TABLE 14 (concluded)

	Hosiery and Knit Goods		*Boots and Shoes*		*Foundries and Machine Shops*	
	NBER	Douglas	NBER[c]	Douglas	NBER	Douglas
1890	9.4	11.3	16.1	16.9	18.5	31.9
1891	9.6	11.5	15.9	16.7	19.0	31.3
1892	10.1	10.7	16.1	17.1	18.6	32.3
1893	10.6	10.8	16.4	17.3	18.8	32.2
1894	10.3	10.3	16.0	17.1	18.6	31.2
1895	9.9	11.1	15.4	17.3	18.0	31.3
1896	10.0	10.6	15.0	17.2	17.8	31.7
1897	9.5	10.1	14.7	17.3	17.3	31.7
1898	9.6	10.2	14.2	17.3	17.5	31.6
1899	10.2	10.0	14.5	17.5	17.3	32.2
1900	10.2	10.1	14.8	17.8	18.0	33.2
1901	10.2	10.9	15.1	17.8	18.3	34.0
1902	10.4	11.8	15.4	18.6	19.4	35.2
1903	11.0	12.5	16.5	19.5	20.2	36.3
1904	10.7	12.0	16.3	20.0	20.0	36.4
1905	11.2	12.9	17.2	20.4	20.2	36.6
1906	12.7	13.5	17.6	20.7	21.3	37.8
1907	12.3	14.4	18.5	21.6	21.8	38.9
1908	12.2	14.4	18.4	21.2	21.9	36.7
1909	12.4	14.2	18.4	22.0	22.0	36.9
1910	13.0	14.5	19.4	21.9	23.0	38.6
1911	13.3	14.5	19.8	22.2	23.5	39.6
1912	14.0	15.4	20.4	22.3	24.1	39.9
1913	14.6	16.7	21.0	24.1	25.1	40.6
1914	16.0	17.2	21.2	24.3	25.3	41.3

SOURCE: NBER series from Table 13. Douglas series: Paul Douglas, *Real Wages in the United States, 1890–1926*, Boston, 1930, pp. 96 and 101.

[a] Includes cotton smallwares and cotton lace.

[b] Includes felt goods and wool hats.

[c] Includes boot and shoe cut stock and findings.

CHART 3

Comparisons of Estimates of Average Hourly Earnings in Six Industries, 1890–1914

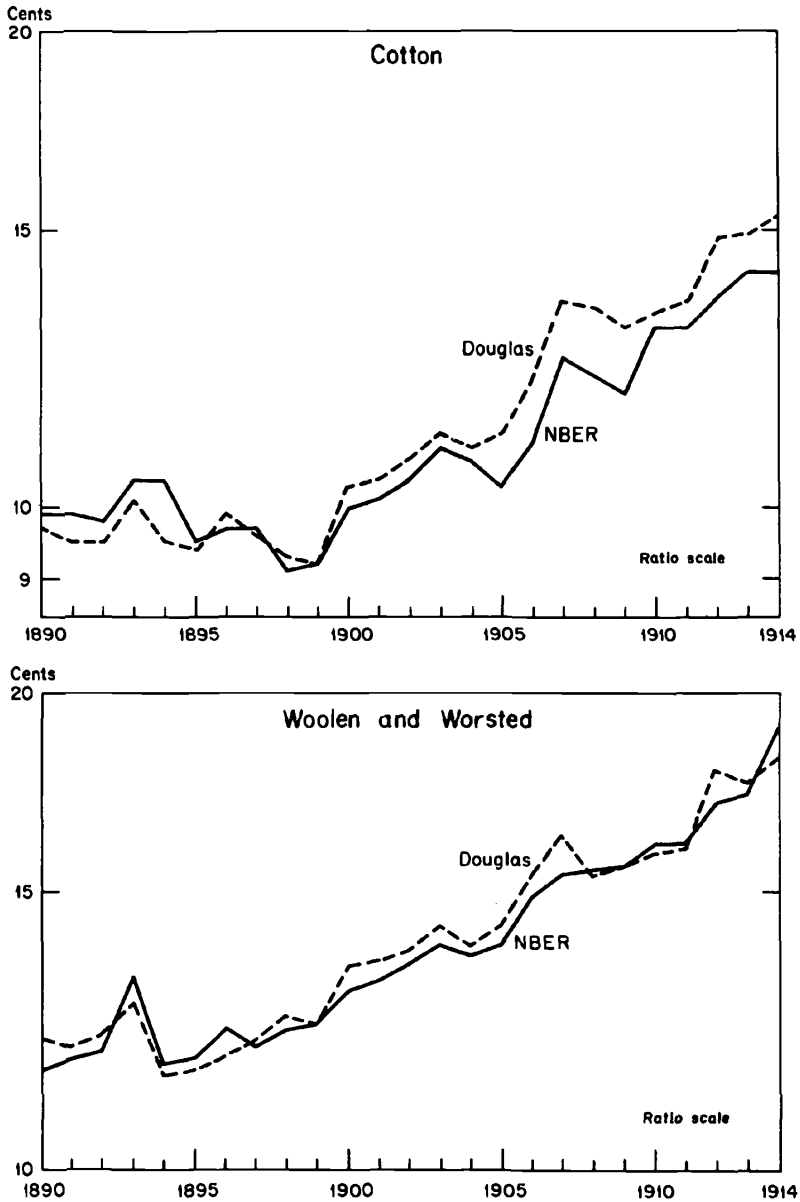

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CHART 3 (continued)

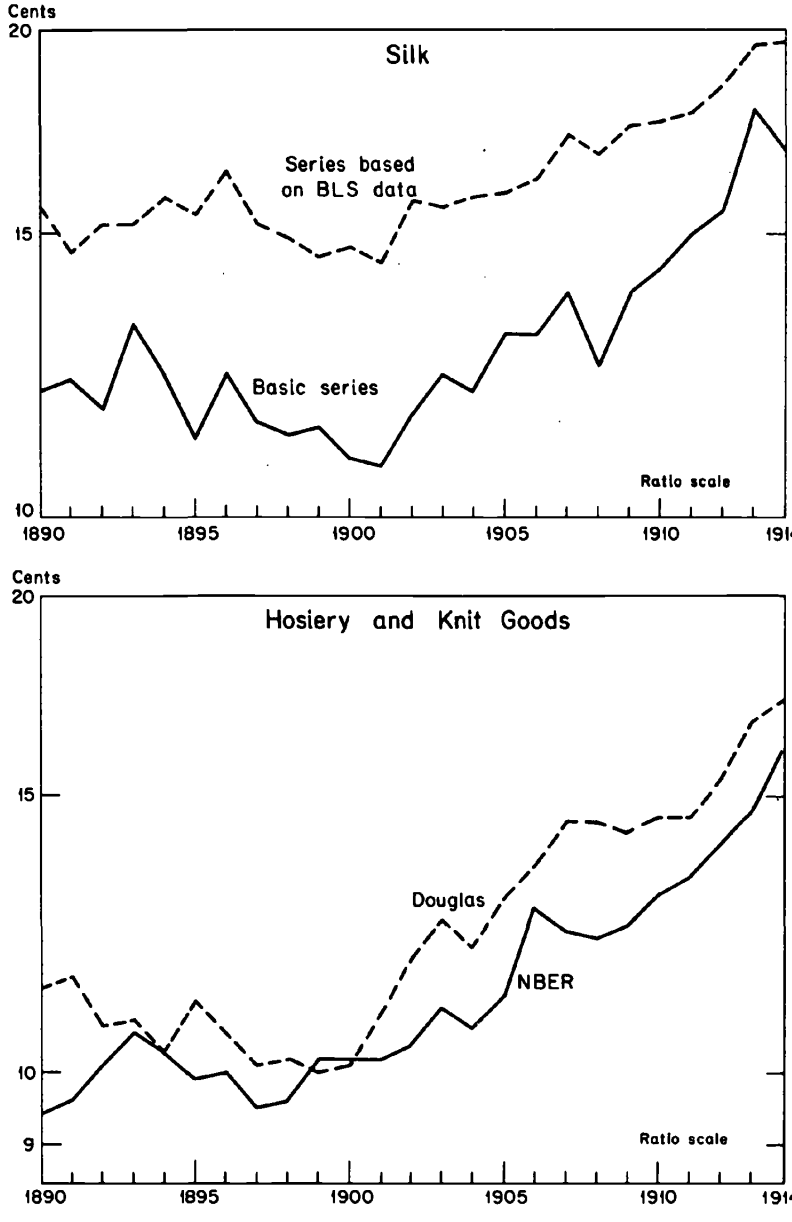

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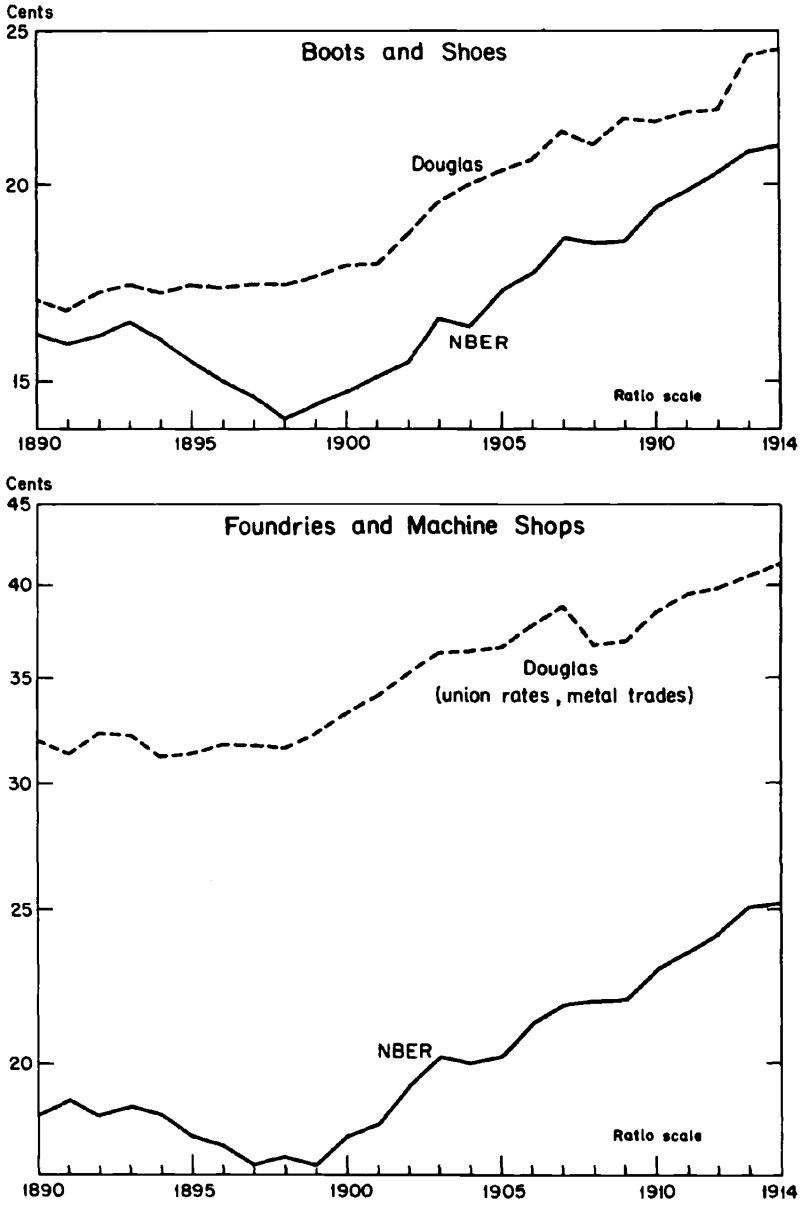
CHART 3 (concluded)



estimated from the 1914 Census data that about 0.3 cent of this difference is due to our inclusion of the lower-paying industries "boot and shoe cut stock" and "boot and shoe findings." The rest we presume results from the exclusion from the BLS sample of firms "whose main or sole products are pegged shoes or specialties such as slippers, leggings, felt boots, etc."[29] In this industry there are no significant differences in geographical distribution between the census data and the BLS sample.

The second largest difference in level is in the silk industry; 2.8 cents per hour in 1914. Here the BLS sample excludes establishments "manufacturing exclusively machine twist, sewing and embroidery silks, braids, laces, novelties, etc."[30] That these are low-paying branches of the industry may be inferred from the relatively low annual earnings in New York State, which produced almost two-thirds of the total output of fringes, braids, and bindings. There are also differences in geographical distribution some of which seem unrelated to the differences in industry definition. New Jersey and Massachusetts, both high-wage states, are overrepresented in the BLS sample, though Massachusetts produced a slightly higher share of fringes, braids, and bindings than of total output.[31]

In hosiery and knit goods there is a rather small difference in level between our series and Douglas's (1.2 cents in 1914), though there is a major difference in industry definition. The BLS data are confined to establishments making hosiery and knit underwear; they exclude establishments making such products as sweaters, bathing suits, gloves and mittens, and jersey cloth. Massachusetts, a high-wage state, is greatly overrepresented in the BLS sample.

In the cotton industry, our series lies below Douglas's after 1899; the difference reaches 1.2 cents by 1914. This difference does not arise from industry definition. Our definition includes two small branches of the industry, cotton smallwares and cotton lace, not included in the BLS data. These branches employed 13,000 of the 393,000 workers in the industry in 1914. They were confined to the northern states and had higher average annual earnings than the industry as a whole. Excluding them widens the difference in 1914 between our series and Douglas's by about 0.1 cent.

The source of the difference seems instead to be the geographical

[29] BLS Bulletin No. 232, p. 20.
[30] BLS Bulletin No. 190, p. 195.
[31] *Ibid.*, and *Census of Manufactures, 1914*, Vol. II, pp. 127 and 141–142.

composition of the BLS sample. This sample heavily overweights New Hampshire; it has 19 per cent of the BLS weight and less than 6 per cent of census employment. New Hampshire hourly earnings in the cotton goods industry can be roughly estimated from the census data at 17 cents in 1914, compared with the national average of 14.0. Much of the corresponding underweighting arises from the omission of several states producing relatively small amounts of cotton textiles. The most important of these are Virginia, Maryland, Tennessee, and Mississippi. The average annual earnings of the omitted states as a group are well below the national average, and these states also had a longer workweek than the national average.[32]

In the woolen industry, despite differences in industry definition, there is no appreciable difference in level between Douglas's series and ours. The two do not differ by as much as 1 cent in any year.

The series in each of the five sets just discussed differ in movement as well as in level. The differences in movement are most pronounced in the 1890's. Almost all of our series and many of Douglas's reach a peak in 1893 and then decline rather sharply.[33] However, of the five series based on BLS payroll data shown in Table 14, only two (cotton and woolens and worsteds) follow this general pattern. The Douglas series for hosiery and knit goods is higher both in 1891 and 1895 than in 1893; the silk series based on BLS data is higher in 1895 than in 1893, and Douglas's for boots and shoes shows no appreciable decline during the whole depression of the 1890's. Our series, based on state data for all three of these industries, follows the typical pattern of an 1893 peak and a sharp decline. In boots and shoes the decline is unbroken from 1893 to 1898, in marked contrast to the Douglas series.

These differences in movement seem to be related to the size of the sample in the *Nineteenth Annual Report*. The two payroll series that conform best to the general pattern had the largest samples. The average number of workers covered by these series for 1890–99 was 7,045 in cotton and 3,131 in woolen and worsted. In the poorly

[32] See BLS Bulletin No. 239, p. 30 and *Census of Manufactures, 1914*, Vol. II, pp. 21, 26, and 47. The BLS sample is that of identical establishments for which 1914 and 1916 data were secured; it is this sample that governs the level of Douglas's series. New Jersey is included only in cotton finishing; we have not included it among the "omitted states" mentioned in the text.

[33] The declines are typically prolonged as well as sharp. Of our eleven industry series that go back to 1893, the earliest to regain its 1893 level is iron and steel, which does so in 1899. Three industries do not regain their 1893 level until 1906 or 1907 (silk, dyeing and finishing textiles, and leather).

conforming series it was 1,683 in silk, 1,206 in boots and shoes, and 824 in hosiery and knit goods.[34]

During the 1890's, only one of our series for the first five industries shown in Table 14 ever departs appreciably from the general pattern. In cotton, our hourly earnings series remains unchanged from 1893 to 1894, while Douglas's falls. It can be seen in Table 13 that this stability of hourly earnings results from proportional falls in daily hours and daily earnings. The hours series may here be reflecting actual rather than full-time hours, since the fall is reversed in 1895. We may, therefore, have overestimated hourly earnings in 1894 by double counting time not worked, once in the reduction in days in operation and once in the reduction in hours.

Our series for these first five industries reach their low points at different dates; woolens and worsteds in 1894, hosiery and knit goods in 1897, cotton and boots and shoes in 1898, and silk not until 1901. Two of the four series based on BLS data that show clear cyclical declines (boots and shoes does not) have their low points in the same year as our series: woolens and worsteds and silk. The other two, cotton and hosiery and knit goods, reach their lowest point in 1899, somewhat later than our series.

After 1900, there are few differences in movement between the series in the two sets. Our series for boots and shoes declines in the business contraction of 1904 while Douglas's does not, and it does not recover in 1909 from its fall in 1908. Our series for hosiery and knit goods turns down in 1907, two years before Douglas's and one year before most of the series for other industries. This series is dominated by the Pennsylvania data, which show a sharp drop in wages in the hosiery branch of the industry from 1906 to 1907.[35] Our basic series for silk reaches a peak in 1903 and drops during the business contraction of 1904, while the series based on BLS data drops in 1903. In 1913 our basic silk series shows a sharp peak as a result of the Paterson strike.[36] The BLS series rises less from 1912 to 1913 and continues to rise to 1914.

[34] This inference about the effect of sample size is supported by the behavior of the Douglas payroll series not shown in Table 14. Three of these (iron and steel, lumber, and slaughtering and meatpacking) conform to the general pattern. In all three the average sample coverage for 1890–99 is over 2,400 workers. In clothing, the pattern is atypical; wages in 1896 are above those of 1893. Here the sample coverage is 1,043 workers.

[35] Pennsylvania, *Annual Report of the Secretary of Internal Affairs*, Part III, Industrial Statistics, Vol. XXXV, 1907 (1908), pp. 123–124 and 179.

[36] This strike, involving almost 22,000 workers and lasting 22 weeks, was conducted by the Industrial Workers of the World. The Paterson area employed about 25,000 of the

In woolen and worsted, our series fails to fall in 1908, while Douglas's shows the drop characteristic of most of the series. This is one of the instances in which our series for annual earnings and days in operation both fall, but days in operation fall more (see p. 36 above). There is an unusual fall in the Douglas series in 1913 not present in our series. In the cotton industry our series is unusual in that the wage decline of 1904 continues in 1905; the Douglas series shows the typical one-year decline.

We turn now to the final comparison in Table 14, that between our series for foundries and machine shops and the Douglas union-rate series for metal trades. The difference in level is very large throughout the period. In 1890, the union rate series is 72 per cent above ours and in 1914, 63 per cent.

Our definition of foundries and machine shops, though very broad, is considerably narrower than that of the union-rate series for metal trades. In several occupations in the metal trades series, especially blacksmiths and helpers, boiler makers and helpers, and machinists and helpers, most of the rates shown are from railroad repair shops, and there a few quotations from miscellaneous industries such as automobile repairing and breweries.[37] However, this difference in industry definitions seems to account for only a small part of the difference in level between our series and the union-rate series. When we estimate hourly earnings in railroad repair shops for 1909 and 1914 using our usual method of combining census and state data, the estimates lie from zero to 8 per cent above our corresponding

28,000 New Jersey silk workers, including dye-house workers. A detailed account of the strike, highly favorable to the employers, is given in New Jersey, Bureau of Statistics of Labor and Industries, *Thirty Sixth Annual Report* (1914), pp. 175–242. See also S. Perlman and P. Taft, *Labor Movements*, Vol. IV of *History of Labor in the United States*, J. R. Commons, ed. (1935), pp. 274–277.

Our New Jersey series for average earnings in silk, including dyeing, moves as follows for 1912–14 (in cents): 1912, 19.7; 1913, 26.7; 1914, 21.0. This series is overweighted in intercensal years in our national series, since we have data from only three states in our interpolating series after 1904. New Jersey had 26 per cent of the census employment in the industry in 1914, and has 36 per cent of the weight in our interpolating series.

Just why the strike produced this sharp rise in our earnings series is not clear. A wage increase of 5 to 10 per cent was announced at the end of the strike (New Jersey, *Thirty Sixth Annual Report*, p. 227), although the union had been broken. The account in the New Jersey Report also indicates that about 2,000 workers were at work throughout the strike and more were at work during parts of it; these may have been predominantly highly skilled workers, or they may have received extra pay during the strike. Our estimate of earnings would also be raised if, on days when a mill was reported as not in operation, a few workers were present and paid, or if the data included in wage payments amounts paid during the shutdown to the augmented force of company guards.

[37] BLS Bulletin No. 171, pp. 245–267.

estimates for foundries and machine shops. The great bulk of the difference in level must, therefore, be due to other causes. These can be discussed in relation to the union-rate segment of the Douglas series (1907–14) from which the whole series takes its level. First, the union-rate data are confined, generally, to large cities. Second, they cover only eight occupations, six of skilled workers and two of helpers of skilled workers. They omit laborers, apprentices, and many semiskilled occupations.[38] Third, it seems probable that, in a given occupation and city, union rates were above the average wage, either because the union was most successful in organizing high-paid workers or because rates were raised by the unions. As mentioned earlier, Wolman has estimated that only 6.5 per cent of workers in the metal trades (excluding iron and steel) were organized in 1910.[39]

Our series for foundries and machine shops declines more in the depression of the 1890's than the Douglas metal trades series. Our series declines 8.0 per cent from 1893 to 1897, and the metal trade series declines 3.4 per cent from 1892 to 1894. In the business contraction of 1904 our series declines slightly, while Douglas's rises very slightly. However, Douglas's series falls rather sharply in the business contraction of 1908, while ours rises slightly because in Massachusetts and New Jersey days in operation fall more than annual earnings.

The iron and steel industry is the seventh industry in which our series can be compared with others, and here several other series are available. These are shown in Table 15 and Chart 4.

Our estimates lie below Douglas's by about 3 cents an hour in the closing years of the period and about 5 cents an hour early in the period. The movement of the two series is very similar, except that ours fails to fall appreciably from 1907 to 1908. In both level and movement, the series published by the United States Steel and Bethlehem Steel Corporations are much closer to our series than to Douglas's.[40] However, both of these company series rise from 1913 to 1914, which is not true of the other two.

The probable reason for the high level of the Douglas series is that the BLS data do not cover all the departments of the industry. They

[38] State reports from Ohio giving occupational wage data for foundries and machine shops in this period show more than ninety occupations in Cleveland, and additional occupations in other cities.

[39] See p. 20 above.

[40] These two series were derived by dividing total payrolls by man-hours, according to letters received from the two corporations. Bethlehem states that these are actual rather than standard hours, though neither letter explains how man-hours were measured or estimated.

do not cover crucible furnaces, rod mills, or structural shape mills, or the conversion of rolled products into finished products such as wire, pipes and tubes, nails, or bolts. Such conversion was frequently done in the same establishment where the steel was rolled, in which case it

TABLE 15

Average Hourly Earnings in the Iron and Steel Industry, 1892–1914
(cents)

	NBER	Douglas	U.S. Steel	Bethlehem Steel
1892	17.0	22.2		
1893	17.2	22.9		
1894	15.8	19.9		
1895	15.3	20.7		
1896	15.8	21.2		
1897	15.4	20.3		
1898	15.8	20.5		
1899	17.9	21.8		
1900	18.7	23.4		
1901	19.6	23.8		
1902	20.3	25.4	20.1	
1903	20.2	25.8	20.7	
1904	19.2	24.0	19.2	
1905	19.4	24.5	19.8	20.0
1906	20.3	25.5	20.4	20.0
1907	21.5	26.4	21.4	21.0
1908	21.4	23.9	21.4	21.0
1909	22.0	24.5	21.6	22.5
1910	23.2	26.8	22.4	22.0
1911	24.7	27.3	23.4	23.1
1912	24.8	28.3	23.8	24.8
1913	27.4	30.6	25.2	26.2
1914	26.6	29.8	25.7	27.1

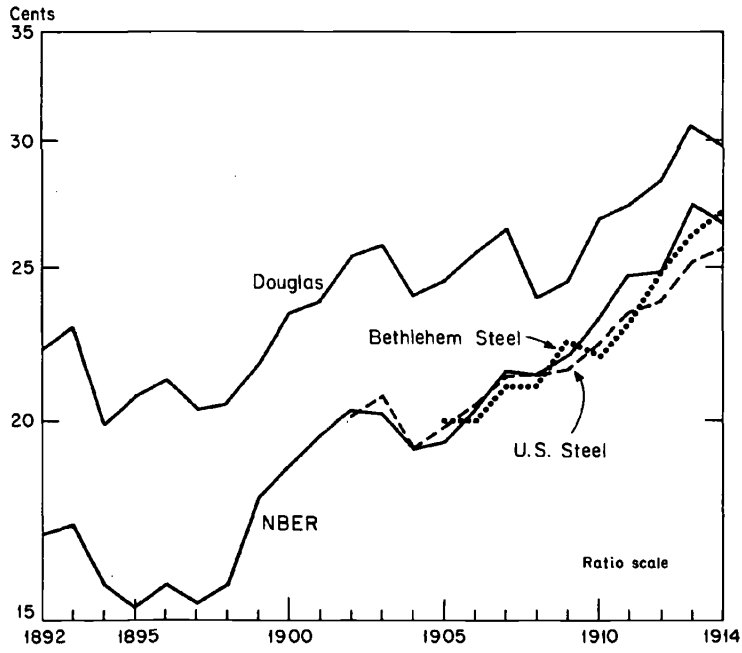
SOURCE: For NBER series, see text. Douglas series: Paul Douglas, *Real Wages in the United States, 1890–1926*, Boston, 1930, p. 101. U.S. Steel: United States Steel Corporation, *47th Annual Report, 1948*, p. 28. Bethlehem Steel: Bethlehem Steel Corporation, *Annual Report, 1954*, p. 19.

is included in the census industry. These departments appear to have lower hourly earnings than the included departments. In addition, the regular BLS data exclude workers not assigned to any department engaged directly in production—the power, mechanical, and yard

force. A special BLS study for 1910 shows that such workers were more than one-third of the total and that their average earnings were slightly less than those of "productive" workers.[41]

CHART 4

Average Hourly Earnings, Iron and Steel, 1892–1914



The study just mentioned also permits us to estimate average hourly earnings for the whole industry for May 1910 at 21.6 cents.[42] This is somewhat below any of the figures shown in Table 15 for that year. This figure is also affected by exclusions; the 1910 study omits all plants of the Bethlehem Steel Corporation and also omits departments producing sheet, tin and terne plate, wire, nails, and bolts.

[41] *Report on Conditions of Employment in the Iron and Steel Industry*, Senate Document 110, 62nd Congress, 1st Session (1911), Vol. 1, pp. xxviii–xxix. The average hourly earnings in productive occupations were 22.3 cents; in the power, mechanical, and yard force, 21.0 cents. This last figure was computed from a frequency distribution given in the source.

[42] Computed from the data cited in footnote 41 and a similar frequency distribution for general occupations in the productive departments given in the same table.

Although our earnings estimates for the steel industry are supported by the data available from other sources, our estimates of standard hours are lower than any others. Table 16 shows three series for average weekly hours, 1902–14. The comparisons are not extended back of 1902, since there is only one estimate (Douglas) of the

TABLE 16

Average Weekly Hours in the Iron and Steel Industry, 1902–14

	NBER[a]	Douglas[b]	U.S. Steel
1902	64.0	67.3	68.4
1903	64.0	67.4	66.6
1904	63.4	66.8	67.4
1905	64.1	67.5	68.9
1906	64.0	67.4	68.6
1907	64.0	67.4	68.5
1908	63.2	66.5	65.1
1909	63.8	67.2	68.8
1910	63.5	67.2	68.4
1911	62.3	66.3	67.2
1912	61.9	66.1	69.0
1913	61.7	66.3	68.9
1914	60.7	65.5	67.6

SOURCE: For NBER series, see text. Douglas series: Paul Douglas, *Real Wages in the United States, 1890–1926*, pp. 96 and 101. U.S. Steel: United States Steel Corporation, *47th Annual Report, 1948*, p. 28.

[a] Standard workweek; Douglas adjusted to census levels in 1909 and 1914; see p. 42.

[b] Standard workweek.

movement of hours available before then. In addition to the estimates shown in Table 16, an estimate for 1910 of 68.5 hours can be made from the special BLS study of that year.[43]

If we had used any of these higher estimates of weekly hours and applied them to our estimates of daily earnings, the resulting hourly earnings would lie below the other hourly earnings series. There is

[43] *Report on Conditions of Employment in the Iron and Steel Industry*, p. xliii. Average hours for general occupations and for power, mechanical, and yard force were computed from frequency distributions. The assumed means of the class intervals were chosen so as to reproduce as closely as possible the published mean for productive occupations. Ethel B. Jones has pointed out to us that our hours estimates may be low because they are benched to census data on prevailing hours of establishments. Within these establishments there were probably departments with longer hours than those of the establishment as a whole.

some possibility that such an earnings series would be more accurate than the one we have used, since our estimates after 1908 lie above the series on earnings in United States Steel, and these, in turn, were probably above the industry average.[44] On the other hand, the omission of departments making finished products from rolled steel may well explain the higher level of the Douglas hours estimates, while this plus the omission of two other departments with short workweeks, sheet and tinplate, could explain the high level of hours shown by the 1910 study. There are presumably no such omissions in the hours series published by United States Steel. However, in general the workweek for all companies was longest in the departments producing the products where U.S. Steel had the largest share of industry output (ingots and heavy rolled products).[45]

This completes the discussion of earnings series that can be compared with alternative series. For some series already discussed, and some others, comparisons can be made in 1914 with the data published by the National Industrial Conference Board. These comparisons are shown in Table 17, together with Douglas's estimates where available. In two cases, cotton and paper and paper products, the NICB divides our industry into two parts. In both cases, our estimate lies between the two NICB figures, though in both cases a weighted average of their figures lies above ours.[46]

Where direct comparison between our figures and the NICB figures

[44] U.S. Steel had a large proportion of its employment in the Pittsburgh district, which was in general the highest wage district (see *ibid.*, p. xxxiv). Within this district, U.S. Steel employees had higher earnings than those of small companies, but somewhat lower earnings than those of large independent companies. This last statement is based on comparisons of average earnings by type of company in each of five departments (blast furnaces, open hearth furnaces, blooming mills, plate mills, and bar mills) computed from frequency distributions in *ibid.*, Vol. IV, p. 264. Large independent companies ranked first except in open hearth furnaces, where U.S. Steel ranked first. U.S. Steel ranked last in bar mills.

[45] For U.S. Steel's share of output by products in 1913 and 1914 see Temporary National Economic Committee, *Investigation of Concentration of Economic Power*, Part 31 (1941), p. 17,747. The corporation's share of industry production was 50.3 per cent for ingots and 50.6 per cent for rails in 1914, while in sheet it was 39.3 per cent and in tubes and pipe, 44.8. In 1910, the standard workweek of productive workers in tube mills was 62.0 hours compared with 69.8 for all departments (*Report on Conditions of Employment*, p. xliii); in 1914 the standard workweek in sheet mills was 52.3 hours, compared with 64.9 in all departments (Wolman, *Hours of Work in American Industry*, p. 9, computed from BLS data). On the other hand, U.S. Steel produced more than half the industry output of wire rods and tinplate in 1914, and in these departments the standard workweek was also short.

[46] Weighting the NICB cotton figures by census employment in the South and the non-South gives an industry estimate of 15.1 cents. Weighting the NICB figures for paper and for paper products by census employment gives an average of 21.2 cents.

is possible, theirs are higher in six cases and lower in two; in boots and shoes the figures are the same. The largest difference is 3.2 cents an hour in electrical apparatus. In two other industries the difference is between 2 and 3 cents an hour.

There are six industries for which Table 17 permits direct comparisons between three sets of data. In three of these—iron and steel, boots and shoes, and foundries and machine shops—the NICB figure is closer to ours than to Douglas's. The NICB figure for iron

TABLE 17

Comparison of Estimates of Average Hourly Earnings by Industry, 1914
(cents)

	NICB[a]	Douglas	NBER
Iron and steel	26.3	29.8	26.6
Electrical apparatus	27.2	n.s.	24.0
Foundries and machine shops	27.8	41.3[b]	25.3
Cotton, North	17.6	15.3	14.1
Cotton, South	11.7		
Hosiery and knit goods	17.8	17.2	16.0
Silk	19.6	19.7[c]	16.9
Wool	18.2	18.2	19.0
Leather	21.7	n.s.	21.4
Boots and shoes	21.2	24.3	21.2
Paper and pulp	23.3	n.s.	20.5
Paper products	18.7		
Rubber	25.0	n.s.	23.9

n.s. = not given in source.

[a] National Industrial Conference Board, *Wages and Hours in American Industry*, New York, 1925, Chapter IV. Data are for July.

[b] Metal trades, union rates.

[c] NBER estimate from BLS data, using Douglas's method.

and steel further confirms the level of our estimates for that industry. In the other three industries—hosiery and knit goods, silk, and wool —the NICB data lie closer to the Douglas or BLS figures than to ours. This suggests that in these industries the NICB industry definition is similar to that of the BLS, but this inference cannot be checked directly.

We can also make comparisons for 1904 between some of our industry estimates and BLS estimates from Bulletin 65.[47] Table 18

[47] These are from "BLS Historical Estimates of Earnings and Hours." The methods used in making these estimates are briefly discussed on pp. 38–39.

compares these estimates with ours and Douglas's. Our estimates are consistently below those of the BLS, probably because the BLS data are based on wage rates for selected occupations only. The Douglas estimates, though based on the same data as the BLS estimates, are very close to ours for two industries, cotton goods and woolens and worsteds. This is because Douglas, in effect, corrects his 1904 estimates by the 1914 ratio of wages in selected occupations to wages in all occupations. In hosiery and knit goods, the Douglas estimate is somewhat closer to the BLS estimate than to ours, perhaps because

TABLE 18

Comparison of Estimates of Average Hourly Earnings by Industry, 1904
(cents)

	BLS[a]	Douglas	NBER
Cotton goods	13.0	10.9	10.7
Dyeing and finishing textiles	18.0	n.s.	15.4
Foundries and machine shops	24.3	36.4[b]	20.0
Hosiery and knit goods	12.7	12.0	10.7
Leather	17.6	n.s.	16.1
Woolens and worsteds	15.0	13.9	13.7

SOURCE: BLS series: *Monthly Labor Review*, July 1955, p. 802. NBER series: See text. Douglas series: Paul Douglas, *Real Wages in the United States, 1890–1926*, Boston, 1930, pp. 96 and 101.

n.s. = not given in source.

[a] These figures, presented in the source to the hundredth of a cent, have been rounded to the nearest tenth of a cent.

[b] Metal trades, union rates.

the Douglas and BLS data cover a more narrowly defined industry than ours. For foundries and machine shops the Douglas estimate is, of course, much higher than the other two because it has been linked to the series of union rates for the metal trades.

Comparisons of industry estimates for 1890 are also of interest, since this year forms the link between series for earlier periods and those for our period. Table 19 compares our estimates and Douglas's, which extend forward from 1890, with some estimates from the Aldrich Report, which extends backward, and from the Dewey Report. The estimates from the Aldrich and Dewey data are those of Clarence D. Long.

The various sets of estimates shown in Table 19 display no consistent pattern. This is in keeping with the view expressed earlier that the

Dewey Report estimates reflect offsetting biases: the upward bias usually present in small nonrandom wage samples and the downward bias of the median relative to the mean. Both of these biases are present in the estimates from the Aldrich data, the first to a much more marked degree. Our own data, we feel, have a rather uniform slight downward bias. In the eight comparisons of our figures with the Dewey Report medians, ours are lower in three cases and higher

TABLE 19

Comparison of Estimates of Average Hourly Earnings by Industry, 1890
(cents)

	Aldrich Report[a]	Dewey Report[b]	Douglas[c]	NBER[d]
Boots and shoes, factory product	n.s.	17.0	16.9	16.1
Cotton goods	12	10.0	9.7	9.9
Dyeing and finishing textiles	n.s.	12.0	n.s.	15.4
Foundries and machine shops	n.s.	16.0	31.9[e]	18.5
Hosiery and knit goods	n.s.	10.0	11.3	9.4
Leather	16	15.0	n.s.	16.9
Rubber	n.s.	15.0	n.s.	15.8
Woolens and worsteds	13	10.0	12.1	11.6

n.s. = not given in source.

[a] From Clarence D. Long, *Wages and Earnings in the United States, 1860–1890*, Princeton University Press for NBER, 1960. Median of occupational daily wages divided by mean daily hours. Long uses the median for comparability with the Dewey Report data; elsewhere he presents mean daily wages from the Aldrich Report.

[b] *Ibid.*, Table A–8. Median hourly wages.

[c] Paul Douglas, *Real Wages in the United States, 1890–1926*, Boston, 1930, pp. 96 and 101.

[d] See text.

[e] Metal trades, union rates.

in five. The Douglas payroll estimates lie closer to our figures than to the Dewey medians in cotton and wool, and closer to the Dewey medians in boots and shoes and in hosiery and knit goods. The Aldrich Report medians are above the Dewey medians in every case, and above our estimates in two of the three cases. The downward bias of the median seems to be especially important in the Dewey Report data for the woolen industry, where the median earnings are no higher than in cotton or hosiery and knit goods. On all other evidence, wages in the woolen industry lie significantly above wages in these other two industries.

We conclude this section with some comments on a few of the series in Table 13 whose movements have not yet been discussed. It should be noted that "all textiles" is more than the combination of our five series on individual textile industries. It also includes two smaller industries not shown separately: (1) carpets other than rag, and (2) cordage, twine, jute, and linen goods. In addition, the state data used as interpolators include some series that could not be assigned to a particular textile industry, such as "mixed textiles" or "cotton and woolen textiles." For this reason the movement of the series should be somewhat more reliable than that of its components. In computing the all-textile series, we combined data by states and states by census employment.

The series for glass presented unusual difficulties. The number of days worked per year in the glass industry is very low. In 1914, an average of 256 days was worked in the states for which we have data; in other industries the average number of days worked was between 270 and 289. The New Jersey reports mention each year that "closing down for the months of July and August is an established practice in all glass factories," and census data on employment by months in 1914 show that in the glass industry (exclusive of cutting, staining, and ornamenting) employment in the lowest month, August, was only 57.7 per cent of employment in the peak month, March.

Such seasonality in employment would lead us to overestimate daily and hourly earnings if we applied our usual method. The census computes average employment for the year by summing employment for the twelve months and dividing by twelve. If we divide total wage payments by employment so computed to obtain average annual earnings, we have already allowed for the fact that some plants do not operate in the summer months. If we now divide these annual earnings by days worked, we again allow for summer closings, and this double counting of days not worked gives too high a daily wage.[48]

To prevent the overestimation of daily earnings on this account, we have adjusted the census employment figures for glass (exclusive of cutting, staining, and ornamenting, which is part of our series) before computing annual earnings. The adjustment consists of discarding the three months during which employment is lowest

[48] Rather late in our work we discovered that a similar seasonal problem was present in another of our series, pottery and clay products. The brick industry, a major component of this series, is highly seasonal, and we could devise no satisfactory method of allowing for this. Accordingly, the series for pottery and clay products was discarded.

(July, August, and September) and using the average employment for the remaining nine months.

Because this adjustment is somewhat arbitrary, we needed an independent check on the level of our series for glass. Such a check is afforded by the Dewey Report.[49] The Dewey Report data for glass for 1899 (the year ending June 1, 1900) cover 6,148 workers, out of a total industry employment of 52,818. The data cover the middle-Atlantic, central, and southern states and do not exclude any occupations. We have combined the three frequency distributions of wage rates per hour (for males 16 and over, females, and males under 16) for all areas and occupations and computed the mean of the combined distribution, which is 18.9 cents. This lies between the figures for 1899 (18.1 cents) and 1900 (19.5 cents) of our basic series, and suggests that the adjustment described in the preceding paragraph is an appropriate one.

The cyclical movement of our series for glass is unusual and may not be reliable. The trough in 1903 is a year earlier than for most industries, while the trough in 1909 is a year late (see Table 13). Exactly the same movements in 1903 and 1909 appear in the series for paper and paper products. For both industries, in key states in 1908, there are declines in employment and days in operation without corresponding declines in annual earnings.

The period 1890–1914 is one in which a number of new industries were growing rapidly. Unfortunately, we were unable to get state data for most such industries and they are not well represented in our industry series. For the industries shown in Table 13, there is no clear relation between the rise in wages and the rate of growth in employment. However, by looking within the rubber industry, we can contrast the wage movement of the old, stable branches with that of a new, rapidly growing branch. The old branches are rubber boots and shoes and rubber hose and belting; the new branch is rubber, not elsewhere specified (n.e.s.), which by 1910 consisted largely of rubber tires and tubes. Although we do not have separate series on these branches for 1900–1910, we can approximate them closely by state

[49] *Employees and Wages*, pp. 482–483. The Dewey Report is greatly superior to the *Nineteenth Annual Report* in that for most industries it has considerably larger samples of workers, and its data cover all the workers in the establishments sampled. It has not been widely used because it covers only two years (the years ending June 1, 1890 and June 1, 1900) and because the basic data are presented as detailed frequency distributions for which medians are the only averages given. The distribution of hourly wage rates for glass has seventy-four classes, most of them one cent wide.

series. In 1909, Ohio had 39 per cent of employment in rubber, n.e.s., and was unimportant in the other two branches. The production of rubber boots and shoes was highly concentrated in Massachusetts, and that of rubber belting and hose in New Jersey. Table 20 shows the movement of daily earnings and of census employment in the rubber industry in these three states for 1899–1910. The earnings series are the state data before adjustment to census levels. Such adjustment would lower the level of the Ohio series somewhat,

TABLE 20

Average Daily Earnings and Wage Earner Employment in the Rubber Industry, Three States, 1899–1910

	Average Daily Earnings			*Number of Wage Earners*		
	New Jersey	Massachusetts	Ohio	New Jersey	Massachusetts	Ohio
1899	$1.54	$1.58	—[a]	3,385	11,510	3,505
1900	1.58	1.55	$1.45			
1901	1.58	1.70	1.51			
1902	1.60	1.57	1.72			
1903	1.62	1.57	1.81			
1904	1.68	1.61	1.80	3,920	12,677	4,815
1905	1.63	1.66	1.82			
1906	1.64	1.76	2.04			
1907	1.77	1.70	1.92			
1908	1.90	1.86	2.04			
1909	1.80	1.81	2.08	6,550	10,346	11,065
1910	1.81	1.85	2.31			

SOURCE: See Appendix A.
[a] Not shown; sample inadequate.

but would not affect its movement appreciably. The faster rise in earnings in Ohio is undoubtedly related to the faster growth of employment; a large part of it comes early in the period, suggesting that the beginning stages of the rapid expansion caused the greatest labor shortages.

Beginning in 1899 we have series for thirteen industries excluding "all textiles." From 1899 to 1914 there is a very slight tendency for the earnings differentials among these industries to narrow. The coefficient of variation of the thirteen average hourly earnings figures drops from 21 per cent in 1899 to 19 per cent in 1914.

The Combined-Industry Series

In this section we combine the industry average hourly earnings series of the preceding section into a weighted average which serves as a check on the all-manufacturing series. We cannot make a similar check for average daily hours because the hours series for all manufacturing and for the individual industries are based on the same data. However, for earnings, the all-manufacturing series covers a much wider range of industries than the individual industry series do, while the latter include data from a number of states not used in the all-manufacturing series.

In combining the industries series we treat "all textiles" as one industry; it already includes the separate series for the other textile industries. "All textiles" and the eight nontextile industries of the preceding section are combined using census employment weights with linear interpolations of weights between census years. The industry series that do not go back to 1890 are brought in by linking so as not to disturb the movement of the combined series. The resulting series for nine industries combined is compared with the all-manufacturing series in Table 21 and Chart 5.

The two series never differ by more than one cent. The all-manufacturing series lies 0.1 cent below the nine-industry series in 1890 but rises until it is 1.0 cent higher in 1913, indicating that industries whose wages rose less than the average are overrepresented in the nine-industry series. The principal difference in movement occurs in the business contraction of 1908, when the nine-industry series rises slightly while the all-manufacturing series falls. The rise in the nine-industry series throughout 1907–09 occurs despite the fact that all but two of its components (leather and foundries and machine shops) fall either from 1907 to 1908 or from 1908 to 1909. However, only three fall between the first pair of years, and three others rise sharply. The sharp rises are in paper, rubber, and glass; in each case, in the leading states, employment and days in operation fall, but days in operation fall more than annual earnings.

The nine-industry series was also computed with constant 1914 weights. We have not shown this series here, since it never differs by more than 0.1 cent from the variable-weight series. This indicates that the rather considerable differences among the industries in rates of growth of employment are not strongly related to wage levels. This lack of relation was confirmed by examining a scatter diagram in

which percentage changes in employment from 1899 to 1914 were plotted against 1914 average hourly earnings, with the principal component industries of all textiles plotted separately.

TABLE 21

Average Hourly Earnings in All Manufacturing and in Nine Manufacturing Industries Combined, 1890–1914
(cents)

	All Manufacturing	Nine Industries
1890	14.4	14.5
1891	14.4	14.7
1892	14.5	14.6
1893	15.1	15.2
1894	13.9	14.5
1895	13.8	14.0
1896	14.4	14.2
1897	14.0	13.9
1898	13.7	13.9
1899	14.6	14.3
1900	15.1	14.8
1901	15.8	15.2
1902	16.5	15.8
1903	17.0	16.3
1904	16.9	16.1
1905	17.2	16.3
1906	18.4	17.1
1907	19.1	17.8
1908	18.4	17.9
1909	18.6	18.0
1910	19.8	18.9
1911	20.2	19.4
1912	20.7	20.0
1913	22.1	21.1
1914	22.0	21.2

SOURCE: All Manufacturing: Table 10. Nine Industries: computed from Table 13.

CHART 5

Average Hourly Earnings, All Manufacturing and Nine Industries Combined, 1890–1914