was decided to confine the distribution to trade, transportation and public utilities, railroads, personal services and government, because there were virtually no laborers, n.o.s., in the other service industries in 1909.

TABLE A-16

Share and Numbers of Laborers, N.O.S., in the Service Industries, United States, 1849–1909

Industry	1909	1899	1889	1879	1869 [a]	1859	1849
Trade	17.1	15.2	13.7	16.9	16.0	19.0	23.4
		67,619	48,586	40,219	33,725	27,845	22,431
Transportation and public utilities	15.9	16.5	10.8	12.9	13.0	15.0	18.4
		73,402	38,301	30,700	27,402	21,983	17,638
Railroads	51.0	52.0	55.7	37.4	35.0	27.5	13.0
		231,327	197,535	89,002	73,774	40,303	12,460
Personal	8.6	9.7	11.3	9.1	11.0	12.5	15.1
		43,151	40,075	21,657	23,186	18,319	14,474
Government	7.1	6.6	8.5	23.7	25.0	26.0	30.1
		29,361	30,145	56,402	52,696	38,104	28,853
Total		444,860	354,642	237,985	210,783	146,554	95,856

NOTE: Derivation of totals is explained in preceding text. For details see Weiss, *op. cit.*, Table 36. The 1909 share for each industry was extrapolated backwards to 1869 on the change in the share of urban workers with characteristic occupations in that industry. The shares for 1849 and 1859 are extensions of trends for earlier years. For railroads and personal service the trend was based on data for 1869–1909, for trade and transportation the basis was 1869–1889, and government was based on 1869 and 1879. Certain adjustments were required to obtain a total of 100 per cent. In 1859, an additional 2.5 per cent was placed in railroads. In 1849, an additional 9 per cent was allocated proportionately among all industries, except railroads.

[a] Adjusted.

try.[104] Thus, if the share of the urban characteristic occupations in trade fell from 44.7 per cent in 1909 to 39.7 per cent in 1899, the share of labor, n.o.s., was assumed to fall from 17.1 to 15.2 per cent. We have implicitly assumed that the ratio of characteristic occupations to laborers, n.o.s., remained constant. This procedure allocated over 90 per cent of all labor, n.o.s., in all years except 1869. For 1879 through 1899 the unallocated laborers were placed in railroads. This was done because the addition produced estimates more in line with what is required to adjust the census data to the actual employment estimates in the railroad industry.[105]

The 1869 adjustment was somewhat different. The original distribution plus the unallocated laborers, n.o.s., resulted in more laborers, n.o.s., being allocated to railroads than was likely, considering the constraint arising from the independent estimates of railroad employment. Therefore, the railroad share was placed at 35 per cent and the remaining industries were simply rounded upwards to account for the remaining 3.8 per cent.

Urban data for occupations were not available for 1849 and 1859, so a different procedure had to be used. The method was to extend the trend values of the shares. In both 1849 and 1859 the trend values failed to sum to 100 per cent. The discrepancies of 2.5 per cent in 1859 and 9 per cent in 1849 were allocated among the various industries, as noted in Table A-16.

Other Repeater Occupations

For the remaining seven repeater occupations we first obtained the total number of workers with each repeater occupation in services, and then distributed this total among the service industries. The total in services was obtained by distributing the U.S. total of workers in each repeater group between service and nonservice sectors. The share

[104] Shares rather than actual numbers had to be used because the urban sample varied from year to year, and the numbers would not be comparable, but the shares would be closely comparable.

The shares of laborers, n.o.s., used as the basis for distribution are the shares attached to each industry for the entire service labor force in 1909. These shares were used rather than those for only the urban labor force because the latter basis would understate the share of laborers, n.o.s., attached to personal services.

[105] For an idea of the necessary magnitude of labor, n.o.s., in railroads, see Weiss, *op. cit.*, pp. 68–82, and 114–115.

in service in 1909 was extrapolated back on the basis of the change in the ratio of the characteristic occupations in service to the characteristic occupations in manufacturing.[106]

These totals for service were then distributed according to the process described in Daniel Carson's work. The steps are as follows:

1. Obtain a ratio of characteristic occupations in the given year to those in the base year, 1909, for each industry.

2. Obtain a ratio of the total repeater group in the given year to the total for the base year. (This is the total in Services, and not the totals for the U.S.)

3. Obtain a weighted index for the total of characteristic occupations for all industries involved in each distribution.

4. Obtain the ratio of the results of step 2 to the results of step 3, and apply this ratio to the indexes obtained in step 1.

5. Apply this modified index to the base year figure for that repeater occupation in each industry.

There are two basic assumptions underlying this entire procedure. Step 1 (if it were applied unmodifiedly) assumes that the industrial structure of characteristic occupations to repeater occupations remains unchanged. Step 4 (derived in steps 2 and 3) assumes that any change in the sectoral structure of characteristic occupations to repeater occupations that occurs between the base year and the given year, occurs proportionately among all industries involved.

The procedure need not be completely invalidated if the assumptions do not hold. First, the repeater occupations are such a small share of any industry's total labor force, that small deviations from the assumptions have little importance. A large deviation from the assumptions can be observed and the original distribution arrived at can be modified accordingly.

The procedure did not allocate exactly the number of workers with repeater occupations that were estimated to be in services, and adjustments were made. The original procedure gave reasonable results for all but these occupations. Modifications were required in the cases of

[106] Manufacturing was used as the representative of all nonservice, because these repeater occupations would not be found in large numbers in the other nonservice industries. In this respect they differ from the other repeater group, labor, n.o.s.

draymen, teamsters and hackmen; clerks, etc.; and agents and collectors.

For draymen, teamsters and hackmen it was decided that the base year weights were inappropriately high in trade and other transportation. The 1909 figure includes occupations which were of little, if any, significance in 1859 and 1849. Specifically, 205,000 of the 207,000 draymen in trade in 1909 are laundry deliverymen; while 277,000 of the 303,000 in transportation in 1909 belong to trucking companies. In light of transportation facilities in 1859 and 1849, and in light of the existing technology in laundry machines in 1859 and 1849, it is unlikely that such large groups of draymen were attached to these industries in 1859 and 1849. Thus the 14,000 over allocated in 1859, and 15,000 in 1849 were deducted from trade and other transportation.

Regarding agents and collectors the change in the basic ratio of characteristic to repeater occupations appears to have occurred in finance, rather than proportionately among all industries.[107] If the basic change occurred proportionately among all industries as our procedure assumes (that is, if the ratio of repeater occupations to characteristic occupations for each industry in 1859 was one-fourth the 1909 ratio), then the procedure fails to allocate one-half of the number of agents and collectors estimated to be engaged in the service sector. If as a modification we assume that all industries, except finance, have the same ratio of repeater occupations to characteristic occupations in 1859 as in 1909 and the 1859 ratio in finance is one-fourth the 1909 ratio in finance, then the distribution accounts for all the repeaters that were supposed to be in services in 1859.[108]

A situation similar to that for agents and collectors (an under allocation) occurred in the distribution of clerks, copyists, bookkeepers, accountants and cashiers. While the solution was not as evident as in the preceding cases, it was decided to place the undistributed clerks, etc. in trade. This was done because some people listed by the census

[107] The ratio of agents and collectors to characteristic occupations was believed to have been lower in 1859 than in 1909 because the insurance industry was much less important in 1859 than in 1909, and most of the agents and collectors in finance would have been employed in the insurance industry.

[108] A similar modification was required in 1849. It was assumed that the 1849 finance ratio was one-sixth of the 1909 ratio.

TABLE A-17

Industrial Distribution of Gainful Workers with Repeater Occupations, U.S., 1849, 1859

Industry		Draymen	Agents & Collectors	Clerks, etc.	Office Boys	Firemen & Engineers	Packers & Shippers	Weighers & Gaugers
Trade	1849	5,114	2,648	51,383	895	78	79	–
	1859	14,229	4,205	94,556	1,704	158	225	207
Transportation	1849	21,865	3,818	9,989	588	641	16	–
	1859	36,219	5,726	16,662	830	1,006	41	32
Finance	1849	–	870	2,088	31	–	–	–
	1859	–	3,481	6,544	98	–	–	–
Professional	1849	123	–	2,271	90	29	–	–
	1859	225	–	3,876	156	55	–	171
Personal	1849	761	195	5,136	74	20	5	–
	1859	1,535	317	9,586	140	42	15	–
Government	1849	749	–	5,503	60	327	–	–
	1859	1,140	–	7,683	87	516	–	–

SOURCES: Weiss, *op. cit.* Table 39 for totals, U.S. Census, 1900, *Special Report, Occupations,* pp. l–lviii. The procedure used has been adopted from Carson (*op. cit.*, p. 125, Table 19). We have discussed the procedure at some length in the text immediately preceding this table, and the reader is referred to that discussion for details.

as clerks were probably salesmen, and it is likely that such a group would be larger in 1859 and 1849 than in 1909. The industrial distribution of the number of workers in each repeater occupation is presented for 1849 and 1859 in Table A-17.

Gainful Workers in the Independent Hand Trades [109]

This group of occupations is composed of those who work either as employees of manufacturing establishments, or in small, independent shops. Some independent hand tradesmen, while engaged in production, primarily performed a service–repair work. Others would have been engaged primarily in production. The service sector should exclude the latter group but it is included in the present study for two reasons. First, it is difficult to make an estimate of those engaged only in services. Second, those independent tradesmen engaged in production have been excluded from Gallman's commodity output study and it is desirable to include them in some sector so that their contribution does not go unrecorded.

The hand trades deemed important enough to merit attention are the following: 1. blacksmiths, whitesmiths, tinsmiths, coppersmiths; gunsmiths, locksmiths and bellhangers; 2. shoe and boot repairers; 3. dressmakers, milliners, seamstresses, tailors and tailoresses.

The Smithing Trade

The population census listed all blacksmiths, regardless of where they worked. It thus enumerated those blacksmiths working in all manufacturing establishments, blacksmithing and otherwise, as well as those employed by railroads. The manufacturing census listed blacksmith establishments and their employees. This group was taken to be the independent blacksmiths to be included in the present study. Because census enumeration of "hands employed" varied from year to year, the data in the manufacturing census could not be used directly.[110] Also, it was felt that the 1849 and 1859 data presented in

[109] The estimates are presented in Table A-12.

[110] In 1889 and 1899, employers and salaried officials were not included in "hands employed." In deriving our estimates, we assumed the total labor force to be hands employed plus one employer for each establishment. For 1869 and 1879 it is not clear whether or not employers were included with "hands employed." We assumed

the census understated the number of blacksmiths because establishments producing less than $500 were unreported.[111] The approach used was to obtain an average ratio of independent blacksmiths, as derived from the manufacturing census, to total blacksmiths listed in the population census for 1869–1899, then apply this ratio to the total number of blacksmiths listed in the population census for 1849 and 1859. These same ratios were used to obtain the number of whitesmiths, gunsmiths, locksmiths, and bellhangers and coppersmiths operating as independent hand tradesmen at each benchmark date 1849–1899.

The Tailoring Trade

The procedure used in estimating the number of workers engaged as independent tailors is just the reverse of the procedure used for blacksmiths. That is, the manufacturing census total for these trades was taken to be the number engaged primarily in manufacturing. The difference between the population census count and the manufacturing census count is taken to be the number working as independent hand tradesmen. This is because the average output per tailoring establishment, as reported by the manufacturing census, was almost four times as great as that for blacksmithing, indicating that the clothing establishments counted in the manufacturing census were primarily engaged in manufacturing and not in repair services.[112]

Boot and Shoe Repair Industry

The totals for this industry were estimated in the same manner as the tailoring trades.

that the total independent blacksmiths labor force was approximately twice as large as the number of establishments. This required a slight adjustment in 1879, but no adjustment in 1869. See *Twelfth U.S. Census,* 1900, vol. III.

[111] The Commissioner for the 1870 Census described as deficient the returns of the 1850 and 1860 censuses relating to the hand trades. He felt that it was unlikely so many firms produced under $500 in 1849 and 1859, and apparently many borderline firms were unreported (1870 U.S. Census, *Industry and Wealth,* pp. 373–374).

It is apparent that the 1859 data are understated. The census data show an absolute decline in the number of blacksmithing firms between 1849 and 1859. The decline recorded was 10,000 firms.

[112] A second consideration is that the manufacturing census totals for this industry are included in Gallman's commodity output study, whereas the blacksmiths, etc., were omitted from his study.

Gainful Workers in Services, 1839

Trade. Theodore Marburg developed two estimates of the labor force in trade for 1839, and two for 1849.[113] Our detailed estimate for 1849 fell within the range established by his two estimates of 281,000 and 408,000. For 1839, therefore, an estimate comparable to our later year estimates should fall within his 1839 range of 170,000–270,000. If we assume that our 1839 estimate should lie in the same relative position in Marburg's range as did our 1849 estimate, we obtain an 1839 gainful worker estimate of 232,000. That is, the difference between our 1849 estimate and Marburg's lower bound, expressed as a percentage of Marburg's range, is 62.2 per cent. Therefore, the difference between our 1839 estimate and his lower bound of 170,000 should be 62.2 per cent of his range of 100,000. The difference equals 62,200, which when added to 170,000 yields 232,000 in trade in 1839.

Transportation and Public Utilities

The industry total for 1839 was obtained by inflating the known values for the labor force in railroads and ocean navigation. The number of workers in these two components in 1839 was derived separately,[114] and it was decided that combined they accounted for 67 per cent of the industry. The result was an industry gainful worker total of 86,000.

Finance

The labor force in finance was obtained by extending a trend of employees per establishment (banks) for 1849–1869, back to 1839.[115] The values were 9.1 employees per bank in 1849, 14.7 in 1859, and 25.8 in 1869. The trend value for 1839 is 6 employees per bank, which when weighted by the number of banks (1901) yields a labor force of 5,400.

[113] Theodore Marburg, "Income Originating in Trade, 1799–1869," *Trends in the American Economy in the Nineteenth Century.*

[114] See *supra,* discussion to Table A-15. For detailed estimates see Weiss, *op. cit.,* Table 42, pp. 126–128. The procedure adopted yielded the most reasonable 1839 estimate of three alternatives.

[115] The labor force data have been derived in this paper; the number of banks was obtained from *Historical Statistics,* p. 624.

Professional Services

A total of 65,255 was obtained from the 1839 Census, which contained a count of "learned professions and engineers." We do not know the exact comparability of this group with our industry composition for later years. However, the census figure appears reasonable.

Personal Service

The 1839 labor force engaged in personal services is the sum of the free domestics estimated by Lebergott (240,000) [116] and an estimate of the slave domestics. It was hoped that the slave domestics could be estimated in the same way as for 1849 and 1859. However, neither the size distribution of slaveholdings, nor the number of slaveholders, is available for 1839. Fortunately, between 1849 and 1859 the size distribution changed very little.[117] In fact the change in size distribution was so small that the effect on the total number of domestics was virtually zero.[118] Assuming that the size distribution of slaveholdings was the same in 1839 as it was in 1849 appears to be rather sound.

The total number of slaveholders was obtained by assuming an average of 9 slaves per holder. From 1849 to 1859 the change in the average number of slaves was from 9.2 to 10.3. Thus assuming 9 slaves per holder seems reasonable for 1839. When the procedure is worked out the total number of slave domestics in 1839 is 358,139. This amounts to 14.4 per cent of the total slave population, which is in line with the 14 per cent in 1849 and the 13.1 per cent in 1859. Combining this slave estimate with Lebergott's estimate of free domestics in personal service yields a gainful worker total of 598,139 in personal services.

[116] Lebergott, in *Output, Employment, and Productivity*. We used his 1839 estimate because his estimates of free domestics for the later years are virtually identical to ours.

[117] The largest change was a fall in the share of slaveholders owning between two and four slaves. The decline was only of 2 per cent, which converts to a change of only 1,000 domestics, for that group. This understatement would be partially offset by the rise in the share of some other size grouping.

[118] The total number of domestics in 1849 was 447,000, which means that an error of 1,000 domestics is an error of one-fourth of 1 per cent.

Government

The number of federal employees is available for 1839, as well as in later years.[119] In later years, federal employees comprised an average of 47.5 per cent of the industry total for local, state and federal nonmilitary labor.[120] Since no trend was evident in the later data, the average was assumed to hold for 1839. Inflating the data presented for federal employees (18,038) yields a total of 37,975 nonmilitary workers.

Education

The number of teachers was placed at 45,000 in 1839. This was the number arrived at by Lebergott using the establishment data.[121] As a check we used teacher/pupil ratios for various types of schools available and arrived at virtually the same number (46,000).[122]

Independent Hand Trades

This would appear to be the weakest estimate of the group. The 1840 Population Census lists a total of 791,739 engaged in manufactures and trades. From this total we deducted 500,000 which Lebergott estimated as the factory work force.[123] This leaves 291,739 presumably engaged in nonfactory work. While this figure is not wholly comparable to the population census totals for laborers engaged in all the hand trades, it should be reasonably close. In later years the independent hand trades in the service sector comprised an average of 38 per cent of the population census totals for the occupations smiths, boot and shoe makers and repairers, seamstresses, dressmakers, tailors and milliners.[124] The share was remarkably steady and was assumed to hold for 1839. This yields a total of 110,860 in independent hand trades in 1839. It appears reasonable in light of the number so en-

119 Presented in *Historical Statistics,* p. 710, as compiled from the *Official Register of the U.S.*

120 The totals were derived in an earlier section of the paper, the federal data used here is from *Historical Statistics,* p. 710.

121 Lebergott, *op. cit.,* p. 201.

122 Data from the censuses for 1840 and 1850.

123 Lebergott, *op. cit.,* p. 178.

124 The number in the service sector is derived in an earlier section on "independent hand trades."

gaged in later years. Since the nonfactory work force in 1839 no doubt included others besides smiths, etc., the industry total derived for 1839 is most likely a maximum. How much lower the number should be would be purely conjecture, so we have left it at 110,000.

With all the industries derived above, we have a total of 1,180,000 in services in 1839. This is 20.9 per cent of the total 1839 labor force, a share almost perfectly in line with the trend from 22.8 per cent in 1849 to 32.9 per cent in 1899.

DISCUSSION

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The inputs into the paper before us are easy to establish: some office supplies, a little building space (probably squeezed out of a library corner and a family bedroom), a modest amount of pre-computer age calculating machine time, and many man-hours of labor—clearly a handicraft operation of classical proportions.

The problem, as so often throughout this Conference, is to assess the output. Were I a dean or chairman of a university personnel committee, I would immediately count the pages, bearing in mind that any pleasurable reaction must be tempered by the condition of joint authorship and the substantial time discount necessitated by the long production period of all NBER publications. On the other hand, if I chose as my output criterion the number of numbers, rather than pages, produced, I might conclude that productivity here has been negative. The principal output consists of the value added estimates for nine service sectors and labor force estimates for eight sectors for each of seven years presented in Tables A-1 and A-12, a total of 119 numbers. (A more generous allowance might recognize that other appendix tables sometimes give value of product and materials estimates, and greater sectoral detail.) Thus, thousands of numbers in the primary sources have been reduced to, at best, a few hundreds. And, facetiousness aside, it must be admitted that this reduction has been at some real cost, as Professor Lebergott's difficulties in following some of the estimating procedures illustrate. (But then, on this last point, it is only fair to recognize that Weiss' underlying dissertation pro-

vides much more detail, and that the present report represents a preliminary, not final, product.)

Suppose, however, one takes as basis for assessing output, the more elusive criterion of contribution to knowledge. If, by this, one means the advance over preexisting knowledge, my personal judgment (I generously leave to others the problem of devising an objective quantitative yardstick) is that the contribution is quite high. True, unlike others at the Conference, there is little in this paper that directly confronts the difficult conceptual issues plaguing the service sector. But that was not the purpose of the paper. The set of numbers so laboriously and artfully distilled from the raw material provides instead, and—in my opinion—for the first time, a plausible description of the over-all dimensions of service versus commodity industries during a long and important period of American economic development; a perspective, it may be noted, which will itself further analysis of the conceptual issues. This is not to suggest that the present figures are definitive; on the contrary, it has already been observed that they should be viewed as preliminary. But prior knowledge, particularly on the income side, seems now to have been seriously defective. For the nineteenth century, the principal previous estimates of value added by industry are those of Robert Martin [9]. These were used by Simon Kuznets together with his own estimates for 1919–28 on to develop a picture of trends in the industrial structure of U.S. national product since 1869–78 [5, p. 89].

The extent of revision represented by the Gallman-Weiss estimates is quickly appreciated. Averaging the 1869, 1879, and 1889 values, one finds that the share of the service sector in value added by industry of origin in the "Martin-Kuznets" (M-K) estimates is 59 per cent; [1] in the G-W estimates, 43 per cent. In other words, the new series reverses significantly the relative size of the service and commodity sectors in value added—the M-K estimates show the service sector about 40 per cent greater than the commodity sector, the G-W estimates about 25 per cent less. Since both sets of estimates draw on essentially the same labor force figures for this period (Daniel Carson's [1]), this disparity carries over to the income per worker estimates. The G-W

[1] The M-K figures quoted in this paragraph are from [6, pp. 73, 103].

estimates show the service sector with current dollar income per worker about 70 per cent above the national average; the Kuznets estimates, 130 per cent above.

ASSESSMENT OF OVER-ALL MAGNITUDES

Clearly the new estimates by Gallman and Weiss lead to a radical change in one's impression of the position of the service sector in the nineteenth century economy. But what reasons are there for supposing that the G-W picture is the more accurate one? Three may be noted.

Underlying Workmanship

The first has to do with the quality of the craftsmanship entering into construction of the estimates. Even a casual comparison of Martin's procedures with those of G-W will quickly reveal that the latter have exploited a much wider range of sources, have given much fuller thought to the models employed in estimation, and have labored to test and check their results. It is perhaps sufficient to note that Martin's methodological discussion covers a mere eight pages and mentions not a single test of the estimates [9, pp. 138–146].

External Consistency

The second relates to the consistency of American experience with those of other times and places. When the G-W estimates are viewed in the perspective provided by the extensive evidence for other countries assembled by Kuznets, one finds that the relative position of the service sector in the late nineteenth century United States now looks more like that in other economies at comparable levels of development, whereas heretofore the U.S. was an "outlier." (It is a remarkable tribute to Kuznets' efforts in mobilizing and analyzing these international data—which can easily be written off for their manifest shortcomings—that they do in fact provide such useful perspective.) Thus, comparing the M-K estimate of the income share of the service sector in 1869–89 U.S. with that of countries with similar per capita income levels currently (those in Kuznets' economic level classes III and IV), one finds that of fourteen countries in the latter group, only

three have values as high or higher than that of the U.S. [6, App. Table I]. With regard to relative income per worker in the service sector, only one of eleven countries has a value as high or higher than that shown by the M-K estimate for the U.S. [*ibid.*, App. Table V]. In contrast, the new G-W estimates place the U.S. much closer to the median values for both magnitudes.

Inspection of the time series, as well as cross-section, data for other countries further supports the impression that the M-K service income estimates for the U.S. are on the high side, though a precise comparison is handicapped by the difficulty of identifying the historical period in each of the other countries corresponding to the economic level of the U.S. in 1869–89. For example, only 4 of almost 120 observations on thirteen countries extending from various points in the nineteenth century down to the present, show a value for the income share of the service sector equal to or greater than that of the U.S. in 1869–89 [*ibid.*, App. Table II].[2]

Internal Consistency

The foregoing test of the plausibility of the G-W versus M-K estimates of value added originating in the service sector involves the comparative consistency of the two estimates with what is known of experience in other economies. A third test relates to an issue of *internal* consistency. In commenting on Gallman's previously published estimates in Volume 30, I pointed out a seeming contradiction between the rising trend of consumer services in the distribution of national product by type of product shown by Gallman's estimates and the declining share of the service industries in the distribution of value added by industry of origin indicated by the Martin estimates [2, pp. 87–88]. This disparity in trends, which was particularly marked in the nineteenth century, contrasted sharply with the similar trends in the two shares shown by Kuznets' estimates for the period after 1919–28, that for which the reliability of the estimates was greatest.

[2] I have not attempted to look into possible sources of bias in the Martin estimates, but one reason was noted in a study some years ago where I pointed out that there appeared to be a substantial upward bias in Martin's 1879 figure for the transport sector compared with that for 1899 [8, pp. 712–713].

This disparity is now removed by the new Gallman-Weiss estimates which show a rising share of the service sector in the industry of origin estimates in the nineteenth century, a movement consistent with the rising share of consumer services in the final product estimates. Subsequently, I shall raise a question about the consistency between the decade movements shown by these estimates, but as far as the general direction of trend in the late nineteenth century is concerned, it seems to me that the new Gallman-Weiss figures once again test out as superior.

To summarize the discussion to this point, my impression is that the G-W estimates indicate plausible orders of magnitude for the nineteenth century ratio of service to commodity activities and relative income per worker. In this, they provide a substantial advance in knowledge.

SOME RESERVATIONS

The discussion so far has focussed on the service sector as a whole especially in the period from 1869 on, for which alternative estimates were already available. Suppose, however, one is interested in greater industrial or temporal detail, or in the analysis of trends rather than levels? Only a very limited assessment is attempted here. Three tests are made of the consistency of the present estimates with other series which, on analytical grounds, one would expect to be related. The tests suggest that (1) the size of several of the service industries may be overstated in 1839 and, to a lesser extent, in 1849 and 1859, and (2) that the decade rates of change in the total and, implicitly, the components of the service sector require further study, certainly in the period 1869–89, and very likely in the pre-1869 period as well. Finally, on the basis of the foregoing and some additional considerations, doubts are expressed about the estimated trend in current and constant dollar income per worker in the service sector relative to that in the commodity sector. While the heterogeneous nature of the different service industries makes it difficult to arrive at a general assessment on the basis of the piecemeal tests and considerations advanced here, such a statement is attempted in the conclusion, though admittedly it may suffer from inadequate foundation.

Test 1: Service Labor Force and Urban Population

A finding that has emerged in recent years from the study of long swings, or Kuznets cycles, in economic growth, is that fluctuations in the growth of a number of service industries are positively associated with those in urban growth [3]. Periods of rapid urbanization have been marked by rapid expansion of a number of service industries and vice-versa. The question naturally comes to mind how the trend of labor force in the service industries as estimated by G-W compares with that in urban population. To answer this, the G-W estimates of labor force in each service industry have been expressed as a ratio to urban population at each date. To provide additional perspective, I have added estimates for two years in the twentieth century for industries for which comparable data were readily available. (The comparison was not carried to more recent dates, because the old definition of "urban" becomes progressively less relevant in the twentieth century.) Several observations are suggested by Table 1.

From 1869 on there appears to be a stable or slight downward trend in the ratio of the total service labor force to urban population (line 1). Examination of the components shows this to be the result of the disparate trends for personal services and the hand trades (lines 7 and 10) compared with the other industries. If these two industries, which are less urban centered, are eliminated, a mild upward trend appears in the ratio of the remaining service industries considered as a whole, to urban population (line 2). For some of the component industries, the ratio is quite stable over the period; for others, it drifts irregularly upward. All in all, the consistency from one date to the next, during this period when the basic data on service labor force are strongest, is noteworthy, and supports the view that the trends for a number of the service industries bear a close relation to urban population growth.

If one turns to the pre-1869 period, and leaves aside personal services and the hand trades, a noticeable contrast with the trend in the subsequent period is apparent. Of the remaining six industries, four (and also the total for the six as a whole) exhibit a declining rather than stable or rising trend in the ratio. The most important industry numerically is trade, which shows a ratio of its labor force to urban

TABLE 1

Ratio of Service Labor Force to Urban Population, by Industry, United States, 1839–1919
(per cent)

Line	1839	1849	1859	1869	1879	1889	1899A	1899B	1909	1919
1 Service sector total	64.0	52.8	45.1	32.6	31.0	32.9	31.9	30.0 [a]	30.9 [a]	28.7 [a]
2 Total less personal services and hand trades	25.6	23.0	20.9	18.2	18.6	21.2	21.1	21.0	22.1	22.6
3 Trade	12.6	10.2	9.9	7.9	8.2	8.4	8.4	8.2	8.0	7.5
4 Transportation and public utilities	4.7	5.4	4.9	5.1	5.1	6.8	6.4	6.7	7.2	7.4
5 Finance	0.3	0.2	0.4	0.4	0.4	0.7	1.0	1.0	1.2	1.5
6 Professional	3.5	3.2	2.6	1.8	1.9	2.1	2.2	2.4	2.6	2.8
7 Personal	32.4	25.8	20.7	12.2	10.3	9.8	9.0	9.0	8.7	6.2
8 Government	2.1	1.7	1.2	1.2	1.3	1.5	1.7	2.7	3.1	3.5
9 Education	2.4	2.3	1.9	1.7	1.6	1.6	1.5			
10 Hand trades	6.0	4.0	3.5	2.2	2.1	1.9	1.8	–	–	–

SOURCES: Service labor force by industry: 1839–1899A, Gallman and Weiss, Table A-12; 1899B–1919, Carson's estimates [in 1, p. 47]. Differences in industrial classification between G-W and Carson are described by G-W at the start of their appendix discussion of gainful worker estimates.
Urban population: [10, series A-36].
[a] Excluding hand trades.

population in 1839 50 per cent higher than in 1869, after which the ratio remains almost constant. Note, too, the trend for the professional industries. For this sector, the ratio is about halved between 1839 and 1869, after which it rises steadily. Only for two of the six industries, transportation (the estimates for which may well be the strongest) and finance, does the pre-1869 trend fall in line with that for the later period. These results may reflect reality, but they may also indicate a progressively growing upward bias in the estimates as one moves back to 1839. It is particularly troubling that the periods characterized by disparate trends correspond precisely to those between which the comprehensiveness of census coverage of the services shifted abruptly. Only from 1869 onward did the census of occupations, even in concept, embrace the entire service sector.

Test 2: Free White Domestics and Foreign-Born Population

Historically, the principal source of white domestics has been the foreign-born female population. For example, of the three decades following 1869, that in which the largest increase occurs in the personal service labor force is 1879–89, the decade of highest immigration [3, Charts 3 and 8; 4]. A plausible basis for assessing the estimate for the labor force of free white domestics, therefore, is to compare its trend with that in the principal source population. The following is an illustrative comparison for the first three dates, those for which I could obtain or infer the G-W labor force estimates for this group from their paper:

	1839	*1849*	*1859*
Free white domestics (000)	240	397	600
Foreign-born females [3] (000)	413	1,000	1,904
Ratio, a/b (%)	58	40	32

The level of the 1839 ratio is startling—could three out of every five immigrant women have been employed as servants at this date? More-

[3] For 1849 and 1859 [10, series A-57]. The 1839 estimate was obtained as follows. The implicit survival rate of foreign-born females, 1849–59, was estimated from their observed total increase and an estimate of their net immigration. This survival rate was then assumed applicable to 1839–49. From this plus the estimated net migration 1839–49 and the 1849 population, the implied 1839 population was obtained. The net immigration estimates are averages of those made by Wilcox and Rossiter [7, p. 94], to which the decade average of female to total immigration was applied [10, series C-134].

over, the sharp decline in the ratio contrasts sharply with the stability of the ratio of slave domestics to slave population during this period.[4] Of the three dates, the estimate for 1859 is by far the best founded, suggesting that the G-W figures for free domestics in 1849 and 1839 may be biased upward.[5] However, the procedure I have employed to test the estimate is quite simple, and intended primarily to be illustrative. Further work along these lines, taking account of the post-1859 data, and perhaps using greater ethnic detail, seems desirable.

General Observations on the 1839–59 Labor Force and Income Estimates

Viewed broadly, the two tests performed above raise questions about the consistency of the estimates on *economic* characteristics of the labor force with what is known regarding the *location* of the population (test 1) and its *demographic* characteristics (test 2). These questions, in turn, suggest a more general approach to developing comprehensive labor force estimates for 1839–59. The aim of this approach would be to develop concurrently estimates of labor force by industry, by location (state and rural-urban), and by demographic characteristics (sex, age, and ethnic composition), using systematically *both* population and labor force data at each date. In this way, it would seem possible to develop an estimate of the industrial structure of the labor force consistent with what is known about the spatial and demographic characteristics of the population. While I hesitate to urge such a job on the authors, I feel that until it is done, we may not be in a sufficiently secure position with regard to the labor force data to perform confidently a number of analyses (such as trends in income per worker) which we should like to do.

The foregoing observations, implying possibly upward biases in the

[4] See the sections of the G-W appendix describing the ingenious procedures used to estimate slave domestics.

[5] Lebergott's estimate for 1849 is lower than G-W's, and yields a more plausible ratio of free white domestics to foreign-born females of 35 per cent. For 1839 Lebergott's estimate was adopted by G-W. But this estimate was derived by a linear interpolation between 1790 and 1850, and hence fails to allow for the probable effect on free domestics of the sharp upsurge in immigration during the 1840's. Thus, reference both to Lebergott's 1849 estimate and the procedure he uses for his 1839 estimate tends to support the inference of a possible upward bias in the G-W estimates for the two years. Cf. [2, pp. 203–204].

early year estimates for service labor force, have somewhat different implications for the income estimates. For personal services, where the labor force estimate was used in constructing the income estimate, whatever bias may exist in the former is carried over to the latter. But for several of the other service industries, the income estimate was developed independently of that for labor force, and would therefore not reflect biases in the latter. If, for the service sector as a whole, labor force estimates were revised downward to a greater extent than income, relative income per worker would be pushed upward, perhaps to a dubious level. But it is possible that the income estimate too may contain its own biases in an upward direction. At a minimum, it would seem desirable for the authors to check through the decisions made in their income estimating procedures to make sure they do not tend systematically toward inflating (or, for that matter, deflating) the result. This is especially desirable for trade, which bulks largest in the service sector income total, and for which the underlying data seem rather frail.

Test 3: Output of Final Consumer Services and Corresponding Labor Force Input

The question of the consistency between industry of origin and final product estimates has already been discussed in comparing the G-W and M-K estimates. The present test attempts to push this approach somewhat further by comparing estimates of implied growth rates per decade for three analytically related magnitudes: (a) output of final consumer services as directly estimated by Gallman in Volume 30 [2]; (b) output of final consumer services implied in the present G-W estimates of value added in the service industries; and (c) labor force in the service industries principally related to final consumer demand, taken here as the aggregate of the finance, professional, personal and hand trades sectors as given in the G-W estimates.

My estimates for item (b) are undoubtedly cruder than those which Gallman and Weiss can make with the data at their disposal. Hence, rather than detail my procedure, I shall merely note that I drew upon their value of product estimates where available, William G. Whitney's input-output table for 1899, and Dorothy Brady's rent index.

The rates of change, in per cent per decade, implied by the three series for the decades since 1869 compare as follows:

	1869–79	*1879–89*	*1889–99*
(a) Output of final consumer services (Vol. 30)	62	12	42
(b) Output of final consumer services implicit in present G-W estimates	51	51	35
(c) Labor force in service industries principally related to final consumer demand	27	54	31

Note that for the latest decade, 1889–99, the orders of magnitude of the three series are fairly close, while for the two preceding decades, substantial differences are apparent. If the first two decades shown are combined, all three series suggest fairly high (though not identical) growth over the entire 1869–89 period, but series (a) allocates most of it to the first decade, series (c), to the second, and series (b) divides it evenly. On the basis of my earlier reasoning regarding the relation of the service industries to urbanization, I would tend to appraise the series (c) pattern as the most plausible and that of series (a) as the most questionable with regard to the relative rates of change in 1869–79 and 1879–89. The main point, however, is that this test suggests some possible inconsistencies among the estimates for this period. Moreover, a similar comparison for the decades prior to 1869 suggests there are perhaps substantal discrepancies in the earlier period also.[6] Rather than pursue this point with my own rough estimates, however, let me simply express the hope that the authors, with the fuller body of data at their disposal, may find it possible to present a comparison like that illustrated above covering the entire 1839–99 period.

Trends in Product per Worker

Before concluding, I should like to make two brief observations on the authors' guarded inferences regarding the long-term trend in product per worker for the service sector as a whole.

[6] In attempting to compare the estimates in Volume 30 with those presented here, certain problems arose regarding compositional detail and dating. It would be especially helpful for the present purpose if the Volume 30 estimates were given for the single years 1869, 1879, 1889, and 1899, and if the rent component of final services to consumers were separately shown.

With regard to the *current* dollar estimates of value added per worker, the emphasis is on convergence between the service and commodity sectors, with the possible exception of the Variant 2 estimate [cf. G-W, Table 8, and accompanying text]. An examination of the line by line entries in the authors' table reveals that this conclusion rests very largely on the difference in level between the pre-1869 estimates and those for the later dates. The 1869, 1889, and 1899 estimates for all three variants are quite similar; any inference from the data for the later period alone on a converging trend would have to rest chiefly on the relative position of the 1879 value. Moreover, comparing the earlier and later periods, one finds that it is particularly the 1839 and 1849 estimates that create the impression of convergence. Since it is the estimates for these years which seem least reliable, I am inclined to feel that the conclusion about convergence is not sufficiently well established at this time.

As for the *constant* dollar trend, I am even more reluctant to accept the authors' suggestion that there were similar rates of long-term productivity advance in the two (service and commodity) sectors, or perhaps a slightly higher rate in commodity production. In addition to the doubts just noted relating to relative trends in the current dollar estimates, there is the issue of deflation procedures, which in the present paper is the least intensively developed part of the estimates. Substantively, the generalization seems dubious when one considers the very large share of domestic services in the service labor force, a group whose productivity improvement one suspects was quite low. The authors do have on their side a high increase in transportation productivity and an increasing share of this sector in the service labor force. But, domestic service aside, what are the implied productivity changes in the remaining service industries—trade, finance, education, the professions, government—which are glossed over in the paper by the high degree of aggregation used in making the real product estimates? Clearly, on this subject the paper comes up against the questions stressed elsewhere in this Conference. While I believe the perspective provided by history would illuminate these issues, I am inclined to feel that priority should first be given to more tractable matters, like strengthening the current dollar income and labor force estimates, and that for the present inferences regarding relative growth rates of productivity should be abjured. The authors may feel that

this is what the Conference program required, but there are more than enough solid contributions in their paper which amply justify it.

CONCLUSION

All in all, I come away from this paper with a feeling much like that which followed from examination of Gallman's final product estimates in Volume 30. For the period from 1869 on, the new estimates represent a marked improvement over those which went before; for the earlier period, the estimates represent a major step toward filling an important gap in knowledge, though further work is probably required before they can be confidently used for some analytical purposes. With regard to both sets of estimates I have tried to raise some questions and suggest a few tests which I hope may merit consideration. But it is important to recognize that a great deal of time and effort has already been invested, not only in constructing, but testing the estimates as well. While some additional work seems needed, let us hope that Professor Gallman may soon find it possible to pull together his work and that of his associates over the past decade or so, for it promises to add up to a major advance in our quantitative knowledge of U.S. economic growth.

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STANLEY LEBERGOTT, Wesleyan University

As I wander through the mighty palaces that Kuznets and Goldsmith and Gallman have been putting up, with their great beams, multitudinous rooms and handsome architecture, I wonder about Goethe's editor. When Goethe had written passionately in his autobiography, "She, she alone, I really loved," the editor carefully added his footnote in publication: "Here Goethe was in error."

Must we follow that improbable editor? But this is the play as Dr. Fuchs has cast it, and I must be about my business. The Gallman-Weiss foray into the nether world of national income estimation was long overdue, and is most welcome. For service *is* here—if not to stay. As an over-all comment let me say that the output estimates constitute a fine advance, though I am slightly depressed that their employment estimating seems only a mild variant of my Volume 30 procedures rather than a hearty alternative with new techniques and better sources. But let me be specific.

1. First let me express my hope for a published version of their paper having what Goldsmith termed "reproducibility." The dedicated national income aficionado will want to refer repeatedly to this paper. In it he should find a usable description of how such major items as rent, trade margin, coasting trade output were estimated, and reasonable detail on how slave domestics were estimated. As of now we can tell too little about the quality of these numerically very important items.

2. We shall all doubtless revel in these output and employment estimates. What about those for productivity? At this stage in our inquiry into the nineteenth century we may be acting like Aesop's

monkey. You will remember that by trying to get all the nuts out of the jar at once he ended up with none at all. Now we want three items—employment, output and partial productivity. But to create reliable employment figures we must test them against output series, against capital stock or service figures. And to create output data of fine quality we must check with independent data on inputs (labor among others). Yet if we do so, of course, we lose the degree of freedom needed for creating a productivity ratio. I sympathize with those estimators—I know of at least one—who began happily with my employment series then found it so enmeshed in referrals to output and other data that they could not simply contrive a productivity series from it. But we are at the W. I. King stage in our nineteenth century investigations. Before Kuznets-reliability can be achieved we must first establish each series as truly as may be—in fact, even using partial productivity ratios as a guide in establishing the series. If it is only for the next generation of investigators to reap what we have sown, so be it.

Turn, if you will, to Table 8. Is it really true that current dollar output per transport worker (line 2) was cut in half from 1839 to 1849? (And that constant dollar output per worker in this rapidly expanding sector fell by even more?) Or that the typical bank clerk generated seven times as much output as the small tradesman in 1839 and only three times as much in 1859? Or that finance could triple its small share of the service labor force from 1879 to 1899 while its output per worker was more than cut in half (and wages, in a competitive market, harshly affected)? Or that in 1899 distribution should still have half again as much output per worker as the skilled hand trades? These queries, and others, do not suggest conclusions about productivity, but rather points for inspecting both output and employment estimates to see how such results arose, to study the sensitivity of the estimating procedure.

3. Let us take a look—too casual, to be sure—at the admirably extensive work Gallman and Weiss devoted to output estimation. Table 4 tells us that distribution, transport and housing account for over three-quarters of the service total. How well do the big three qualify? In the absence of much explanatory detail one presumes that after 1869 Barger's margin estimates by kind of business were used, with

some graceful trend added, perhaps, before 1869. Now Barger shows constant ratios by kind of business right up to 1919, except for a marked advance from 1869 to 1879. That advance comes from 1869 figures based on data for a few grocery stores and 1879 figures for the state of Indiana. (Had he used Indiana data for grocery stores in 1879, as is done for other major kinds of business, the advance would have disappeared.) Now what is there in this reasonable activity of stipulating constant ratios by kind of business, and adding some chancy indications of change, that can tell us much about patterns of historic change? Specifically, how margins changed as flatboat stores died out, tin peddlers from Berlin disappeared, roads and competition improved, and cities grew at varying rates? I infer that the nineteenth century margin has a reasonable level—it surely ran between 25 and 40 per cent—but we are not warranted in saying much about how it changed from period to period, nor in comparing it with more modern estimates. A fortiori the analysis of productivity changes, in trade or service, must be hampered.

4. What of other output estimates? (a) *Transport.* The sizable category of wagon transport seems inadvertently omitted. Fluctuations in coasting activity seem—the notes are brief—to be assumed to match those in foreign trade, an unusually perfect correlation to be stipulated. (b) *Finance.* An earnings rate of 5.95 per cent on assets is assumed for all state banks 1839–99—casting a wild light indeed on interregional investment and capital flows. (c) *Professions.* About half the total for the group rests on the hypotheses that per capita medical costs rose from $1.50 to $2.00 between 1839 and 1859, using typical charges for yearly slave medical care. Sampling variability is great, however, with a range of $1.00 to $2.50 being reported in any given year in that period. (d) *Personal Service.* My wage estimates are used for free labor but, although I provide equally *un*satisfactory estimates for each Southern state, hiring rates for the sizable group of slave domestics are here estimated as 80 per cent of the U.S. average in all years, using a surmise DeBow made at one point. Imputed room and board are intentionally excluded, for which I see no conceptual warrant.

5. Distributive margin deserves a comment: its size is great, and its estimate involves the entire deflation procedure for output. Despite

the decisive, if supporting, role played by the retail price deflators we have little indication of their validity and not much description of how they were derived. Prior to 1869 the commodity flow, and hence distributive margin, deflator apparently rests on a combined Massachusetts-Philadelphia retail price series (Table 3; Vol. 30, pp. 92–93, 115). The possible bias in using such an index to deflate U.S. data has been alluded to by Dorothy Brady (Vol. 30, p. 97). Certainly to test the deflation of the largest single service item, distributive spread, we should have a comparison of wholesale versus retail price trends for each major item.

6. For employment Gallman and Weiss have in principle gone back to Carson's manipulation of Population Census data. In practice they have massively adjusted (personal service) or rejected (railroads, federal employees) most of the Census data. They adopted a number of my estimates and seem, essentially, to have followed my procedures for still others. But since they do not provide enough detail in their final estimates, nor explanations of procedure, it is impossible to know the quality of their figures. I can only add one obvious point: the gainful worker figures they derive are at levels inconsistent with most of my figures for 1900 and thereafter, since the latter figures are linked to the kind of industrial census materials used in preparing the national income accounts. Hence most of their service employment series would be at levels inconsistent with those in the national accounts after 1929.

In sum, further work will make these inquiries more valuable, valuable though they surely are already. But of those who give most, most is demanded.

COMMENT

Solomon Fabricant, New York University

One reason it is difficult to accept the Gallman/Weiss results is that the authors stick too closely to the standard system of national accounts.

The standard system, and the concept of GNP and the industrial classification embedded in this system, were developed for use in

modern industrialized economies. The suitability of the system even for these economies is being increasingly questioned, as experience with it teaches us something of its limitations, as the uses to which it is put become more refined, and as change takes place in the structure of the economy and the place of the economic structure in the structure of society as a whole. But there has always been serious doubt about the applicability of the standard system of accounts to economies of a hundred and more years ago, to present-day developing countries, and even to the new crop of "centrally planned" economies. We are, or should be, troubled by the kinds of questions provoked by A. G. B. Fisher and Colin Clark when they talk about the so-called "tertiary industries" and the relation of these industries to the stage of economic development. These questions are at least twenty years old. They came up in the Conference on Research in Income and Wealth in 1946.[1]

The questions relate not only to the service industries, but also to construction, manufacturing, and transportation, not to mention still other industries. But they apply with special force, perhaps, to the service industries. The ancient problem raised by the omission of household work in preparing food for consumption, mending and washing clothes, maintaining the home and other buildings, providing health and educational and fire protection services—the list is endless—is just one of these questions. When the service industries are at the center of our attention, and even when we are concerned with them only in order to add services to commodity output to get total national product, we cannot ignore important kinds of household production and their shifts from and back to the household.

Not only total production, but also its industrial distribution is in question. Industries change in content, as we go back in time, even though their names remain the same. To use the terminology of the Census of Manufactures, "primary product specialization ratios" and "coverage ratios" become different, sometimes very much different.

These questions apply also to the industrial distribution of the labor

[1] Gallman and Weiss refer to my paper on "The Changing Industrial Distribution of Gainful Workers: Comments on the Decennial Statistics, 1820–1940," *Studies in Income and Wealth 11,* New York, NBER, 1949, in which some of these questions are mentioned. See also P. T. Bauer and B. S. Yamey, "Economic Progress and Occupational Distribution," *Economic Journal,* December 1951.

force and to its total magnitude. Besides housewives, students also come into question. When the objective is to study unemployment, there is less (though still some) error in classifying students as out of the labor force. But for the use to which the estimates made by Gallman and Weiss will be put, it is arbitrary to exclude students. As Gallman and Weiss know, students were in fact included in the Census of Occupations in 1850 and 1860 when over fifteen years of age, even when not also gainfully occupied. Even today, and even in the United States, it would be wrong for many purposes to omit students from any calculation of the size and distribution of manpower, or to omit the work they do from the evaluation of current production and investment. I am sure students are not omitted by centrally planned economies when they make their calculations and plans.

Consumers as a whole also are part of the picture. We are already talking, at this conference, of demands on the time of consumers, and of substitution between the work done by consumers and by producers in retail trade, health services, transportation, and other kinds of production. There is little excuse for ignoring these shifts and their relevance for historical estimates, now that Gary Becker's paper has been out for over two years.[2] As the Census of Transportation made clear recently, a very substantial portion, probably the major portion, of local transportation between home and work is provided now not by the "transportation industry" but by the household. Related questions come to mind when we recall the famous portal-to-portal case which tested the hours and overtime-pay section of the Fair Labor Standards Act of 1938.

Are these trivialities? I do not think so, but of course some efforts at estimation are needed. Economic historians should be alert to the possible bias in GNP as a measure of national output. Maybe the bias leads to an overstatement of economic growth over the nineteenth and early twentieth centuries, and to an understatement in more recent decades, at least in the United States. If interest is in the industrial distribution of production or of the labor force at a moment in time, the relative importance of such industries as domestic service and education is vastly underrated when housewives and students and

[2] "A Theory of the Allocation of Time," *Economic Journal*, September 1965.

the work they do are excluded. And international comparisons of industrial structures are spoiled by these exclusions. Also, great changes have taken place in the relative numbers of housewives and students. What would the Gallman/Weiss industrial distributions look like, in 1839 and in 1899, if housewives and students were not excluded?

What I am suggesting, of course, is that the national accounts need to be reconstructed when interest is in long-term economic change—and also in comparisons between developed economies on the one hand and developing or centrally planned economies on the other.

O. J. FIRESTONE, University of Ottawa

In light of the importance of developing more systematic accounts for the health sector, it is of interest to note that the Central Bureau of Statistics in the Netherlands has published three reports on the cost and financing of public health services.[1]

The survey covers the total expenditures of the central government, the provinces and municipalities, funds collected and disbursed by insurance companies, industries and households. The key data show goods and money flows in connection with preventative and curative health care, presented in a double entry form showing expenditures and receipts. Other data include per capita health care expenditures by type, number of days by type of medical treatment, and number of persons insured with sick funds and insurance companies. Most of the tabular material provides details for six sectors: the central government, the provinces, the municipalities, households, industries and a small residual grouping called "undistributed." Statistics are also provided of receipts and expenditures relating to the activities of societies concerned with health care in the Netherlands and of sick funds.

While in its present form of development, the Dutch Health Ac-

[1] The first and third reports were published only in Dutch; the second report entitled "Cost of Health Care in the Netherlands, 1958," *Statistical Studies No. 15, February 1963*, The Netherlands Central Bureau of Statistics, The Hague, 1963, was also published in English.

counts do not quite dovetail with the National Accounts, they appear to show the direction in which balancing accounts can be developed to measure on an integrated basis economic activity and money flows relating to efforts to maintain, preserve and improve the health of the nation. No other country appears to have done similar work in developing national health accounts and the question arises whether this would not be a useful area for further research work in the United States and elsewhere.

REPLY BY GALLMAN AND WEISS

I

Easterlin's comment is exceptionally thoughtful, careful and constructive. We believe that the results of his tests are more favorable to the estimates than he indicates, but otherwise have no serious quarrel with him.

The ratio of service workers (less those in domestic service and the hand trades) to urban population, 1839 to 1919, is contained in line 2 of Easterlin's Table 1. The ratio falls from a peak of almost 26 per cent, in 1839, to a trough of just over 18 per cent, in 1869, and then rises to a level of almost 23 per cent, in 1919. Easterlin believes that the high levels achieved in the pre-Civil War years, the fairly marked drop to 1869, and the subsequent rise all tell against our estimates. He believes that the growth of the work force involved depended upon urban growth and that, therefore, the ratio in line 2 should either remain constant across time, or perhaps rise gently. We do not agree.

Easterlin's expectations appear to be derived from a model that explains the level of service employment exclusively in terms of urban phenomena. Such a model may perform adequately when urban population and income are large, relative to the national aggregates, and when even rural services are dispensed importantly from an urban setting. But in 1839 only roughly 10 per cent of the U.S. population lived in urban places. At that date, one would suppose that *rural* determinants of the size of the service labor force would have had an important independent effect—relatively much more important than

in subsequent American history. Consequently, the ratio of *all* service workers to *urban* population should have been high in 1839.

The point can be demonstrated by a simple procedure. Easterlin seems to be saying that the probable numerical relationship between urban population and the service work force can be represented by a coefficient that either remains constant or drifts slowly, and perhaps irregularly, upward from 1839 to 1919. Now let us introduce a rural impact on the service labor force and express it as a coefficient of the rural population—say .01. We can then compute the rural impact on the service labor force at each date and eliminate it from the labor force figure. The numbers of workers remaining, expressed as ratios to urban population, are as follows:

1839	17.4%	1889	19.4%
1849	17.5	1899	19.5
1859	16.8	1909	20.9
1869	15.3	1919	21.6
1879	16.1		

The pre-Civil War values are now lower than those at the turn of the century, as Easterlin appears to believe they should be. The values still drift downward from 1849 to 1869, but the movement is very much less pronounced than in Easterlin's Table 1. In any case, no one, Easterlin least of all, would suppose that the results of the complex interrelations among urban population, rural population and service labor force could be captured with any greater precision by so simple a model. The point of the exercise is to demonstrate that if the rural sector is allowed to have an independent effect on the number of service workers—even a very small effect—the pattern described by the ratios in line 2 of Easterlin's Table 1 becomes by no means unreasonable. The premise appears to us to be entirely proper and, thus, Easterlin's conclusion that the ratios in his table tell against our series does not seem warranted.

The movements in the ratios relating to the components of the service sector (Easterlin Table 1, lines 3–6, 8, 9) also strike us as more plausible than Easterlin apparently believes. In a nation in which a small fraction of the population lives in cities (U.S., 1839), trade, the professions, government and education *must* be staffed importantly by people whose activities are oriented to the countryside, and many of

these people—country storekeepers, one-room schoolteachers, country doctors, even law officers—must reside in the country. It is not at all surprising to us, then, that the ratio of, e.g., *all* professionals to *urban* population is substantially higher in 1839, when the *rural* population accounts for roughly 90 per cent of the population, than in 1869, when it accounts for about 70 per cent.

One final point should be made with respect to Easterlin's comments on Table 1. Easterlin argues that the data for 1869 onward have a firmer basis in the census than the data for earlier years. "Only from 1869 onward did the census of occupations, even in concept, embrace the entire service sector." However, for all elements of the service sector except personal services, the 1859 census provides very nearly as full an account as do the subsequent censuses. Furthermore, the taking of the census of 1869 was attended by special difficulties, which must make one a little wary of the results obtained. Easterlin scans the evidence, 1869–1919, to obtain an impression of probable trends. He might better use 1859, 1879–1919. Were he to do this, he would be less likely to conclude that the early estimates contain an upward bias.

Easterlin's second test involves the comparison of our estimates of free domestics, 1839, 1849, 1859, to his estimates of foreign-born females. He finds that the ratio of the former to the latter drops from .58, in 1839, to .40, in 1849, and .32, in 1859 and concludes that the pattern is not plausible: "could three out of every five immigrant women have been employed as servants at this date [1839]? Moreover, the sharp decline in the ratio contrasts sharply with the stability of the ratio of slave domestics to slave population during this period."

The test is almost identical, in kind, with the preceding one and is subject to the same criticism. Easterlin's question implies that all free domestics were immigrant women. But they weren't. Some were men, some were native women. Among native women, domestic service was probably most common for free Negroes. Now the ratio of free female domestic servants to foreign-born women plus free Negro women stands at .36, in 1839, and .27, in 1859. Assume, further, that just 1 per cent of free white native women were in domestic service in the antebellum years. Then less than a quarter of foreign-born and free

Negro women were servants in 1839, and something over one-fifth, in 1859. These ratios seem reasonable enough and the drop between 1839 and 1859 is by no means troublesome.

According to Easterlin the population of immigrant women increased nearly fivefold, 1839–1859, a period during which the total population (and, even more relevant, the non-Southern population) did not even double. Assuming that all free female domestics were employed outside the South and that average household size outside the South was five, then our estimates imply one domestic servant per 8.9 families, in 1839, and one per 6.6 families, in 1859, the change in the ratio presumably reflecting the increase in supply afforded by immigrant women. But let us suppose with Easterlin that the correct ratio of free female domestics to foreign-born women in 1839 is .32, the same as in 1859. Then there were only 132,000 free female domestics in the U.S. in 1839, or one for every sixteen households in the non-South, as compared with one for every 6.6 households, in 1859. Is this change over time plausible? We think not. Again we think that Easterlin's model is unduly simple. It seems much more reasonable to us to suppose that immigrant women in some measure replaced native women as domestic servants during the decades 1839–1859, a possibility for which Easterlin does not allow.

Let it be understood that we are well aware that our estimates of the numbers of free domestics in 1839 and 1849 are weak. However, we think that Easterlin's test does not introduce a new basis for distrusting them. Indeed, if anything, the ultimate results of the test tend to strengthen one's confidence in the original estimates.

One final point is suggested by Easterlin's two tests and his comments concerning them. We agree that distributions of the population between rural and urban areas, among ethnic groups, etc., are valuable in testing our estimates and potentially valuable for producing new, stronger ones. But the preceding paragraphs show very clearly that before the latter objective can be approached we need a good deal of evidence on the numerical relationships between components of the labor force and these variables. Where can this evidence be acquired for the pre-Civil War period? The only comprehensive source of which we are aware is the manuscript census. To mount an assault on this body of data will require a major input of resources. Thus, we

join Easterlin in looking forward to new approaches to the issues he has raised, but we do not expect early results.

II

Stanley Lebergott begins by placing us in the distinguished company of Kuznets and Goldsmith. But then he topples us from these heights. We fall through all of the history of mankind, down through the origins of man: in the fourth paragraph we fetch up beside Aesop's monkey, gibbering away over some nuts in a jar.

Once these flights of fancy are over, Lebergott turns to appraisals of our work that, at base, seem fair and useful enough. However, there are errors of detail and emphasis that give to his criticism too severe an aspect.

1. Lebergott asks for "reproducibility," leaving the impression that our appendix provides inadequate descriptions of our estimating procedures and that the reader has no recourse. It should be said, therefore, that the present paper rests importantly on two previous studies, the Volume 30 paper by Gallman, and the dissertation by Weiss; both cited in the appendix, both available, and both containing further estimating details.

2. While our appendix notes may leave something to be desired, Lebergott's rendition of them is also less than perfect: (a) Thus he says we assumed that fluctuations in coasting trade matched those in foreign trade, whereas the notes show that the relationship was subjected to major modifications—changes in coasting rates relative to foreign trade rates, differences in tonnage engaged, allowances for shorter and more frequent trips in coasting. (b) In describing our procedure for obtaining distributive margins before 1869 he writes: "In the absence of much explanatory detail one presumes that after 1869 Barger's margin estimates by kind of business were used, with some graceful trend added, perhaps, before 1869." Apparently he failed to notice that the estimates are moored at 1839 by Seaman's work on margins. (c) He seems to infer (last four sentences of paragraph numbered 3) that the trend in the ratio of value added by distribution to the value of commodities flowing into distribution (hereafter called the "aggregate margin") depends exclusively on trends in the outlet margins, failing to notice that changes in the composi-

tion of the flow into distribution also have bearing. (d) He appears to regard the trend over time in the "aggregate margin" as crucial to the trend in value added by distribution, forgetting the effect on the latter of the trend in the value of commodities flowing into distribution. He accepts as reasonable a variation in the "aggregate margin" within the limits .25 and .40. The maximum rise in value added obtainable through an increase in the "aggregate margin," operating alone, is then 60 per cent. In fact, value added rose by more than 1300 per cent, 1839–1899, indicating that the variable neglected by Lebergott must have been of very great importance. (e) Lebergott does not explain how he arrived at the limits, .25 and .40. Our guess is that he subtracted value added by distribution (our Table A-1) from the value of commodities flowing to consumers (Volume 30, page 27), for the years 1839 and 1899 (treating the flow across the decade 1894–1903 as roughly equal to the flow across the year 1899) and then divided the residual through value added by distribution. This procedure involves the assumption that all commodities flowing to consumers passed through distributive channels. Of course they did not. If the share passing through distributive channels rose over time, then this procedure overstates the importance of the rise in the "aggregate margin." Thus the maximum increase in value added obtainable from a rise in the "aggregate margin" is less than 60 per cent. In this context, the estimating procedure for deriving outlet margins (point b, above) assumes a much more limited importance than Lebergott gives it.

3. Lebergott also misreads our tables. Thus he treats the values in Table 8 as absolutes, whereas they are, in fact, relatives. For example, output per worker in finance was not "more than cut in half" between 1879 and 1899, as Lebergott says it was, but fell relative to the sectoral average. In reference to Table 8 he asks: "Is it really true . . . that the typical bank clerk generated seven times as much output as the small tradesman in 1839 and only three times as much in 1859?" But the output involved was "generated" not only by bank clerks and small tradesmen, but also by bank officers and large traders, property as well as labor. The denominators of the "output per worker" ratios include not only employed clerks, bank officers, large and small traders, but unemployed members of these occupations, as well—i.e., workers "generating" no output at all. That at least one of these factors has

importance in the explanation of the findings in question is suggested by the fact that the average number of employees per bank nearly tripled between 1839 and 1859. The change may reflect a change in the occupational structure of the labor force in finance. On the other hand, the occupational structure in the hand trades was quite stable over this period.

4. In general, the tests Lebergott conducts are partial and weak, as the preceding paragraph suggests. One final example (out of several available) will have to suffice. Lebergott appears to doubt our finding about the relative levels of output per worker in distribution and the hand trades, at 1899. The basis for this doubt is not clear, but Lebergott again appears to be treating our results as though they should reflect relative labor earnings in the two industries. He neglects earnings of property. Preliminary capital stock figures for the two industries tend to support our finding that value added per worker in distribution was markedly higher than value added per worker in the hand trades. Lebergott's tests do perform one valuable function, perhaps intended. Read with care and thought they support our own view that the interpretation of the cardinal differences and the decade-by-decade changes described in Table 8 is not a simple matter. In our paper we did not attempt interpretations of this kind, focusing instead on the ranking of the ratios and the broad, long-term patterns of change. The table was drawn up for this purpose and the reader who wants to use it for other purposes cannot do so effectively without a careful consideration of the wide range of factors producing each value in the table.

5. Lebergott's desire for colorful exposition stands in the way of clarity. Thus he says our estimates of value added by state banking cast "a wild light indeed on interregional investment and capital flows." In fact, they cast no light on regional questions, nor were they intended to, nor can we imagine why they should be expected to. Presumably Lebergott had something else in mind. Presumably he posits a specific connection between regional flows and changes in the level of the ratio of aggregate earnings to aggregate assets of state banks. The nature of the connection, why a knowledge of it would put our estimates in question, and the importance of the matter are

neither stated nor evident. More might be said. But the above will perhaps be enough to place Lebergott's comment in proper perspective.

III

Solomon Fabricant expresses concern over our adherence to the "standard system" of national accounts. We appreciate the deficiencies of the standard system and hope that one day the unconventional conceptual boxes Fabricant describes are filled with appropriate estimates relating to the nineteenth century. That we have not attempted in this paper to fill them reflects only limitations on our time and resources. The research projects required to meet Fabricant's requests are of formidable dimensions, as he is surely aware. When we began our paper we believed (and we still believe) that the scholarly returns would be better if we were to work initially within the traditional framework. We knew that we could simplify our estimating problems in this way and that, therefore, we could expect to compile a more comprehensive and reliable set of figures than would be possible were we to deploy our limited resources across the wide horizons to which Fabricant's eyes are turned.

Other considerations were more persuasive. Our previous work and the work of others had suggested to us that the standard system is far more relevant to nineteenth century America than Fabricant supposes. It may be useful to describe very briefly the work that influenced our decision, since Fabricant's treatment of these issues makes no reference to it and, therefore, we may suppose that it is not widely known.

1. According to Fabricant "there has always been serious doubt about the applicability of the standard system of accounts to economies of a hundred and more years ago. . . ." This judgment, as it relates to the American case, is at variance with the views of notable economic analysts of the last century. For example, beginning in the mid-1840's Ezra Seaman published a series of accounts for the U.S. that are thoroughly modern in concept and execution. Seaman built up estimates of the national product from both the income-originating and the final-flow sides, anticipating in the latter both the concepts and the procedures to be developed by Kuznets in the following cen-

tury. Seaman's objects were also modern: he was chiefly interested in establishing an empirically-based analysis of economic growth that would have policy implications. While Seaman's work is the most sophisticated of the time, others were preparing estimates and thinking of economic problems within a national accounts framework, encouraging the idea that the conventional system is relevant to the nineteenth century economy. (See Robert E. Gallman, "Estimates of American National Product Made Before the Civil War," *Economic Development and Cultural Change,* April 1961, pp. 397–412.)

2. That Seaman conceived of the economy in much the same terms as did Kuznets, in the following century, should not be entirely surprising. We are misled if we think of the U.S. in the 1840's as roughly equivalent to a modern underdeveloped economy. American performance in that decade was already very high, even by modern standards. (See the papers by the senior author in Volumes 24 and 30 of this series, as well as the previously-cited paper.) Fabricant's linking of "economies of a hundred and more years ago" with "present-day developing countries" invites inferences regarding the American case that are not legitimate.

3. Fabricant's doubts with respect to the standard system relate, in his own words, "not only to the service industries, but also to construction, manufacturing, and transportation. . . ." So far as the commodity-producing activities are concerned, there is some basis in the existing literature for appraising the quantitative significance of the problem to which Fabricant refers. (Fabricant recognizes the need for measurements, but does not canvas those available.) The senior author, in a paper published in Volume 30 of this series, attempted to estimate the maximum impact on measurements of the pace and structure of U.S. growth, 1839–1899, that could be obtained by broadening the concept of the national accounts to include the main elements of manufacturing and construction lying outside the market system. Each reader should judge the results for himself. Our own conclusion is that the standard system comes through the test very well. For example, the rate of growth of GNP and the structure of flows to consumers are essentially alike in the standard set of measurements and in those that allow for the chief manufacturing and construction activities carried out beyond the orbit of the market.

4. So far as service activities are concerned, Fabricant places special emphasis on our failure to incorporate opportunity costs of education in our estimates of output. But Fishlow's figures show that the opportunity costs of education in the years 1860, 1880 and 1900 were at levels equal to only 1.4, 1.9, and 2.4 per cent of our estimates of value added by the service sector (Albert Fishlow, "Levels of Nineteenth Century American Investment in Education," *Journal of Economic History,* December 1966). That is, the omission appears to be of little quantitative significance in the nineteenth century, the period to which our paper is confined.

The evidence described above led us to suppose that the proper place to begin the study of the service sector in the nineteenth century is with measurements following the conventional forms. With these in hand, work along the lines proposed by Fabricant ought to proceed more smoothly, if only because there is now a surer basis for identifying the components of output and labor input requiring treatment and, additionally, some materials from which imputations may be made. While we hope work in these areas will proceed, we regard the matter as very much less pressing than does Fabricant, for the reasons indicated above.