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# The Growth of Output Before 1840

WILLIAM N. PARKER
AND
FRANKLEE WHARTENBY
THE UNIVERSITY OF NORTH CAROLINA

Two questions must be answered if the years from 1800 to 1840 are to be understood as fully as later periods in American economic history. First, did output grow faster than the population? And second, how steady was the increase in output?

The only national income series for the period—that of Robert F. Martin[1]—gives surprising answers, which, together with their statistical basis, we examine in the first section. Martin's estimates have been recently criticized by Simon Kuznets, whose criticisms are considered in the second section. We are not prepared at present to go beyond the essentially negative results presented here. Whatever may emerge from further research, it is clear that the data are extremely fragmentary.

## I

Table 1 presents Martin's three series of income per capita. Each is stated in current dollars and deflated by two different price indexes. The production income series, which exclude transfer payments, are most relevant to a study of economic growth, although the differences among the three series are insignificant. The use of different deflators also produces only minor differences. Converting Martin's realized private production income per capita to an index (1799 = 100) yields the following result:

| | *1799* | *1809* | *1819* | *1829* | *1839* |
|---|---|---|---|---|---|
| Current dollar series | 100 | 99 | 71 | 58 | 74 |
| Deflated series | 100 | 96 | 79 | 77 | 92 |

Martin's answers to our initial questions are thus that (1) total output did not increase more rapidly than population over the whole period, and (2) the growth of output was particularly slow in the 1810's and failed to exceed population growth during the 1820's.

[1] Robert F. Martin, *National Income in the United States, 1799–1938*, National Industrial Conference Board, NICB Studies 241, 1939.

TABLE 1

Three Measures of Realized Per Capita Income, Decades, 1799–1839
(dollars)

| *Per Capita Income* | *1799* | *1809* | *1819* | *1829* | *1839* |
|---|---|---|---|---|---|
| In current dollars: | | | | | |
| National | 131 | 130 | 93 | 78 | 98 |
| Production[a] | 130 | 129 | 93 | 77 | 97 |
| Private production[b] | 129 | 128 | 91 | 75 | 95 |
| In 1926 dollars: (cost of living index[c] as deflator) | | | | | |
| National | 216 | 204 | 173 | 164 | 198 |
| Production[a] | 215 | 204 | 172 | 163 | 196 |
| Private production[b] | 213 | 201 | 169 | 159 | 191 |
| In 1926 dollars: (general price level index[d] as deflator) | | | | | |
| National | 211 | 202 | 168 | 166 | 197 |
| Production[a] | 210 | 201 | 167 | 165 | 195 |
| Private production[b] | 208 | 199 | 164 | 161 | 191 |

[a] Excludes transfer payments, rents on homes, and mortgage interest on homes. The estimates of rents and mortgage interest involve extrapolations from the post-1880 period.

[b] Also excludes government income payments to individuals.

[c] The National Industrial Conference Board's Cost of Living Index, used in the Board's *Studies in Enterprise and Social Progress*, 1939, p. 79.

[d] An extension backward of the Snyder index (Carl Snyder, *Business Cycles and Business Measurements*, Macmillan, 1927, pp. 286–287) made by the National Industrial Conference Board and not published separately (see text footnote 4).

Source: Robert F. Martin, *National Income in the United States, 1799–1938*, National Industrial Conference Board, NICB Studies 241, 1939, pp. 6, 10, and 14. All references to Martin in the following tables refer to this volume.

Martin's published source notes are barely sufficient to permit a reconstruction of his data and methods for this period. The current dollar estimates are built up by summation of value added by industrial sector and converted into a constant dollar series by applying a single price index to the total. In Table 2 Martin's current dollar series by sectors is given along with the weights of the sectors in the 1799 and 1839 totals. Agriculture, and transport and communication, the two largest sectors in nearly every decade, account for just under two-thirds of the 1799 total and just over half of the 1839 total. Together with construction, they show the weakest growth over the period as a whole and an absolute decline during the 1810's, which largely accounts for the depressed movement of the entire series. An index of the movement of the current dollar series by sector in relation to population growth is given in Table 3.

TABLE 2

Private Production Income by Sector of Origin, Decades, 1799–1839
(current dollar figures in millions)

| *Sector* | *1799* | | *1809* | *1819* | *1829* | *1839* | |
|---|---|---|---|---|---|---|---|
| Agriculture | $264 | 40% | $306 | $294 | $329 | $ 545 | 35% |
| Mining and quarrying | 1 | [a] | 2 | 2 | 3 | 5 | [a] |
| Electric light, power, and gas | [a] | [a] | [a] | [a] | [a] | 1 | [a] |
| Manufacturing | 32 | 5 | 55 | 64 | 98 | 162 | 10 |
| Construction | 53 | 8 | 72 | 58 | 66 | 95 | 6 |
| Transportation and communication | 160 | 24 | 236 | 176 | 143 | 277 | 18 |
| Trade | 35 | 5 | 41 | 55 | 61 | 135 | 9 |
| Service | 64 | 10 | 110 | 132 | 163 | 222 | 14 |
| Miscellaneous[b] | 59 | 9 | 79 | 74 | 84 | 135 | 9 |
| Total | $668 | 100% | $901 | $855 | $947 | $1,577 | 100% |

[a] Less than $500,000 or 1 per cent.
[b] Including finance.

Source: Martin, p. 58.

TABLE 3

Indexes of Private Production Income by Sector of Origin, Per Capita of Total Population, Decades, 1799–1839
(1799 = 100)

| *Sector* | *1809* | *1819* | *1829* | *1839* |
|---|---|---|---|---|
| Agriculture | 85 | 61 | 51 | 64 |
| Mining and quarrying | 147 | 111 | 126 | 158 |
| Manufacturing | 126 | 110 | 126 | 158 |
| Construction | 100 | 61 | 51 | 56 |
| Transportation and communication | 109 | 60 | 36 | 54 |
| Trade | 85 | 87 | 71 | 119 |
| Service | 126 | 113 | 104 | 108 |
| Miscellaneous | 98 | 69 | 59 | 71 |

Source: Table 2 divided by the population estimates derived from Martin's per capita calculations (in thousands): 1799—5,178; 1809—7,039; 1819—9,396; 1829—12,627; and 1839—16,600 (Martin, pp. 14–15).

If the individual components in the current dollar series were more firmly based, it would be profitable to experiment with different "inflators" for the physical volume component series and different deflators in the aggregate series. For example, Martin has inflated his physical volume series for agriculture by the Warren and Pearson price index for farm products for the years ending in zero to yield the major

component of the total income series.[2] The aggregate current dollar series is then deflated by an index of the general price level, apparently for years ending in nine, to yield the real income series.[3] The relation between the two indexes is shown in the accompanying tabulation.

| | *1799, 1800* | | *1809, 1810* | | *1819, 1820* | | *1829, 1830* | | *1839, 1840* | |
|---|---|---|---|---|---|---|---|---|---|---|
| Warren–Pearson index of prices of farm products (1910–14 = 100) | 98 | 99 | 83 | 90 | 87 | 68 | 59 | 58 | 86 | 65 |
| Martin's implicit index of general price level (1926 = 100) | 62 | | 64 | | 55 | | 47 | | 50 | |
| Ratios of indexes: | | | | | | | | | | |
| Warren–Pearson (0) to Martin (9) | 1.60 | | 1.41 | | 1.24 | | 1.23 | | 1.30 | |
| Warren–Pearson (9) to Martin (9) | 1.58 | | 1.30 | | 1.58 | | 1.26 | | 1.72 | |

The use of one index for inflating farm output and another for deflating current income may be justified for a measurement of farm income alone in real terms. In the measurement of total income, any relative loss sustained by farmers through an unfavorable movement in the relation between the two indexes should be compensated by a "gain" in some other sector. Martin's estimates for the other sectors, however, are computed by different methods, so that any such "losses" show up as reductions in total income. The third line of the tabulation indicates that the divergence of movement followed a pattern tending to reduce the growth of real output in each decade between 1799 and 1829. Apart from this, the fourth line shows that the choice of different years to inflate by the farm price index and to deflate by the general price index produces a specially drastic fall in total income between 1799 and 1819 and minimizes the recovery of the thirties. Had the years ending in zero been used in both indexes, and assuming that the movement of the general price index used by Martin resembled Tucker's,[4] some of the distortion in 1820 and 1840 would remain since the farm price index fell sharply relative to the general price level in those years.

[2] G. F. Warren and F. A. Pearson, "Wholesale Prices in the United States for 135 Years, 1797 to 1932," in *Wholesale Prices for 213 Years, 1720 to 1932*, Cornell University Agricultural Experiment Station, Memoir 142, November 1932, p. 113. Martin, *op. cit.*, p. 136, and "the estimates . . . between 1799 and 1899, inclusive, apply to no specific year but to a twelve months' period beginning and ending within the two years beginning on January 1 of the year indicated" on p. 134.

[3] The index is evidently the one published as a graph in *Conference Board Studies in Enterprise and Social Progress*, National Industrial Conference Board, 1939, p. 78. Correspondence with the NICB indicates that this is probably the index which was used and that the data for the graph have not been published.

[4] Rufus S. Tucker, "Statistics of Gold and Prices, 1791–1932," *Review of Economic Statistics*, February 1934, pp. 25 and 26. See also below, Table 6.

No amount of adjustment, however, can overcome the weakness of Martin's basic data. An analysis of the sources and methods of constructing the current dollar series in each sector leaves no room for a more sophisticated analysis of the deflated series.

AGRICULTURE

Martin's physical volume index is based on certain series given without source references by Mulhall[5] and one other series: population. The Mulhall series are the production, consumption, and value of grain, cotton, and tobacco, and the value of capital invested in agriculture. For cotton and tobacco, Mulhall's data correspond very roughly to the generally accepted series.[6] There is no figure for grain for 1810, and capital figures are given for only 1790, 1810, and 1840.

How Martin filled these gaps is not known. On the capital series, Mulhall comments cryptically that the data are "official except as regards 1810 and 1840," and on the grain series that "production of grain in the eighteenth century can only be estimated roughly on the basis of population; exact returns begin with the year 1840." The percentage increase in his grain series between 1820 and 1830 and 1840 is almost the same as the increase in population in the censuses of those years. Only the cotton and tobacco series appear to be reliable, and those make up less than a third of the weight of Martin's combined series. Population, either directly or as the basis for Mulhall's grain series, accounts for nearly 40 per cent of the index weights—at least between 1820 and 1840. It adds nothing to our knowledge to derive a per capita output figure from a series itself based on population.

Martin used the Mulhall series as representative series and gave them weights corresponding to the relative values in 1850 of groups of farm products whose output moved (presumably in the second half of the century) in harmony with them. Kuznets has pointed out the curiously high weight given to the capital series (20.9);[7] to weight the tobacco

[5] Michael Mulhall, *A Dictionary of Statistics*, London, Routledge, 1903, p. 42.

[6] For example, with those of Marvin W. Towne and Wayne D. Rasmussen. See their table in their paper in this volume.

| | 1800 | 1810 | 1820 | 1830 | 1840 |
|---|---|---|---|---|---|
| | (in millions of pounds) | | | | |
| Cotton: | | | | | |
| Mulhall | 36 | 115 | 160 | 350 | 878 |
| Towne–Rasmussen | 30 | 84 | 162 | 355 | 690 |
| Tobacco: | | | | | |
| Mulhall | 107 | 117 | 127 | 142 | 219 |
| Towne–Rasmussen | 115 | 110 | 130 | 152 | 219 |

[7] Simon Kuznets, "Long-term Changes in the National Income of the United States of America from 1805 to 1950," in *Income and Wealth of the United States*, International Association for Research in Income and Wealth, Income and Wealth Series II, The Johns Hopkins Press, 1952, p. 235.

production series by 20.8—a weight nearly as high as that of grain which by Mulhall's own figure was roughly fifteen times that of tobacco—is equally anomalous. The two series act as a drag on the movement of the total over the period as a whole.[8] Tobacco production grew much more slowly than population before 1830, and Mulhall's "unofficial" capital estimate falls from $47 per inhabitant in 1810 to $35 in 1840. Between 1810 and 1820, however, the individual series for cotton and tobacco show a rise in physical terms, and it is unlikely that a decline was interpolated by Martin in the grain or capital series.

The downward movement in Martin's final series in current prices between 1809 and 1819 must arise when the volume index calculated from the Mulhall data is "inflated" by the Warren and Pearson index. The problems involved in using a price index based on one set of weights to inflate a physical volume index based on another set of weights are compounded by the use—as a component of the physical volume series with a weight of 13.1 per cent—of Mulhall's data on the *values* of grain, cotton, and tobacco produced, converted by Martin into 1910–14 dollars.

### TRANSPORTATION AND COMMUNICATION

The index by which the 1849 figure on transportation and communication income was projected back to 1800 is composed of two parts, one representing water shipment and one land transport. The two series were weighted by unpublished estimates of Willford I. King for the share of each in his 1850 estimate of income arising in this sector.

The water shipment series is based on the official series of registered shipping engaged in trade, including foreign, coastwise, and fishing. Fishing and whaling boats do not appear to have been eliminated, but their total probably causes no serious distortion.[9] Evidently Martin used the Warren and Pearson wholesale price index to inflate the series.[10] The land shipment series is the one used to estimate the value of income arising in trade: an index of the annual commercial movement, which

[8] It is not clear whether the weight of livestock production is assigned by Martin to agricultural capital or to grain output. If Mulhall's estimate of livestock holdings had been used instead of either of these representative series, a much stronger upward movement would have been given to the total. However, Mulhall's 1810 figure for horses is only a quarter and for cattle only a fifth of the 1805 figure given by Samuel Blodget, *Economica*, privately published, 1806, p. 60.

[9] Martin, p. 139. The sources given are the *Statistical Abstract of the United States*, Bureau of the Census, 1912, and *1850 Census of the United States*, J.D.B. DeBow, *Compendium of the Seventh Census*. The DeBow figures are for 1820 and 1840 only, and are virtually identical with the figures of the *Statistical Abstract*, which are given for each census year. On the page following these source references Martin refers to the *Compendium of the Sixth Census*, but it is the DeBow *Compendium* that is meant.

[10] Martin does not specifically state what index was used; see, however, the references on his page 134 and in his footnote 1 on page 140, where one of the shipping tonnage series is inflated by the wholesale price index for another purpose.

in turn is based entirely on water shipment statistics, including the tonnage in Great Lakes and coastwise commerce, value series for total exports and imports, and a series for exports from the state of Louisiana (to show trade on western rivers).

While serious exception might be taken to the use of water shipments to represent land shipments, the land shipment series appears to have almost no weight in the combined series. In Table 4, the water shipment

TABLE 4

Estimate of Income Arising in Transportation and Communication, Decades, 1799–1840
(1849 = 100)

| *Index* | *1799, 1800* | *1809, 1810* | *1819, 1820* | *1829, 1830* | *1839, 1840* |
|---|---|---|---|---|---|
| Water shipments, volume[a] | 27 | 40 | 36 | 34 | 62 |
| Wholesale prices:[b] | | | | | |
| (9) years | 154 | 159 | 152 | 117 | 137 |
| (0) years | 154 | 155 | 126 | 108 | 113 |
| Fiscal years | 153 | 155 | 137 | 110 | 123 |
| Water shipments, inflated:[c] | | | | | |
| (9) years | 42 | 64 | 55 | 40 | 85 |
| (0) years | 42 | 62 | 45 | 37 | 70 |
| Fiscal years | 41 | 62 | 49 | 37 | 76 |
| Land shipments[d] | 18 | 21 | 28 | 31 | 69 |
| Combined transportation and communication[e] | 40 | 59 | 44 | 36 | 69 |

[a] Index of tonnage registered and enrolled derived from Martin's sources: *1850 Census of the United States*, J. D. B. DeBow, *Compendium of the Seventh Census*, 1854, p. 191, and *Statistical Abstract of the United States*, Bureau of the Census, 1912, p. 784.

[b] G. F. Warren and F. A. Pearson, "Wholesale Prices in the United States for 135 Years, 1797 to 1932," *Wholesale Prices for 213 Years, 1720 to 1932*, Cornell University Agricultural Experiment Station, Memoir 142, November 1932, pp. 7–9. All references to Warren and Pearson in the following tables refer to this volume.

[c] Water shipment volume index inflated by the wholesale price index.

[d] Martin's estimate of income from trade (see Table 7).

[e] Martin's estimate of income from transportation and communication (p. 58).

series, reconstructed and inflated by what appears to be the appropriate price index, is compared (1849 = 100) with the series representing land shipments and with the composite series for transportation and communication. It is evident that the combined series is almost identical with the water shipment series.[11]

Apparently Martin used the Warren and Pearson wholesale price index to inflate the water shipment series, but his choice of years is less certain. As Table 4 shows, the index for the years ending in nine is

[11] Even if the weight of the water transport series were somewhat less overwhelming than indicated here, the combined index would move closely with the shipping tonnage data on which the water shipment series is based. This is true because these tonnage series also appear in the land shipment series, accounting for about 55 per cent of its total weight.

identical with that for the years ending in zero as between 1799 and 1800. This is also true for 1849 and 1850. However, the index is much higher in 1819 and in 1839 than in 1820 and 1840, respectively.[12] Since the shipping tonnage data are stated in the source cited by Martin (the 1912 *Statistical Abstract*) to be for the fiscal year, it would seem appropriate to use the Warren and Pearson index on this basis.[13] However, the 1839, 1840 figures indicate that the index for the years ending in zero must have been chosen, because for the land shipment index and the combined index to be the same (69), the water shipment index, if not virtually weightless, must also be the same (70, not 85 or 76). Use of the index for the years ending in nine would have raised the figures for 1819, 1820 and 1839, 1840 by about 20 per cent relative to the other figures in the series. Thus the combined index would have risen more between 1800 and 1840 and dipped less in 1819, 1820.[14]

Apart from this bias, the value of the transport and communication series as a component in the estimate of total income hinges on the usefulness of ship tonnages registered and enrolled as an index of the changes in the volume of transport services[15] and on the suitability of the wholesale price index as an indication of the movement in the unit price of transport services. Changes in the speed of travel and in the ratio of land to water shipment would affect the usefulness of the tonnage data. Changes in transport rates relative to the level of wholesale prices would similarly affect the reliability of the inflated series. Transport rates fell sharply relative to other prices while the speed of travel and the ratio of land to water travel increased. Close investigation is required to judge how these elements balanced out and when they began to take effect.

[12] The absolute figures are shown in footnote 14.

[13] Warren and Pearson, pp. 7–9.

[14] In the incorporation of the transport and communication series in current dollars into the total income series, and the deflation of the latter by Martin's implicit index of the general price level to yield a real income series, the distortion observed for the agricultural income series arises, though to a lesser degree:

| | 1799, 1800 | | 1809, 1810 | | 1819, 1820 | | 1829, 1830 | | 1839, 1840 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Warren–Pearson wholesale price index (1910–14 = 100) | 126 | 129 | 130 | 131 | 125 | 106 | 96 | 91 | 112 | 95 |
| Martin's implicit index of general price level (1926 = 100) | 62 | | 64 | | 55 | | 47 | | 50 | |
| Ratios of indexes: | | | | | | | | | | |
| Warren–Pearson (0) to Martin (9) | 2.08 | | 2.05 | | 1.93 | | 1.94 | | 1.90 | |
| Warren–Pearson (9) to Martin (9) | 2.03 | | 2.03 | | 2.27 | | 2.04 | | 2.24 | |

[15] Douglass C. North has pointed out that the original series were cleared of "ghost tonnage" (i.e. ships sunk or removed from service) in 1800–1801, 1811, 1818, 1828–1830, and 1837, and this would have affected the result.

MANUFACTURING

Martin states that the estimate of income arising in manufacturing before 1850 was based on the data of the censuses of 1820 and 1840 adjusted for underreporting, with 1799 and 1829 interpolated along a smooth curve.[16] It is not clear whether the figure for 1809 is interpolated or derived from data on the gross value of manufacturing gathered at the time of the census.

From Martin's description of his methods one can reconstruct approximately his figure for 1819 based on the census of 1820, raised by the ratio of the number giving manufacturing as their employment in the population census to the number of employees given in the deficient census of manufactures. This means an upward adjustment of 475 per cent and assumes that per capita value added by the unreported employees was equal to that for those reported.[17] If household manufactures and small establishments were those most unreported, Martin's adjustment would probably yield too high a figure. Productivity was lower in such employment, and persons giving their occupation as manufacture in the population census were probably on the average not as fully employed (even with Martin's allowance for unemployment) as those counted in the census of manufactures. The 1820 census for manufactures was in any case notoriously deficient and inaccurate.[18]

Martin's next bench mark is at 1840, but his figure appears low. The 1840 census does not give the cost of raw materials, except for the value of fuels used in smelting, and Martin does not state how his deduction is made. Allowing for his stated adjustment for underreporting of the census gross value figures, his allowance for value of raw materials appears to have been exactly 70 per cent. This ratio is higher than one calculated from the 1820 census (61 per cent), or the 1850 census (54 per cent). George Tucker in 1843 based his rough estimate on a ratio of one-third for manufactures except mills, and three-fourths for mills.[19] Robert E. Gallman, after a careful industry-by-industry study of the underreporting and raw materials ratios, arrived at almost

[16] Martin, p. 138.

[17] The calculations are based on a reported gross value of $38.7 million, reduced by raw materials consumed to a net value of $15 million. The number reporting occupation as manufacture in the population census is reduced by 16 per cent to account for assumed unemployment.

[18] No summary of state tables was published in it because of the incompleteness of the returns; see Henry J. Dubester, *Catalog of United States Census Publications, 1790–1945* (Library of Congress, 1950, pp. 11–12). The discussion found in Carrol D. Wright, *The History and Growth of the United States Census* (56th Cong., 1st sess., S. Doc. 194, 1900, pp. 27 and 38), discredits it, as does the analysis found in the twelfth census (*1900 Census of the United States*, Vol. VII, *Manufactures*, Part 1, *United States by Industries*, pp. xlix–l).

[19] George Tucker, "Progress of the United States in Population and Wealth in Fifty Years," *Hunt's Merchant's Magazine*, 1843, p. 207.

the same figure as Tucker's.[20] Table 5 gives the calculations on which our criticism of Martin's estimate is based.

TABLE 5

Estimate of Gross and Net Value of Manufacturing, 1820 and 1840
(dollar figures in millions)

| | *1820* | *1840* |
|---|---|---|
| Gross value of manufactures ($)[a] | 38.7 | 370 |
| *Less:* Value of raw materials ($) | 23.7[b] | 225[c]<br>200[d] |
| *Equals:* Net value of manufactures ($) | 15.0 | 145[c]<br>170[d] |
| *Times:* Underreporting coefficient[e] | 4.674 | 1.460 |
| *Equals:* Adjusted net value of manufactures ($) | 70.1 | 211[c]<br>248[d]<br>162[f]<br>240[g] |

[a] Censuses of 1820 and 1840.
[b] Census of 1820.
[c] Based on the ratio of the value of raw materials to the gross value of manufactures in the 1820 census (0.61).
[d] Based on the ratio of the value of raw materials to the gross value of manufactures in the 1850 census (0.54).
[e] Derived by Martin's method from the 1820 and 1840 censuses. The numbers reporting their occupation as manufacturing in the population census were reduced by Martin's allowance of 16 per cent for unemployment, and the resulting estimate of employment was divided by the number of employees in manufacturing establishments reporting in the census of manufactures in the respective years. The allowance of 16 per cent for unemployment is derived by Martin from a calculation by Francis A. Walker in the census of 1870 (Martin, p. 137).
[f] Martin, pp. 137–138.
[g] George Tucker, "Progress of the U.S.A. in Population and Wealth," *Hunt's Merchant's Magazine*, 1843, p. 207; and Robert E. Gallman, "Value Added by Agriculture, Mining and Manufacturing in the U.S., 1840–1880," University of Pennsylvania Ph.D. thesis, unpublished, 1946, pp. 247–248.

The nature of the smooth curve on which the figures for 1799 and 1829 can only be surmised from Martin's series (millions of dollars) are interpolated: 1799—32 ($x$); 1809—55 ($x + 23$); 1819—64 ($2x$); 1829—98 ($3x + 2$); and 1839—162 ($5x + 2$); and 1849—291 ($9x + 3$). Oddly enough, 1819 and 1839—Martin's bench marks—appear to lie closer than 1809 does to a single curiously regular curve. What happens to this regularity when it is deflated by a price index? And what logical reason can be given for assuming some regular increase of the total

[20] Robert E. Gallman, "Value Added by Agriculture, Mining, and Manufacturing in the U.S., 1840–1880," unpublished Ph.D. thesis, University of Pennsylvania, 1946, pp. 247–248.

money value of manufactures over a period in which the price level is undergoing violent changes?

SERVICE

Service is the third largest component of Martin's series before 1840. The income earned is based directly upon population growth in twenty-three cities, inflated by a price index and linked in 1850 to persons engaged in service occupations taken from the census.

Table 6 compares Martin's income estimates, his population figures,[21] and the implicit deflator with other indexes, including the Warren and Pearson wholesale price index for years ending in zero. Their index

TABLE 6

Estimate of Income Earned in Service Occupations, Decades, 1799–1840

| *Series* | *1799, 1800* | *1809, 1810* | *1819, 1820* | *1829, 1830* | *1839, 1840* |
|---|---|---|---|---|---|
| Service income (mill. $)[a] | 64 | 110 | 132 | 163 | 223 |
| Population (thous.)[b] | 276 | 393 | 491 | 761 | 1,054 |
| As indexes (1849 = 100): | | | | | |
| Service income | 18 | 31 | 37 | 46 | 63 |
| Population | 15 | 22 | 27 | 42 | 58 |
| Implicit inflator[c] | 120 | 141 | 137 | 110 | 109 |
| Other indexes (1849 = 100): | | | | | |
| Warren and Pearson, (0) years[d] | 154 | 155 | 126 | 108 | 113 |
| Tucker, (9) years[e] | 132 | 149 | 131 | 108 | 123 |
| NICB[f] | 141 | 145 | 125 | 107 | 114 |

[a] Martin, p. 58.
[b] Censuses of 1850 and 1940 (see text footnote 21).
[c] Service income index divided by population index times 100.
[d] Wholesale price index, Warren and Pearson, pp. 7–9.
[e] Wholesale prices and wages index, Rufus S. Tucker, "Statistics of Gold and Prices, 1791–1932," *Review of Economic Statistics*, February 1934, pp. 25–26.
[f] See text footnote 3.

appears to fit Martin's implicit inflator better than either the Tucker index for the years ending in nine or the NICB general price level index he used elsewhere. However, for 1799 the fit is not good, Although Martin's choice among cities is not known, there was much less choice

[21] *1850 Census of the United States* (p. lii), shows eighteen cities with their 1800 populations. The *1940 Census of Population* (Vol. I, *Number of Inhabitants*, p. 32) contains a list of twenty cities with their 1800 population. The list includes a number of cities not included in the 1850 census list. The five largest such cities have 1800 populations noticeably greater than the others, and added to the eighteen cities of the 1850 census list, they make up the twenty-three cities on which our calculation is based. We do not know how this corresponds to Martin's list; he speaks only of "the total number of inhabitants in twenty-three leading cities at each census from 1800 through 1850" (p. 142).

[22] DeBow, *Compendium of the Seventh Census*, A. O. P. Nicholson, 1854, p. 191.

in 1800 than later, so Martin must have used an unknown price index at least for that year.

Unless the persons occupied in the service industries were actually located mainly in the twenty-three cities and furnished a major part of the population there, it is difficult to see why Martin used this as his representative series. The result of linking the series at 1850 to the census series of the numbers engaged in services is an excessively high per capita income in the service occupations compared to the average. The percentage share of the population in the twenty-three major cities compared with the share of service income in Martin's total income figure is as follows:

| | *1799* | *1809* | *1819* | *1829* | *1839* |
|---|---|---|---|---|---|
| Population | 5.3 | 5.6 | 5.2 | 6.1 | 6.3 |
| Income | 9.6 | 12.2 | 15.4 | 17.2 | 14.1 |

If the entire population of the cities had been occupied supplying services, a per capita income double the national average would have been earned. Insofar as the size of families was smaller in cities, the share of the labor force may have been higher, although more women and children were probably employed on farms. The share of the urban labor force engaged in service occupations was far below 100 per cent, particularly since trade and finance are separate categories. Thus an income several times the national average is probably implied.

### TRADE

For income arising in trade or commerce, Martin's sources and methods are stated and the data and calculations set forth in Table 7. Both the weights for the four constituent series and the price index chosen to inflate one of the series remain unspecified by Martin. However, use of value figures available in Martin's source[23] and of the Warren–Pearson wholesale price index yields a result very close to Martin's.

Two questions are suggested by Martin's use of value shipped as an indication of income arising in commerce. The first arises from his exclusive reliance on water shipment data and the low weight given to overland trade, which is represented only by a series of the tonnage employed in coastwise shipping. Martin joined his series in 1850 to one based on the numbers employed in "specified commercial occupations," as given in the census. His choice of occupations is not known, but it must include storekeepers and others engaged in purely local trade. Before 1850, changes in this sector are not reflected by a series based on values or tonnages in shipping.

[23] Willford I. King, *The Wealth and Income of the People of the United States*, Macmillan, 1919, p. 138.

TABLE 7

Estimate of Income in Trade, Decades, 1800–1840

| *Series* | *1800* | *1810* | *1820* | *1830* | *1840* |
|---|---|---|---|---|---|
| Actual tonnage (thous. tons):[a] | | | | | |
| Foreign | 671 | 985 | 620 | 577 | 900 |
| Coastwise excl. Great Lakes | 302 | 440 | 657 | 603 | 1,227 |
| Great Lakes | 1 | 2 | 4 | 11 | 54 |
| Value (mill. $):[b] | | | | | |
| Louisiana exports | 1 | 2 | 8 | 15 | 34 |
| Exports and imports excl. Louisiana | 162 | 150 | 137 | 119 | 188 |
| Tonnage inflated by price index (thous. tons):[c] | | | | | |
| Coastwise excl. Great Lakes | 465 | 682 | 828 | 652 | 1,386 |
| Great Lakes | 1 | 2 | 4 | 12 | 61 |
| As indexes (1850 = 100): | | | | | |
| Inflated tonnage, coastwise plus Great Lakes | 24 | 35 | 43 | 34 | 74 |
| Value of exports and imports, incl. Louisiana exports | 51 | 48 | 45 | 42 | 70 |
| Weighted total[d] | 20 | 24 | 29 | 31 | 67 |
| Martin's estimate[e] | 18 | 21 | 28 | 31 | 69 |

[a] *Statistical Abstract of the United States*, Bureau of the Census, 1912, p. 784, except for the 1800 and 1810 figures for the Great Lakes tonnage, which were estimated.

[b] J. D. B. DeBow, *Industrial Resources of the South and West*, Appleton, Census, 1854, Vol. I, p. 327, except the 1810 figure for the Louisiana tonnage, which was estimated.

[c] Wholesale price index, Warren and Pearson, pp. 7–9.

[d] The weights were computed from the commercial value figures in *1850 Census of the United States*, J. D. B. DeBow, *Compendium of the Seventh Census*, p. 191, and are as follows: inflated coastwise tonnage—22.6; inflated Great Lakes tonnage—21.6; index of inflated tonnage, coastwise plus Great Lakes—33.7; and index of value of exports and imports, including Louisiana exports—22.

[e] Martin, p. 58.

A second problem relates to the fact that Martin's income series for commerce rises steadily throughout the period while that for transport, also based on shipping data, shows the fall and rise characteristic of his estimate for agriculture. This is because the transport series employs only tonnage figures of domestic shipping inflated by a wholesale price index while the trade series uses mostly total value figures which do not move with wholesale prices. Since both represent services performed on producers' and consumers' goods during the process of exchange, a measure of the volume of goods moved would be basic to both series, with the further factor of distance influencing the physical product index for transport, and some measure of the amount of distributive services performed per unit of goods affecting the trade index. Each

physical index would then be appropriately inflated by its own price series. Perhaps this prescription could not be followed with the data for the period, but the different movements in the trade and transport indexes in Martin's estimates reflect his statistical method and bear no relationship to different amounts of services or different movements in the prices of services performed in the two sectors.

CONSTRUCTION

Martin's series of income earned in construction is not difficult to reconstruct since he built it on two readily available series: the tonnage of ships constructed and the growth of population, the latter used to represent new houses, each weighted by its value in the census of 1840 (Table 8). Since the population weight is six times that of shipping, the

TABLE 8

Estimate of Income in Construction, Decades, 1800–1840

| *Series* | *1800* | *1810* | *1820* | *1830* | *1840* |
|---|---|---|---|---|---|
| Actual data:[a] | | | | | |
| Vessels built (thous. tons) | 106 | 128 | 52 | 59 | 121 |
| Population increase (thous.) | 138 | 193 | 240 | 336 | 436 |
| As indexes (1850 = 100): | | | | | |
| Vessels built | 38 | 46 | 19 | 21 | 43 |
| Population increase | 22 | 31 | 38 | 53 | 69 |
| Indexes weighted by value:[b] | | | | | |
| Vessels built | 267 | 323 | 133 | 147 | 302 |
| Population increase | 922 | 1,299 | 1,593 | 2,222 | 2,892 |
| As construction indexes (1850 = 100): | | | | | |
| Vessels built plus population increase: | | | | | |
| Weighted total | 24 | 33 | 35 | 49 | 66 |
| Weighted total inflated by price index[c] | 37 | 51 | 45 | 53 | 74 |
| Martin's estimate[d] | 40 | 54 | 44 | 50 | 71 |

[a] Tonnage of U.S. vessels built from *Statistical Abstract of the United States*, Bureau of the Census, 1912 p. 784; population increase at census year from *Historical Statistics of the United States, 1789–1945*, Bureau of the Census, 1949, Series B-31.

[b] Vessels built weighted by 7.016 (value of ships built in 1840—$7,016, 094); population increase weighted by 41.917 (value of houses built in 1840—$41,917,401); the values are those shown in *1840 Census of the United States*, p. 361.

[c] Wholesale price index, Warren and Pearson, pp. 7–9.

[d] Martin, p. 58.

series simply reflects population growth with the drop between 1810 and 1820 created by the falling off of shipbuilding. The combined physical index, however, moves steadily upward; the decline in the

value series arises from the movement in the price level. If a figure derived from this index is put on a per capita basis, decades with a slackening rate of population growth would, in the absence of any other influence, show a falling income per capita from construction.

MISCELLANEOUS

Martin's miscellaneous classification includes income received by people employed in finance, fishing, and in trades and professions not elsewhere covered. He carried the 1899 estimate, less King's estimate of fishing income, back to 1799 by an index of the total of private production income calculated for all the other categories combined. To these estimates he added estimates of income received in the fishing industry from 1799 to 1839, which were arrived at by inflating total tonnage of ships in the cod, mackerel, and whaling fisheries[24] by a price index, presumably the Warren and Pearson index of wholesale prices.

Martin describes the estimate of income from miscellaneous sources as the least satisfactory component of his national income total. His procedure yields almost the same figures as those which would have resulted if the 1899 miscellaneous estimate, with fishing income included, had been carried back by an index of all other production income. Thus his estimate has virtually no independent effect on the movement of total income.

## *Summary*

Martin's most surprising results are those noted above—the fall in real income per capita in the 1810's, and its failure to rise sufficiently to reach the 1800 level by 1839. These appear to have four sources in Martin's work:

1. In the agriculture estimates two series which do not rise rapidly—tobacco and Mulhall's estimate of agricultural capital—are given heavy weight to represent the bulk of agricultural production on which data are not available.

2. In several instances, an index of physical volume has been inflated by one price index to give the money value index and then deflated by a different index to obtain the real income figure.

3. Data on tonnage and values of water shipment form an important part of several series, and these do not rise steadily over the period.

4. Several series are based on or represented by population growth, so that a rise in income per capita is to that extent automatically ruled out.

[24] From S. Misc. Doc. 107, 44th Cong., 1st sess., Vol. II, 1666, p. 702; S. Rept. 10, 35th Cong., 1st sess., Vol. I, 938, p. 4; and *American State Papers*, Vol. 014, p. 496.

## II

Recently Kuznets has suggested that even without a direct examination of Martin's methods, the series for 1800 to 1880 should be discarded.[25] For 1800 to 1840 Kuznets bases his conclusions on the inherent improbability of falling per capita real income, citing the following evidence as indicative of a rising trend in the period taken as a whole:

1. *A rise in the share of nonagricultural occupations in the total of the gainfully occupied from 27.2 to 31.4 per cent.* Since Martin's series imply a product per worker in agriculture of half the national average, the shift would have accounted for a rise of 7.8 per cent in the average product per worker, assuming no rise in productivity in either the agricultural or the nonagricultural sector.

2. *A rise in the ratio of workers to total population from 0.29 to 0.32, or by about 10 per cent.* Together with the occupational shift, an increase of 19 per cent in real product per capita would have been produced without any rise in productivity.

3. *A greater rise in the output of cotton, wheat, lumber, grain, and in the number of horses, cattle, and sheep on farms than the increase in population; a lesser rise only in tobacco output.*

4. *An apparent rise in labor productivity in wheat, corn, and cotton production.*

5. *An increase in the real wages paid to farm workers in Vermont.*

6. *Somewhat greater declines in wholesale prices of manufactures than of farm products, indicating a relatively greater rise in per worker productivity in manufacturing.* This evidence should be scrutinized with some care, inasmuch as the criticism of Martin's series in our first section may have left the implication that Kuznets's thesis is thereby supported.

The heart of the argument lies in the assumption of a constant, or rising, level of productivity in agriculture during the period (points 3, 4, and 5). Of the output series cited by Kuznets, only the cotton and tobacco series have any known basis. The former is based on a careful amplification of the export series made by Levi Woodbury from contemporary state data.[26] The tobacco series, though taken by Kuznets from Mulhall, corresponds closely to the estimates of Towne and Rasmussen based on export data.[27] We have not been able to trace to their original source the data on wheat taken from the curious publication of Guetter and McKinley, but they show a suspicious correspondence

[25] Kuznets, *op. cit.*, pp. 221–241, and his article "National Income Estimates for the United States prior to 1870," *Journal of Economic History*, Spring 1952.

[26] Exec. Doc. 146, 24th Cong., 1st sess.

[27] See footnote 6.

to population growth during the period.[28] The lumber figure is an estimate by the United States Forest Service, which appears to assume constant per capita production in 1799, 1809, and 1819. The authors of the estimate state that they did not use early census data but do not state what they did use.[29] The remaining data are taken from Mulhall—a source whose accuracy, as Kuznets states, is difficult to appraise.[30] Mulhall himself implied that his grain figure is based on population growth, and his 1810 livestock figure is far below that of Blodget.[31] The lack of any means of estimating output, except of specialized regional crops, before the census of agriculture of 1840 is frankly recognized by Towne and Rasmussen in their paper in the present volume.[32]

The estimates of productivity increases (point 4) originate in a Department of Agriculture publication as part of a table intended to give a general view of the development of productivity from 1800 to 1940.[33] Quotation of these estimates by Kuznets almost certainly puts upon them a greater weight than their authors intended them to support. Their study is devoted almost entirely to developments since 1919, and the figures for the early period do not appear to be the result of thoroughgoing historical investigation. On the other hand, Towne and Rasmussen cautiously state that "evidence suggests that an increase in the application of technology to agriculture began in the early part of the nineteenth century but that it did not cause a significant increase in productivity until the middle of the century."[34] Even in the Department of Agriculture publication cited by Kuznets a conclusion somewhat at variance with the inference of rising productivity is suggested. Dividing the total population of the United States together with an allowance for foreign consumers by the farm employment figure, the authors get a series of "total persons supported at home and abroad by one farm worker" which moves as follows: 1820—4.52; 1830—4.51; 1840—4.49; and 1850—4.68.[35] This movement is in marked contrast to the

[28] F. J. Guetter and A. E. McKinley, *Statistical Tables Relating to the Economic Growth of the United States*, McKinley, 1924. Sources for specific figures are not given in this publication; only a number of source books without page references is given as the source of a large number of the series. From their wheat series, wheat production per capita of the total population runs (in bushels): 1800—0.414; 1810—0.414; 1820—0.395; 1830—0.388; and 1840—0.498.

[29] A. H. Pierson and R. V. Reynolds, *Lumber Production, 1869–1934*, Forest Service, Dept. of Agriculture, 1936.

[30] Kuznets, "Long-Term Changes," p. 234. Kuznets adds, "There is justification for using (Mulhall) here because Martin's estimates themselves rest in part upon some data from Mulhall."

[31] See footnote 8.

[32] See the general discussion in the first section of their paper, *infra*.

[33] M. R. Cooper, C. T. Barton, and A. P. Brodell, *Progress of Farm Mechanization*, Dept. of Agriculture, Misc. Pub. 630, October 1947.

[34] M. W. Towne and W. D. Rasmussen, "Farm Gross Product and Gross Investment," *infra*.

[35] Cooper *et al.*, Table 3.

movement of the series after 1850; it implies that productivity and the level of support of the population in terms of farm products moved together during the earlier period. A simultaneous and perfectly synchronized rise in the two variables is not impossible, but no rise in either variable is at least equally likely.

Nor can we overlook the doubt that Kuznets' point 6 casts on the validity of point 5. An improvement in agriculture's terms of trade would itself permit a real wage rise for farm laborers without any rise in their physical productivity. The Vermont series, compiled in the notable bulletin of T. M. Adams,[36] must be carefully examined and interpreted, particularly since its statistical basis is relatively good.

Adams's series of real wages of Vermont farm laborers shows a rise of 32.3 per cent between the five-year period centered on 1809 and that centered on 1839. However, the index includes an imputed value for board, which was an almost universal supplement to wages at the time. Adams apparently assumed this imputed value as constant in "real" terms, and his inclusion of it in the wage index involves a curious distortion.[37] An index of money wage rates deflated by an index of the cost of items other than food gives a more manageable measure of the trend of that part of the real wage in which productivity increases were probably fully reflected. Apart from food, the portion of the Adams index of farm family living cost applicable to farm laborers is made up almost entirely of clothing. Comparing the movement of the money wage with the index of clothing, we observe a rise of 17.7 per cent in the former and a fall of 12.8 per cent in the latter, indicating a rise in the value of the wage in terms of clothing of about 35 per cent.

In common-sense terms, the theoretical questions involved in interpreting this trend are as follows: Why were Vermont farmers able and required to pay—for about a generation—money wages that rose

[36] T. M. Adams, *Prices Paid by Vermont Farmers*, Vermont Agricultural Experiment Station, Bull. 507, February 1944.

[37] That portion of Adams's index which purports to show the money value of the supplements in kind to the money wage is a pure statistical fabrication, calculated from a quantity of food taken from figures for 1910 to 1940 with the value projected back by his food price index. In addition, the foods involved—which must include such items as meat, milk, eggs, bread, etc.—bear no relation to the items in his food price index for the early period. The latter is based almost entirely on purchased foods whose prices were available. For 1825 the foods and their weights were: butter—22, codfish—25, coffee—4, eggs—3, molasses—11, salt—8, sugar—8, and tea—19 (*ibid.*, p. 32). This index declines sharply (by 39 per cent) between 1809 and 1839, and the money value of board added to the money wage must move down with it. The cost of living index by which the whole wage is deflated, however, falls less rapidly, so a falling "real" value of food is evidently shown despite the assumption of a constant quantity. If a correction were made for the distortion, the real wage index would increase somewhat more than in Adams's series. Sufficient detail is not given in the bulletin to permit recalculation of the indexes. His assumption of a constant real wage in kind, however, is not improbable. In this case only the money wage index reflects increase in labor productivity, or any other economic changes.

moderately upward while living costs were falling? The answer falls into two parts:

1. Vermont farmers *could* pay such wages if, relative to their costs, the prices of the products they sold were rising; if they were willing to accept shrinking profit margins; or if the hired labor was becoming more productive.

2. Vermont farmers *had to* pay such wages if—regardless of what was happening in Vermont agriculture—the wage rate in competing employment was rising at this rate.

On the first point, Adams's data show that the terms of trade were moving favorably for Vermont farmers over the period. The "purchasing power of Vermont farm products—taken as the ratio between Adams's indexes of prices received and prices paid for family living and production costs—rose by 55.2 per cent."[38] Even with no rise in the productivity of hired labor, the Vermont farmer could have paid the higher wage rates.

A closer look into the position of the farmer hiring labor is gained by looking at the movement of money wages relative to the prices of products in which hired labor was most used. Adams's study indicates that this labor was markedly seasonal with nearly half concentrated in the months of June through August.[39] The remainder was used the year around in steady amounts. The pattern suggests that half the labor was used in the field crops, particularly in haying, and the remainder in dairying. To study the movement in the wage-price relationship, we computed the ratio of the money wage index to the price index for all farm products, for dairy products, for grain, and for hay. The scatter of the ratios was so great as to destroy the statistical significance of a trend. It demonstrated mainly the well-known lag of money wages behind prices rather than any steady rise in wages relative to prices. Computing five-year averages of the ratios centered on the last year of each decade between 1799 and 1839, we obtained the following results:[40]

| | *1799* | *1809* | *1819* | *1829* | *1839* |
|---|---|---|---|---|---|
| All products | 0.75 | 0.78 | 0.79 | 0.91 | 0.87 |
| Dairy products | 0.94 | 1.04 | 1.02 | 1.21 | 1.16 |
| Grain | 0.45 | 0.58 | 0.43 | 0.55 | 0.51 |
| Hay | 1.00 | 1.12 | 1.14 | 1.16 | 1.12 |

[38] *ibid.*, p. 105.

[39] *ibid.*, p. 86. Wages were also highest in these months, so that much more than half of the wage bill is accounted for by the seasonal peak.

[40] *ibid.*, pp. 87, 88, 139, and 140.

We then calculated the percentage change in the terminal ratios over the four-decade and three-decade periods:

| | *Between 1799 and 1839* | *Between 1809 and 1839* |
|---|---|---|
| All products | 16.2 | 11.2 |
| Dairy products | 23.1 | 11.8 |
| Grain | 10.5 | −12.3 |
| Hay | 12.0 | 0.3 |

Relative to the prices of grain and hay, the Vermont farmer paid wages perhaps 10 per cent higher in the years around 1839 than in those around 1799. At the same time the terms of trade for his products generally were moving strongly in his favor. The increment of evidence of rising productivity to be derived from such data is indeed marginal.

Did then the rising real wage—taken as evidence of a rise in the returns in competing occupations—indicate a general rise in labor productivity to which the Vermont farmer had to adjust? Whatever the answer, the connection with labor productivity in agriculture is remote. Laborers probably did not leave Vermont farms to become farm laborers elsewhere; the competing occupations were industrial employment or farm ownership. Farm ownership in Vermont may have been attractive by virtue of the movement of the relative prices of Vermont farm products already noted. Industrial growth in southern New England surely raised farm wages even before 1840.

To speak in more general terms, it seems likely that the question of the effect of the westward movement on productivity must be decided by qualitative evidence. The growth in cotton production relative to the slave population suggests a rise in productivity there, based largely on rises in yields per acre with the movement into Alabama and Mississippi.[41] Evidence on other crops is hard to accumulate. Until the transport improvements of the 1820's and 1830's, two opposing forces were at work: the movement to better soils in the Ohio River valley and the movement to less densely settled regions with fewer opportunities for local trade. For the first few years of a pioneer farm the advantage of better soil must have been outweighed by the difficulty of land clearing, road building, and adaptation of crops and techniques to new conditions. This formation of agricultural capital cannot be adequately included in output estimates. However, even when agriculture was well established in the old Northwest, the degree of self-sufficiency was probably greater than in the East, and the level of productivity correspondingly reduced.

To test the effect of the westward movement, by using Seaman's estimates of per capita income by states in 1840 one can calculate what

[41] This conclusion is indicated by the current research of Mrs. Whartenby in plantation records of the period.

the national average per capita income would have been at the preceding census years had the 1840 levels by state occurred under the population distribution among the states and territories then prevailing.[42] Taking $57 as the average in 1840 as shown by Seaman, we obtained the following result: 1790—$63.3; 1800—$61.3; 1810—$60.0; 1820—$59.1; 1830—$58.0; and 1840—$57.0.[43] The calculation of course shows nothing about the actual movement of per capita income, or what that movement would have been in the absence of westward migration. The states gaining population most rapidly in the period were those whose incomes in 1840 were relatively low. It is far from certain that the immediate effect of interregional shifts was actually to raise the national per capita income.[44]

To summarize, the evidence appears to be too weak to support Kuznets' inference that per capita real income followed a rising trend from 1800 to 1840. The validity of his contention depends upon the assumption of a constant or rising level of productivity in agriculture. If agricultural productivity had been constant, the rise in per capita income would have been confined to the 19 per cent suggested by Kuznets' points 1 and 2 and to the rise of productivity outside of agriculture. A small fall in agricultural productivity would have sufficed to wipe out any such gains. Closer study of the qualitative evidence of the period is required before any conclusion can be drawn and cast in even a very rough quantitative form.[45] The analysis of both Martin's

[42] Richard A. Easterlin has suggested that the migrants may have raised their individual incomes by moving west and so produced a rising national average despite interstate differentials in the direction specified by Seaman's estimates. But the movement was based more on expectations than on known and immediately realized gains in income. In any case, the central problem is to estimate the movements of agricultural productivity in the old and new regions.

[43] Ezra Seaman, *Supplement No. 1 to Essays on the Wealth and Progress of Nations*, Baker & Scribner, 1848, pp. 145–148. Another Seaman series and the Tucker series differ in some respects, but not by enough to affect the result of our calculations.

[44] From Seaman's estimates we plotted a scatter diagram of the percentage of agriculture in total income, by state, against per capita income and found a marked negative correlation. The southern states showed consistently higher per capita incomes relative to the share of agriculture in their output than the northern states. Between the northeastern states and the Ohio valley states there was no marked difference in how far individual states fell below the regression line.

Seaman has an interesting estimate of the relation between value of land and population density. He estimated that the value of land of average quality for cultivation and grazing rises—over and above the value of improvements—by 12½ cents per acre for every inhabitant per square mile in the vicinity up to a density of eight per square mile, and after that much faster (*ibid.*, p. 89).

[45] Writing about the early period of British industrialization, Phyllis Deane recently stated: "[The evidence] suggests that most, if not all, of the advance in average real incomes which had been achieved between the end of the seventeenth and the beginning of the nineteenth century had been achieved by 1770, before the Industrial Revolution had well begun. In the last three decades of the eighteenth century, that is, in the period which saw the unmistakable beginnings of rapid industrialization, the rate of increase in average real incomes was apparently negligible, if indeed there was not a positive decline." (Phyllis

estimates and Kuznets' criticisms thus points to the impossibility of securing an answer to the more general questions about national income movement in the period until the question of the movement of productivity in agriculture is directly attacked by the painful techniques of historical research.

## COMMENT

SAMUEL REZNECK, Rensselaer Polytechnic Institute

The paper by William N. Parker and Franklee Whartenby served to introduce the major theme and open the discussions of this conference. Focusing on the first half century of national development of the United States, from 1790 to 1840, they pose and explore the pertinent questions: Was there economic growth? How can it be measured quantitatively, not only in absolute, aggregate terms but also in the relative and significant terms of per capita production and productivity?

In directing such questions to the transitional period between the agricultural and industrial phases of U.S. development, Parker and Mrs. Whartenby have taken on a difficult, if not impossible, task. The difficulty lies in the scarcity and inadequacy of the statistical material. The data seem to lack all three of the characteristics which Simon Kuznets considers essential for the quantitative interpretation and presentation of historical processes—continuity, comparability, and consistency.

Despite this difficulty, the topic is important because it comes to grips with the question of how far back one can push the concept of economic growth with some confidence. At what point can one begin to replace or support qualitative generalization and episodic illustration, which Kuznets discounts as inadequate, with regular and reliable measures of growth?

In the light of this statement of the problem and its significance, what have the authors accomplished or failed to accomplish? One hastens to add that no commentator can pretend to approach Parker's knowledge of the materials and methods available. He has gone into this project with the utmost thoroughness, and the very nature of his tentative report conveys an authoritativeness that commands respect and recognition. He is well aware that time series and indexes may be deceptive in their simplicity, and that the scaffolding may be too slight to support the structure of generalized conclusion erected upon it. Parker is so well aware of this that he is not yet ready to build either a scaffolding or a structure of his own.

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Deane, "The Industrial Revolution and Economic Growth," *Economic Development and Cultural Change*, January 1957, p. 107.) This is, of course, a much-disputed point.

Parker's accomplishment is to clear the ground. He has examined with admirable patience and care the work of others in this field. For nearly twenty years R. F. Martin's survey of the national income since 1799 has been the only approximately continuous income series available and has served both as buffer and challenge. For the period in question Martin's record has always been disturbing because it revealed a declining economic trend, particularly between 1820 and 1840. This cast a cloud of doubt upon our accepted mythology of progress. Parker has explored Martin's sources and methods and demonstrated many inadequacies and inaccuracies. He has not, however, considered the impact of cyclical fluctuations upon the data. The period encompasses the abnormal years of strife and war characterized by inflation between 1808 and 1815. It includes equally sharp deflations after 1819 and again after 1837. Two of the principal bench marks, 1820 and 1840, lie in the very troughs of depression. It seems reasonable to suppose that the newly established commercial and industrial ventures of this era were especially vulnerable to business contractions, and no amount of adjustment can entirely eliminate this influence.

Parker has also examined the one principal attempt to dispute Martin's pessimistic conclusion, Kuznets' attractive and persuasive argument that industry and agriculture were both characterized by a moderate degree of growth. This, too, Parker regards as inference for which the evidence is inadequate.

Parker rightly confines his critical attention to Martin's estimates and Kuznets' attempt at rectification. Colin Clark, however, presents some interesting data in his recent revision of *Conditions of Economic Progress.* Employing a constant international monetary unit (IU), Clark offers statistics of output per worker-hour between 1800 and 1840. These show a decline from 1800 to 1830 from 0.229 IU per hour to 0.176 followed by a partial recovery to 0.209 by 1840. There is no rise beyond the 1800 figures until 1850 and then only to 0.241 per worker-hour. It would be instructive to know the source of these estimates.

The main verdict of Parker's and Mrs. Whartenby's paper on the conclusions of these authors is: Not proven for want of adequate evidence. This raises the question whether there is ever likely to be enough material available for any more reliable measure. Only in 1810, 1820, and 1840 was any attempt made to include manufactures and agriculture in the federal census. The first censuses were notoriously incomplete. The census of 1840, although far from satisfactory, undertook the most comprehensive coverage of economic activity to that date and constitutes the only really substantial bench mark for the whole first half century. It fed a large mass of statistical data into the hopper of economic and political agitation and controversy.

Out of it came two interesting contributions to the literature of

economic progress. One was *Progress of the United States* by George Tucker, Professor of Moral Philosophy and Political Economy at the University of Virginia, and the other was by Ezra Seaman, whose *Essay on the Progress of Nations in Productive Industry, Civilization, Population, and Wealth* has a scope suggesting the present conference. While both of these works served partisan purposes, they contain impressive compilations of statistics including some shrewd attempts to calculate and compare the total national income at different dates in the period preceding 1840. There may also be a great deal of neglected material in contemporary journals such as Niles's, Hunt's, and DeBow's, in the statistical resources of the various states and in the gazettes, almanacs, and annuals popular in that day. In evaluating these data it is important to keep in mind the fact that concern with economic growth was a prominent feature of our economic life even in this early period, and statistics of production and population often were designed to serve as weapons in political debates.

Agriculture, in particular, presents problems. Because of its very universality and priority, occupying close to 70 per cent of the population even in 1840, its treatment requires differentiation and discrimination to disclose its share and role in economic growth. There is, first, the distinction between commercial and subsistence agriculture. The line cannot be drawn very sharply, for in a real sense subsistence was present in all agriculture, but it was a substantial part of the economy in regions where water or land transportation was inadequately developed. This was the case before 1840 over large parts of the country, particularly in the frontier West. By its very nature, the volume and value of subsistence agriculture cannot be easily calculated. It was undoubtedly the most static and inelastic part of the economy and any serious attempt to include it as a whole in the total national income will probably obscure and reduce the effect of economic growth in other lesser but more dynamic segments of the economy.

The growth of machine and factory production undermined household industry, especially after the 1820's and left pockets of subsistence agriculture with unused but immobile labor.

It was one of the paradoxes of U.S. economic development that the very expansion of the frontier and occupation of new land was perhaps a retarding factor in economic growth during the early period. Capital and labor were drawn off into regions not easily accessible, and were not immediately translated into increased output and productivity. The chief lure was the appreciation of land values, which did not immediately or always materialize.

Ezra Seaman's statistical demonstration suggests that western agriculture was least productive on a per capita basis despite its abundance of free land. Its remoteness from markets and high cost of transportation

kept farm prices chronically low, and agricultural labor relatively poorly employed.

In the process of differentiation of diverse agricultural activities, the South and its products must occupy a very prominent place. This is a further observation I would like to bring to Parker's attention. Here the basic issue concerns not only the relative contribution of the South to the growth of the total economy, but also the economic role and productivity of slave labor. This question seems to be altogether underrated, if not overlooked, in the various efforts thus far made to measure economic growth. The agrarian South was, in this early period, much more important, both absolutely and relatively, in a predominantly agricultural economy than it was to be subsequently. The population of the South was, before 1840, still much closer to a parity with the North, especially if the new northwest is excluded. While it had relatively little industry, the South was mainly responsible for the major staple crops which supported the largest part of our foreign trade.

To offset the expanding role of cotton there was the stagnation of the other and older major staple crop, tobacco. There was the subsistence agriculture practiced by a large proportion of the poorer white population in the South, which was subject to the same handicaps and rigidities characteristic of subsistence agriculture generally, and a resultant labor surplus which was revealed in the emigration of white labor to the frontier across the Ohio. Above all there was the fact of Negro slave labor which constituted a substantial portion of southern labor and perhaps one-fifth of the total labor force in 1840. Was this labor economically productive at a rising rate throughout this period, even after allowing for the migration to richer soil and ignoring the factor of declining prices? The apparent profitability and prosperity of cotton agriculture must not be allowed to disguise the fact that Negro slave labor lacked the incentive to increase productivity. How much hidden unemployment may have existed where there was actually more labor time available than was required by the prevailing cycle of farm or plantation work is a matter to be appraised, rather than measured exactly.

Ultimately, substantial economic growth was contingent upon the creation of national markets, the mechanization and extension of transportation and industry, the development of power, mineral fuel, and metal technology, as well as the division of labor and the evolution of better business and managerial techniques. In all of these, relatively small beginnings had been made before 1840, but the really significant revolution was still to follow. In the tentative transition from pre-industrial to industrial stages, retarding factors played their part—lack of capital, inertia of labor, dislocations of the cycle and the trials and failures of technological and business experimentation. To offset this

there was no want of incentive, enterprise, and experimental innovation as manifestations of the money-making spirit. In this respect the U.S. people were scarcely, if at all, underdeveloped as compared even with Britain at this early date. One may say that the spirit of enterprise was strong, although the means were sometimes weak or inadequate and the results not immediately apparent in terms of rising income or profit. The concept of economic progress, or the promise of it, as a socio-psychological phenomenon, was perhaps in advance of actual economic fulfillment. Despite the lag, it was an essential preparation for it.