

COMMODITY OUTPUT, 1839-1899

TABLE A-7
Value Added by Manufacturing, in Current Prices, by Industry
Group and by Source of Data, 1839
(dollar figures in millions)

Industry	Based on Output				Total
	Based on Value of Product Data of Census Report ^a	Data of Census Report and Estimated Prices ^b	Taken from Seaman ^c	Extrapolated or Interpolated ^d	
Ordnance		1		^e	1
Food products	10	8	4	4	26
Tobacco	3				3
Textile products	30			4	34
Apparel	5			6	11
Lumber and wood products			4	10	25
Furniture and fixtures	5				5
Pulp, paper, and paper products	3				3
Printing and publishing				15	15
Chemicals	2	8		3	12
Products of coal				1	1
Leather and leather products	18	6		6	31
Stone, clay and glass products	12 ^f			^e	12
Metals	7	14		4	25
Machinery	7				7
Transport machinery	11			9	20
Professional instru- ments				1	1
Musical instruments	1				1
Miscellaneous				10	10
Total	125	36	8	71	240
Percentage of total value added	52	15	3	30	100

Details may not add to totals because of rounding.

^a Census value of output returns times the 1850 census ratios of value added to value of output, by industry group. (Same method used throughout to get manufacturing value added in 1839 from value of output.)

^b Prices: Producers' prices extrapolated from later censuses on wholesale prices from Cole (pig iron, bar iron, domestic whiskey) and the Aldrich Report, Part II (pig lead, p. 163, sole leather, p. 192); Seaman's prices of soap, candles, gunpowder, ashes, tar, pitch, rosin, turpentine (pp. 455, 457). Cannon and small arms prices of the Mass. census for 1844.

^c Value of output: Seaman, p. 456 (products of mills) divided between "food products" and "wood products" as in 1849.

^d Textile products and leather and leather products estimated from data in the Mass. censuses for 1836 and 1844 and the 1850 federal census. Other items extrapolated from 1849 on value added by the relevant industrial groups.

^e Less than \$500,000.

^f Including stoneworking, which was partly estimated.

OUTPUT GROWTH AND PRICE TRENDS: U.S.

The completeness of the federal census returns was checked indirectly. The manufacturing censuses contain data on numbers employed, collected from employers. The occupational censuses contain data on gainful workers, collected from households. The Fabricant estimates of gainful workers rest on the data of the occupational censuses. The numbers employed in the manufacturing industries represented in the present series were compared with the Fabricant estimates of gainful workers in manufacturing (adjusted as described in the notes to Table 1) for 1859, 1869, 1879, and 1889. The census occupational data were also used directly to check the manufacturing census returns of 1849, 1859, 1869, and 1879. The tests turn up no evidence that the later manufacturing censuses were more complete than the earlier censuses.

The interpolating series (for the intercensal dates) accounted for about a quarter of national manufacturing value added in the forties, about a third in the fifties, and about 15 per cent in the seventies.

CONSTRUCTION

The construction estimates are the result of (1) estimating the flow of construction materials into domestic construction, at producers' prices, (2) marking up these values for transportation and distribution, and (3) marking up the values in delivered prices for value added by construction. For 1874 and 1884, however, value added was interpolated on Kuznets' new estimates of gross construction.⁵⁴

Flow of Materials

For 1869, 1879, 1889, 1894, and 1899 Shaw's estimates (pages 64, 65) were used. The estimating technique for the remaining years is given in the notes to Table A-8.

Transportation and Merchandising Markup

The transportation and merchandising markup was worked out from Barger's data for 1869, 1879, 1889, and 1899 and extrapolated to the earlier years on the assumption that the postwar trend in the ratio of transportation and distribution costs to the value of construction materials entering domestic consumption existed in the prewar period as well. The notes to Table A-9 give the details of the method.

Markup for Value Added

Two construction series were produced (Table A-10), the difference between them lying in the assumptions made in marking up the value of materials flowing into domestic consumption for value added by construction. Variant A series rests on the assumption that the trend

⁵⁴ Kuznets, *Supplement to the Summary Volume*.

COMMODITY OUTPUT, 1839-1899

TABLE A-8
Value of Construction Materials Flowing into Domestic
Consumption, in Current Prices, Quinquennial, 1839-1859
(millions of dollars)

Type of Material	1839	1844	1849	1854	1859
Railroad rails ^a	4	3	6	20	17
Railroad ties ^b	d	d	1	2	1
Other ^c	45	49	67	133	138
Total	48	53	73	155	156

Figures may not add to totals because of rounding.

^a 1854, 1859: Output plus net imports times price. Output—*Mineral Resources*, 1883, p. 138. Net imports—*Commerce and Navigation*, Secretary of the Treasury, 1855, p. 199, 1860, pp. 104, 377, and 460. Price—Unit value in 1869 (Shaw's value of output divided by census return of output) extrapolated on a wholesale price of iron rails (Aldrich Report, Part II, p. 189). 1839-1849: Consumption of rails times price. Consumption—Extrapolated from 1854 on estimates of new track and replacement track laid each year, based on data on new track laid, track in use, and average life of track, taken from the 1880 Census, Vol. IV, *Report on the Agencies of Transportation in the United States*, Part I. Price—Unit value in 1869 extrapolated to 1849 on a wholesale price of iron rails (see note for 1854 and 1859) and to 1844 and 1839 on Cole's price "bar iron, common, English."

^b Extrapolated from Shaw's estimate of value of output in 1869 (assumed to equal consumption) on the product of indexes representing tie requirements (see note a) and tie prices (Aldrich Report, Part II, p. 228, oak board, and Cole, "pine, New York").

^c Value of output plus the net value of imports. *Value of output*: 1839, 1849, 1859—The sum of detailed estimates made by extrapolating Shaw's 1869 estimates (pp. 64-65) on data of the federal censuses. 1844, 1854—Interpolations of estimates for 1839, 1849, 1859 on data of the Conn. (1844 only), Mass., and N.Y. censuses (accounting for about 10 per cent and 15 per cent of national value of output of construction materials in 1844 and 1854, respectively). *Value of net imports*: Rough estimates worked out from the reports of the Secretary of the Treasury. (Net imports amount to less than \$2 million in every year.)

^d Less than \$500,000.

in the ratio of the value of construction output to the value of construction materials was zero. This assumption is supported by the returns of the construction hand trades in the censuses of 1869, 1879, 1889, and 1899, which show ratios of value of output to value of materials of 2.06, 1.93, 2.13, 2.28. Seaman (page 456) estimates that the value of houses built in 1839 was about 2.22 times the value of materials consumed. The census of construction for 1939 shows a ratio of 2.21. The ratio 2.0 was used to get value of output from value of materials.

In *National Product since 1869* (page 100) Kuznets assumes that the ratio of the value of construction output to the value of materials in constant prices had a zero trend. Variant B series is based on this assumption.

The basic flow-of-materials data on which the estimates rest are reasonably sound. But quite clearly the evidence to guide one in estimating the total value of construction from these data was scanty,

OUTPUT GROWTH AND PRICE TRENDS: U.S.

TABLE A-9
 Cost of Transportation and Distribution of Construction Materials
 Flowing into Domestic Consumption, in Current Prices, Decennial,
 1869-1899

<i>Type of Cost</i>	<i>1869</i>	<i>1879</i>	<i>1889</i>	<i>1899</i>
Wholesale Markup				
Lumber outlets:				
Markup (%) ^a	11.1	11.1	11.1	11.1
Weight ^b	22	26	31	35
Hardware outlets:				
Markup (%) ^a	23.5	23.5	23.5	23.5
Weight ^b	45	40	35	31
Weighted mean markup (%)	19.4	18.6	17.7	16.9
Retail Markup				
Coal and lumber yards:				
Markup (%) ^a	22.0	22.7	23.5	24.2
Weight ^b	27	34	43	48
Hardware outlets:				
Markup (%) ^a	33.7	33.7	31.1	28.5
Weight ^b	45	40	35	31
Weighted mean markup (%)	29.3	28.6	26.9	25.9
Distribution Cost (\$ mill.)				
Wholesalers:				
Construction materials handled ^c	232	236	411	452
Cost of wholesaling ^d	45	44	73	76
Retailers:				
Construction materials handled ^e	289	300	540	608
Cost of retailing ^f	85	86	145	157
Total distribution cost	130	130	218	233
Transportation Cost to First Distributor (\$ mill.) ^g	29	16	39	49
Total transportation and distribution cost (\$ mill.)	159	146	257	282

^a Based on Harold Barger, *Distribution's Place in the American Economy since 1869*, Princeton University Press for NBER, 1955, pp. 84 (wholesale) and 81 (retail). Barger's margins (percentages of the sales value of goods) were recalculated as percentages of the purchase value of goods. Barger's margins are intended to measure the entire cost of moving goods from the first distributor to the ultimate purchaser (*ibid.*, p. 55).

^b The share of total construction materials entering distribution which flow through each outlet (*ibid.*, p. 139).

^c Input of construction materials into the distributive system, including the costs of transportation to the first distributor (*ibid.*, p. 131) times the share of input flowing through wholesaling (p. 139).

^d Weighted mean markup for wholesaling times construction materials handled by wholesalers.

^e Input of construction materials into the distributive system, including the costs of transportation to the first distributor (*ibid.*, p. 131), plus the cost of wholesaling.

^f Weighted mean markup for retailing times construction materials handled by retailers.

^g *ibid.*, p. 130.

COMMODITY OUTPUT, 1839-1899

TABLE A-10
Value Added by Construction and the Value of Total Construction, Variants A and B, Quinquennial, 1839-1859 and 1869-1899
(dollar figures in millions)

Series	1839	1844	1849	1854	1859	1869	1874	1879	1884	1889	1894	1899
VARIANT A: CURRENT PRICES (dollars)												
1. Materials entering construction	48	53	73	154	156	377	444	444	839	1,004	1,006	1,006
—producers' values	27	28	37	75	72	159	146	146	257	294	282	282
2. Distribution cost	75	81	110	229	228	536	646	590	1,008	1,096	1,288	1,288
3. Value added by construction	150	162	220	458	456	1,072	1,292	1,180	2,016	2,192	2,596	2,576
4. Value of total construction												
VARIANT A: 1879 PRICES (dollars)												
Total construction:												
5. Price index (1879 = 100)	76	70	72	83	79	133	123	100	112	113	103	115
6. Value (dollars)	197	231	306	553	579	808	1,049	1,180	1,803	1,948	2,533	2,244
VARIANT B: 1879 PRICES (dollars)												
Construction materials:												
7. Price index (1879 = 100)	87	77	77	90	82	132	123	100	107	107	92	105
8. Value (dollars)	87	105	143	255	277	405	526	590	946	1,029	1,417	1,224
9. Value added (dollars)	110	126	163	298	302	403	523	590	857	919	1,116	1,020
VARIANT B: CURRENT PRICES (dollars)												
10. Value added by construction	87	105	143	255	277	405	526	590	946	1,029	1,417	1,224
11. Value of total construction	174	210	286	510	554	810	1,052	1,180	1,892	2,058	2,834	2,448
VARIANT B: CURRENT PRICES (dollars)												
12. Value of total construction	132	147	206	423	436	1,075	1,296	1,180	2,115	2,315	2,905	2,813
13. Value added by construction	57	66	96	194	208	539	650	590	1,107	1,219	1,607	1,525

(Notes to Table A-10 on next page)

especially for the prewar period. It was important, then, that the estimates be tested. Table A-11 presents estimates (some very crude) of several important components of total construction for 1839, together with the estimates from the flow-of-materials data. The flow estimates are \$40 million (variant B) and \$60 million (variant A) larger than the sum of the independent estimates. But the independent estimates do not include the value of business building, including nonresidential agricultural building. It seems likely that this component was about as large as the housing component in 1839. The housing component is roughly the size of the gap between the flow estimates and the sum of the independent estimates. The test is crude but the results are encouraging.

The variant A series was deflated and the variant B series inflated by use of a cost-of-production index (see Table A-10). Grebler, Blank, and Winnick indicate that the long-term movements of a construction cost index from 1890 through 1934 are "remarkably similar" to those of a true price index.⁵⁵ However, the present index has at least two minor weaknesses. The only materials represented are building materials and the materials prices are entirely wholesale prices. Building materials prices probably rose more rapidly (or fell more slowly) during the period than the prices of nonbuilding construction materials (e.g. railroad rails). On the other hand, wholesale prices probably rose more slowly (or fell more rapidly) than retail prices (see Table A-8). The effects of the two weaknesses of the index may offset.

⁵⁵ Leo Grebler, David M. Blank, and Louis Winnick, *Capital Formation in Residential Real Estate: Trends and Prospects*, Princeton University Press for NBER, 1956, p. 352.

Line 1: 1839-59—Table A-8; 1869-99—Shaw, pp. 64-65.

Line 2: Table A-9, interpolated and extrapolated on the value of materials entering construction (see text).

Line 3: Value added is taken to be equal to the value of materials, at cost to the user (lines 1 plus 2). Estimates for 1874 and 1884 are interpolations on Kuznets' new estimates (see text).

Line 4: Line 1 plus line 2 plus line 3 (or 2 times line 3).

Line 5: Made up from an index of building materials (weight—2) and an index of wages in the building trades (weight—1). The former is the Warren and Pearson index, converted to the base 1879, without re-weighting (pp. 100-101). The latter was made up from data in the Aldrich Report, Part I, p. 173, carried from 1889 to 1899 on the Douglas index, *Historical Statistics*, p. 67. The weighting is based on census evidence on the relative importance of wages and materials costs (in current prices).

Line 6: Line 4 divided by line 5.

Line 7: See note to line 5.

Line 8: Line 1 plus line 2 (or line 3) divided by line 7.

Line 9: Line 6 minus line 8.

Line 10: Value added is taken to be equal to the value of materials, in prices of 1879 (line 8). See text.

Line 11: Line 10 plus line 8 (or 2 times line 10).

Line 12: Line 11 times line 5.

Line 13: Line 12 minus the sum of line 1 and line 2.

COMMODITY OUTPUT, 1839-1899

TABLE A-11
Estimates of the Value of Construction, 1839^a
(millions of dollars)

1. Housing	51
2. Public construction (other than canals and railroads)	12
3. New York, Pennsylvania, and Ohio canals	10
4. All other canals	3
5. Railroads	17
6. Lines 1 through 5	93
7. Construction omitted from lines 1 through 5: business building (including agricultural nonresidential building), private expenditures on bridges, turnpikes, river and harbor improvements	
8. Estimates of the value of total construction made from the flow of construction materials:	
Variant A	150.0
Variant B	132.0

^a All items include expenditures on new construction and repairs.

SOURCES:

Line 1: Seaman, p. 456.

Line 2: Seaman, p. 284, "Increase in other public property, such as roads, bridges, churches, national, state and county buildings, forts, harbors, etc." (but excluding canals and railroads) plus an allowance (\$2 million) for repairs.

Line 3: Harvey Hirst Segal, "Canal Cycles, 1834-1861, Public Construction Experience in New York, Pennsylvania and Ohio," Ph.D. thesis, Columbia University, 1956, pp. 117, 118, and 210.

Line 4: Rough estimate based on data in *1880 Census*, Vol. IV, *Report on the Agencies of Transportation*, T. C. Purdy, *Report on the Canals*, pp. 22-25 and 31-32.

Line 5: Estimated from data of the *1850 Census, Compendium*, p. 189.

Value of Manufactured Producers' Durables

The 1869-99 current price data are Shaw's (pages 61, 62). In the main, the prewar estimates are extrapolations of Shaw's detailed estimates for 1869 (pages 124-133) on census data (Table A-12).

TABLE A-12
Value of Manufactured Producers' Durables, Decennial, 1839-1899
(dollar figures in millions)

Year	Current Prices	Price Index (1879 = 100)	1879 Prices
1839	\$26-29	117	\$22-25
1849	64	117	55
1859	119	106	112
1869	296	154	193
1879	322	100	323
1889	562	80	700
1899	829	80	1,034

Source: See text.

Two questions arise:

1. Are census data sufficiently detailed to assure that extrapolating series are comparable over time?
2. If they are, was the division of a given product between use in production and other uses constant between 1839 and 1869?

Census data are given in tolerable detail for 1849 and in profuse detail for 1859. The returns for 1839, however, leave something to be desired. The content of one major item was sufficiently doubtful as to require two estimates to be made, based on different interpretations of the item.

On the second question, the assumption is probably justified for finished products that went almost exclusively to producers in 1869 (and later years), and quite clearly had no uses (or very limited uses) in the hands of others (e.g. locomotives). The principal items failing to meet these criteria are store and office furniture (extrapolated on furniture), business vehicles (extrapolated on carriages and wagons), cordage, and saddlery and harness. These items are important, contributing between $\frac{1}{5}$ and $\frac{1}{6}$ of the total value of manufactured producers' durables. For an estimating error on this account to have a marked effect on the total estimate, however, the change in the share going to producers would have to be pronounced indeed.

Current price estimates were deflated by use of a price index weighted by the components of the value of output estimates. Aldrich Report prices were used, principally. They were carried to 1899 on Shaw's data and pieced out for the earlier years by use of prices from Cole and Warren and Pearson. The Aldrich Report prices used were as follows: two hoop pails, wooden tubs (to 1840), scythes, shovels, harness leather, mortise locks, rim locks, anvils, kitchen chairs (to 1849), bedroom chairs, kitchen tables, meat cutters, circular saws, crosscut saws, hand saws, standard hand saws (to 1859), files (4", 8", 12"), augers, chisels (to 1869). A lumber price index, which moves more nearly with implement prices than any other series available for the earlier years, was taken from Warren and Pearson (p. 118). Also used were leather prices from Cole ("Spanish sole oak at Philadelphia," "hemlock sole at New York," and "sole, at New Orleans").

Current and constant price output of ships and boats were estimated separately for the years before 1899. Values per ton for wooden and iron ships were calculated for 1879 from census data and applied directly to census output data for 1889. A preliminary constant price series was then calculated for the earlier years by weighting Treasury data on ship construction (*Historical Statistics*, p. 211) with 1879 prices. Price index numbers were derived by dividing these estimates through the current price estimates (from census data).

The Treasury reporting system for ships was altered between 1869 and 1879. Consequently the level of the constant price estimates and the

level of the price index numbers for the earlier years had to be adjusted. The level of the index was adjusted and the final constant price series was derived by dividing the current price series by the new price index. The adjustment of the index was worked out in the following way. The Warren and Pearson lumber and metals index numbers for 1869 were shifted to the base 1879 and combined. This number was used as the final ships and boats price index for 1869 and was extrapolated to the earlier years on the preliminary series. The final price index numbers are 1839—126; 1849—110; 1859—106; 1869—131; 1879—100; and 1889—78. The decline from 1879 to 1889 is the result of a substantial decline in the price of iron ships, together with an increase in the weight given the prices of iron ships. Wooden ship prices actually rose somewhat between 1879 and 1889. The index number for 1899 was extrapolated from 1889 on Shaw's price index for ships and boats.

C O M M E N T

NEAL POTTER, Resources for the Future, Inc.

Gallman's tables are a major contribution to the statistical measurement and understanding of the pre-Civil War period in the American economy. He employs a multitude of sources in addition to a careful use of the censuses of industries. We all owe him a debt of gratitude for this job; but we will not be able to fully appraise it except in long and painful use and comparison with other information on the period.¹

Gallman makes adequately clear, however, that the information available for this period leaves much to be desired. Census methods were of variable quality and dubious meaning in the early days—a problem which is intensified by the long time and great changes which have come over the industrial scene since the data were collected. The meaning of words has changed, the character and definitions of industries has changed, and a revolution in statistical methods and standards has come about since the census of 1840.

We should note the sources of probable upward bias in these data: Industries omitted include not only all the services (transport, trade, finance, etc.) but also fishing, forestry, nonfarm home manufacturing, and independent hand trades (such as blacksmithing, tinsmithing, cobbling, harness-making, tailoring, and dressmaking). These activities were in considerable part displaced by manufacturing during the period 1839-99, giving Gallman's commodity output series an upward bias.

¹ One evidence of the changes in meaning which may be attached to figures, as well as changes which may be accepted in the figures themselves, when they are used and compared with other data, is the fact that the author of the tables himself has prepared a set of comments for this volume which are quite different from those prepared for the conference report, though data, trends, and many important conclusions remain unchanged.

To this bias must be added the bias caused by possible improving coverage in the censuses.

In addition we should note the considerable estimating required to fill in the deficiencies of the census data: Gallman's Table A-7 shows that his estimates of manufacturing output in 1839 were only 52 per cent from census data on value of products—and this 52 per cent is an estimate, derived from the 1840 census figures on value of product multiplied by the 1850 census ratios of value added to value of product. The remaining estimates are probably poorer, though still based on relevant data: 15 per cent are based on census physical output data, multiplied by estimated producers' prices, times 1850 census ratios of value added to value of product; 3 per cent comes from the opinion of a contemporary writer; and the remaining 30 per cent is extrapolated in ways not clearly specified, from the value-added figures of the 1850 census.²

The mining data look at first glance a little sounder; they come from censuses and the predecessor of the Bureau of Mines. But we note (in the notes to Table A-4) that in a number of cases physical output had to be multiplied by an estimated average price to get value of output; and from this, value added was estimated by extrapolating ratios from one census to another. We note further that the precious metals mining data was discarded throughout because of an error estimated at nearly 200 per cent. It may well be that the greatest errors occur in the precious metals field, with its large number of individual gold panners and other small operations; but we should remember there has also been a large amount of very small scale mining (of coal, oil, gas, stone, etc.), which makes room for considerable error in these series also.

The figures on construction are a kind of makeshift, since the desired value-added figure is merely estimated as equal to the value of materials used. Gallman offers some evidence that this one-to-one ratio may be correct, but it is clear that the result is a guess employed to cover a large and poorly defined industry.

There remains agriculture, which at the beginning of the period produced 70 per cent of the value added in commodity production, and at the end of the period about one-third. Checking the source notes in Table A-2, we can see that only about one-half of the total value added comes directly from census figures. The other data represent better or worse expedients for estimating figures that are not available. One of these estimates has farm labor producing more than six times as much improvement to the land in 1854 as in 1849, and more than four times as much as in 1859. The increase in this one item accounts for half the increase in real farm output from 1849 to 1854 and it is the principal cause of the out-of-line jump in productivity from 1849 to 1854. (This

² Mr. Gallman tells me, however, that full details are given in his doctoral dissertation.

figure may be correct, but I think we need more evidence.) Other figures, though less startling, may be equally subject to error.

Despite the limitations of his data, Gallman makes some initial uses of the material (as in approximating GNP) and some analyses (as in the tables of first and second differences for the growth rates, and the breakdown of growth in productivity into shifts of labor between sectors and intra-sector productivity gains). These are helpful steps toward the many uses, analyses, and comparisons which these data must undergo on their way to refinement and acceptance.

REPLY by Mr. Gallman

As Mr. Potter says, details of my 1839 estimate for manufacturing are contained in the dissertation cited at the beginning of the appendix to my paper. Mr. Potter's comments suggest to me, however, that it may not be amiss to extend here the remarks which appear in my paper concerning this estimate. I will also add something on the "improvements" estimate for 1854.

Manufacturing value of output in 1839 was divided among industrial groups (see Table A-7). Ratios of value added to value of output were derived for each industrial group from data of the 1850 census and were applied to the 1839 figures. Subsequently the ratios were checked against similar ratios drawn up from data of the censuses of 1860, 1870, and 1880 and were judged to be appropriate.

Value of output of the clothing and leather (other than tanning) industries was estimated from figures for Massachusetts, derived from state censuses (1837, 1845). The leather estimates were made because the 1840 census returns of the value of leather output were deficient. The 1840 returns apparently lump together several important industries, including the clothing industry, in an "all other" category. I preferred to make individual estimates for these industries, since there was good reason to suppose that the "all other" category was under-returned. Estimates were made for industries appearing in the 1850 census, in existence in 1839, but not explicitly reported in the 1840 census (that is, presumably included in "all other"). With some exceptions (for example, clothing, as noted above), the value of output of these industries was extrapolated from 1849 to 1839. The extrapolator, in most cases, was the value of output of the industrial group of the industry for which value of output in 1839 was sought (see Table A-7). For example, the value of output of wooden containers was extrapolated from 1849 to 1839 on the value of output of lumber and wood products returned at both the 1840 and 1850 censuses. Had I used the "all other" category instead of following the procedure described above, the 1839 estimate of value added by manufacturing would have been about 25 per cent smaller than it is. I believe that these estimates, however crude, improve

the record available for manufacturing. In any case, very large errors, indeed, would be required here to change the findings described and discussed in the paper materially.

The "improvements" series accounts for between 2 and 6 per cent of value added by agriculture, in census years, and as much as 16 per cent, in one intercensal year. It is the weakest of the agricultural series that are quantitatively significant. Mr. Potter regards it with suspicion, noting that it "has farm labor producing more than six times as much improvement to the land in 1854 as in 1849, and more than four times as much as in 1859." Some further account of the way in which the estimates were constructed for the fifties may help the reader to evaluate the series.

First, the series covers improvements made by farm labor using farm materials. All other improvements are included in the construction series. It was assumed that farm labor and materials were used exclusively in the improvement of land previously unimproved (breaking virgin land, fencing, etc.) and that nonfarm materials and labor were used to make repairs, replace sod huts with frame buildings, and so on, on improved land. These assumptions leave room for both omissions and duplications. Repairs made with farm materials enter neither the agricultural nor the construction series, while the fencing of virgin land with nonfarm materials enters both. Nonetheless, the violence done reality by these assumptions is probably not great.

The "improvements" series, then, is based on the number of acres of newly improved land. Now the question is whether a very much greater volume of new land was improved in 1854 than in 1849 or 1859. The principal source of virgin land during the fifties was the federal government. The number of acres of land improved between 1850 and 1860 was about 50 million, according to the census. The number of acres sold to individuals by the federal government was about 42 million (Gallman, *op. cit.*, p. 94). For purposes of the estimates, the land improved during the decade was allocated among the years on the basis of federal sales to individuals. Speculation in land would throw the series off, since land purchased for speculative purposes would not be improved immediately. According to Hibbard (*op. cit.*, p. 104), speculation was "given a body blow" by the Preemption Act of 1841. (The speculation of the 1830's had already been extinguished by the collapse of 1837.) Subsequently there was some speculation through the medium of military warrants, and this became serious after 1852, when warrants were made assignable (Hibbard, p. 121). Since land acquired through warrants is excluded from the series on sales used to make the estimates, this speculation should not be reflected in the estimates. With the Graduation Act of 1854 speculation broke out again in connection with the sale of federal land (Hibbard, pp. 300, 301),

though much of the speculation of the mid- and late fifties was still conducted through warrants (Hibbard, p. 224). The collapse of 1857 snuffed out speculation.

The "improvements" estimate for 1854 may be influenced somewhat, then, by speculative activity. How important is this influence likely to be? One cannot say with precision. But suppose that all of the purchases under the graduation principle in fiscal 1855 were speculative purchases, an extreme supposition, since the sale of land below the \$1.25 minimum must have stimulated purchases for immediate improvement. Were the estimates to be remade on this assumption, however (data from Hibbard, p. 104), the estimate of "improvements" in 1854 would be three times the estimate for 1849 and twice the estimate for 1859. That is, a substantial change would be made, but "improvements" would remain very much more important in 1854 than in 1849 or 1859. It should be noted, also, that the findings described and discussed in the paper would remain virtually unchanged.

