Appendix III

Estimates of Average Weekly Hours and Aggregate Man Hours worked in Manufacturing Industries, 1929

Prevailing hours

Estimates of the length of the work week in manufacturing industries are derived from Census compilations of the typical full time hours worked in manufacturing establishments. Census enumerators were given the following instructions with respect to the collection of this information: "The answers to the questions in this inquiry [hours of labor] should represent the normal practice in the plant, and no attempt should be made to account for abnormal conditions or exceptions to the usual practice. For example, in reporting the normal number of hours per week for the individual wage earner, give a figure representing the number of hours for the typical plant operative and disregard the working hours of watchmen, janitors, etc." [1]

Table IIIa, column (2) shows the distribution of wage earners according to the average length of the full time work week, as reported in the *Census of Manufactures: 1929* (I, 60). If a representative value is taken for each grouped frequency, e.g., 42 hours as the average work week for workers in establishments with a work week of more than 40 hours but less than 44 hours, a weighted average can be secured for the total. Such a calculation gives an average of 50 hours as the nominal work week in manufacturing in 1929.[2] The values representing each group are

[1] *Instructions, Census of Manufactures: 1929*, Par. 127, p. 35.
[2] Decline in the length of the prevailing work week in manufacturing industries has been steady. An examination of pre-War and the immediate post-War situations in-

Table IIIa

Variations in Nominal Work Week in Manufacturing Establishments, 1929

Weekly Hours per Establishment (1)	Wage Earners (thousands) (2)	Selected Midpoints (hours per week)	
		All industries (3)	Individual industries (4)
Under 40	40	37.0	39.6
40	247	40.0	
Over 40, under 44	84	42.0	43.8
44 and under 45	811	44.0	
45 and under 48	486	45.5	47.6
48	2,352	48.0	
Over 48, under 54	2,200	50.0	50.8
54	555	54.0	
Over 54, under 60	1,321	56.0	58.3
60 and over	655	63.0	

in column (3), their choice being based on sample data compiled by the Bureau of Labor Statistics on the normal work week in

dicates the reduction in hours gained by manufacturing labor prior to 1929, the change between 1914 and 1919 being the most striking. Although statistics are not available for years since 1929, the average of full-time hours undoubtedly has declined along with the marked reduction in the wage earners' actual work week.

Percentage Distribution of Wage Earners in Manufacturing Establishments according to Length of the Nominal Work Week

Prevailing Hours	1914	1919	1929
48 or under	12	49	47
Over 48 but under 54	13	16	25
54 and over but under 60	48	23	21
60 or over	27	12	7
	100	100	100

The increased efficiency of manufacturing operations permitted a rising output of goods in the face of shorter working hours, so that this reduction of labor effort and consequent increase in leisure time has been both a direct and indirect factor in the rise of living standards. With a reduced input of energy and increased opportunities for enjoying the consumer products they help to produce, workers have found their real standard of living increased from two directions.

Calculations similar to that described in the text have been made for each of the 326 manufacturing industries, although in less detail because of the condensed form of the Census reports. The industry averages are reported in Ap. II, col. (3).

selected industries. Because data on hours worked in individual industries are reported in less detail than for all industries combined, a different set of midpoints had to be chosen for the industry calculations. The new midpoints (column 4) are weighted combinations of the old. Industries differ considerably with respect to prevailing hours and it is probable, of course, that variation in nominal hours among establishments is even greater and among individual employees still greater. Unfortunately our statistics relate only to industries. Nominal hours per week, as we have computed them, range from an average of 42 for fur goods to over 58 for three industries—flax and hemp, beet sugar, and cottonseed oil, cake, and meal. Precise determination of the length of the work week in industries at the extreme ranges is difficult because of the open end classes used in reporting the basic data. For example, sample studies of selected establishments have revealed prevailing work weeks exceeding 60 hours in blast furnaces and in cement manufacture, industries which in our tabulations give averages that fall below our maximum value of 58.3.[3] However, these industry averages gain support from the fact that the general average, 50.4, secured from the individual industry figures, is identical with that drawn from the more detailed reports for all industries where the upper limit is reported as 60 hours and over. Such understatement as occurs in the averages for certain industries is offset by overstatement in others.

Fifty-eight industries, employing 1,560 thousand wage earners, had a nominal work week between 49.5 and 50.5 hours (Table IIIb). In 148 industries, employing 4,404 thousand wage earners, the average work week fell between 48.5 and 51.5 hours. This concentration supports the representativeness of the calculated average of 50.4 hours, in which each industry average was given a weight proportional to the number of wage earners employed. These are averages, it must be remembered, not the exact hours in effect. Indeed, the most common standard was 48 hours per week: some 41,000 establishments, employing 2,352 thousand wage earners, operated on a nominal 48-hour work week in 1929 (see Table IIIa). Not all establishments in the

[3] 58.3 hours per week is the maximum that can be shown by our computations because that is taken as the representative value of the upper open end class 'over 54'.

industries represented adhered to this schedule, of course, so that the industry averages are different.

Table IIIb

Nominal Hours of Work, Manufacturing Industries, 1929

Nominal Hours per Week (1)	Number of Industries with Average Hours as Given			Wage Earners in Industries of Col. (2), (3), (4) (*thousands*)		
	Total (2)	Consumption goods (3)	Capital goods (4)	Total (5)	Consumption goods (6)	Capital goods (7)
41.5–42.4	1	1	..	16	16	..
42.5–43.4	..	..	..	..	..	..
43.5–44.4	1	1	..	6	6	..
44.5–45.4	11	10	1	361	360	1
45.5–46.4	9	9	..	218	218	..
46.5–47.4	25	21	4	534	448	86
47.5–48.4	41	34	7	606	563	43
48.5–49.4	48	42½	5½	1,275	1,086	189
49.5–50.4	58	44	14	1,560	1,100	460
50.5–51.4	42	27	15	1,569	858	711
51.5–52.4	26	17	9	990	425	565
52.5–53.4	21	16	5	487	366	121
53.5–54.4	19	13½	5½	566	281	285
54.5–55.4	11	6	5	521	481	39
55.5–56.4	5	5	..	33	33	..
56.5–57.4	5	4	1	74	41	33
57.5–58.4	3	3	..	23	23	..
Total	326	254	72	8,839	6,306	2,532
Arithmetic mean	50.2	50.0	50.9	50.4	50.1	51.3

In general, the length of the work week tends to vary with the size of the establishment. Table IIIc shows the distribution of the number of wage earners in plants of different size according to reported nominal weekly hours. Thus approximately 20 per cent of all establishments with fewer than 50 wage earners (regardless of industry) were normally operated 48 hours per week. This proportion is considerably higher in the larger plants, increasing to over 35 per cent of all employees in plants having more than 1,000 wage earners. For work weeks varying in length from 48 to 54 hours approximately the same frequency in the larger as in smaller plants is observed, but this is not true for hours greater than 54. Of the 2,160 thousand workers in the

very large plants (over 1,000 per establishment) only 18.0 per cent were reported by establishments with a nominal work week of over 54 hours, as against 26.6 per cent in plants with 101 to 500 wage earners, and a work week of 60 hours or more is much more common in small than large establishments. At the same

Table IIIc

Percentage Distribution of Manufacturing Wage Earners according to Nominal Hours of Plant Operation and Size of Establishment, 1929

	Percentage Distribution of Wage Earners According to Nominal Hours per Week in Establishments with Wage Earners Numbering				
	1–50	51–100	101–500	501–1,000	Over 1,000
Hours not reported	5.2	..	..	..	..
Under 40	1.1	.7	.3	.3	.1
40	4.7	2.2	1.6	2.7	3.1
Over 40, under 44	.8	.7	1.7	.5	.5
44 but under 45	19.3	12.6	6.6	5.8	5.2
45 but under 48	6.4	6.7	5.2	4.1	5.5
48	19.5	21.6	24.2	29.5	36.0
Over 48, under 54	18.0	25.6	27.1	25.6	26.6
54	6.8	7.5	6.7	5.9	5.0
Over 54, under 60	7.9	13.6	17.7	19.4	14.8
60 and over	10.3	8.8	8.9	6.2	3.2
Average full time hours per week	49.5	50.4	51.0	50.7	49.9
Thousands of wage earners	1,690	892	2,920	1,177	2,160

Source: Based on data in Table 8, *Census of Manufactures, 1929*, I, 60

time, 44 hours constituted a work week for 20 per cent of wage earners in the smallest plants as against only 5 per cent of those in the largest plants. The tendency is for the smaller plants to operate at the high and at the low rates. If we calculate averages in the manner described above, no outstanding differences appear, since the extremes of the smaller establishments tend to

counterbalance. Employees in plants with 101 to 500 wage earn-
ers worked an average full time week of 51 hours; the largest
plants with over 1,000 employees per plant averaged a full time
week of 49.9 hours. These figures are affected, of course, by in-
dustrial differences but to what extent it is impossible to say since
industry figures by size of establishment are not available. In
Appendix II the average hours worked in individual industries,
as well as data on the average size of the plants, by industries,
are presented.[4]

Estimated actual hours
While average hours prevailing in manufacturing industries
form an integral part of the manufacturing structure, it is the
hours actually worked that measure labor effort. The capacity
of the labor force may be in terms of full time hours but this
is often a theoretical capacity, for the work week is subject to
modification (other than for changing demand) for reasons of
breakdown of physical equipment, illness or accident to the wage
earner, lack of materials or supplies, seasonal influences, or any
of the various factors that may disrupt the normal schedules of
the manufacturing plant. An approximation to the labor cost of
goods turned out by the manufacturing process necessitates an
estimate of the actual hours worked (Table IIId).

In most instances actual hours were estimated from full time
hours by using ratios between actual and full time hours in
selected industries for which both sets of data were available.
Actual man hours worked in four industries—blast furnaces, ma-
chine tools, lumber, and petroleum refining—were compiled in
the 1929 Census of Manufactures and the estimates of hours in
these industries have been based on these data. For 10 industries
—baking, cigarettes, sugar refining, men's clothing, dyeing and
finishing of textiles, cement, iron and steel, aluminum, brass and
copper manufactures, aircraft—the ratio of actual to full time
hours was computed from Bureau of Labor Statistics reports re-
lating to some period during 1929 or an adjacent year. For 21
additional industries included in National Industrial Conference
Board surveys, average hours worked in 1929 were related to

[4] But note that the hours figure is a weighted average, since it is based on frequency
distributions of wage earners by prevailing hours per establishment.

full time hours in 1928 (data unpublished) and these ratios used to adjust the full time hours based on the Census tabulations. (Data on full time hours in 1929 were not available for the individual industries, but comparison of the Conference

Table IIId

Estimated Actual Hours worked in
Manufacturing Industries, 1929

Hours per Week	Number of Industries with Estimated Hours as Given			Wage Earners in Industries of Col. (2), (3), (4) (*thousands*)		
	Total	Consumption goods	Capital goods	Total	Consumption goods	Capital goods
(1)	(2)	(3)	(4)	(5)	(6)	(7)
39.5–40.4	1	1	..	16	16	..
40.5–41.4	1	1	..	6	6	..
41.5–42.4	5	5	..	349	349	..
42.5–43.4	8	7	1	82	81	1
43.5–44.4	19	19	..	427	427	..
44.5–45.4	28	23	5	649	560	89
45.5–46.4	41	35	6	525	493	32
46.5–47.4	46	35	11	847	791	56
47.5–48.4	43	33	10	2,429	1,207	1,222
48.5–49.4	42	28	14	1,563	912	651
49.5–50.4	29	17	12	543	267	276
50.5–51.4	23	18	5	417	320	97
51.5–52.4	19	13	6	702	651	51
52.5–53.4	7	7	..	65	65	..
53.5–54.4	6	6	..	47	47	..
54.5–55.4	6	6	..	114	114	..
55.5–56.4	..	..	..	..	..	..
56.5–57.4	1	..	1	33	..	33
57.5–58.4	1	..	1	25	..	25
Arithmetic mean*	48.0	47.8	48.7	48.0	47.8	48.7

* These averages are shown here to one decimal point in order to indicate differences arising from the application of a particular method of estimate, with certain broad assumptions, upon the basic data. The possibility of error prohibits the isolation of individual figures or averages for special emphasis apart from the other figures of the table.

Board's general averages indicates no change in average full time hours from 1928 to 1929.) The industries for which these ratios were obtained are: meat packing, cotton goods (weighted average, North and South) knit goods, silk and rayon, woolen and worsted goods, furniture, lumber and mill work, paper and

pulp, paper products, book and job printing, newspaper and periodical printing, chemicals, paints and varnish, rubber products, leather, boots and shoes, hardware, agricultural implements, electrical apparatus, foundry and machine shops, motor vehicles. The total sample represented some 60 per cent of all manufacturing, though the representation of each industry is, of course, incomplete. It should be noted also that the data drawn from Bureau of Labor Statistics reports cover but part of the year, and in some instances, a year other than 1929.

To adjust the full time hours of industries not covered in the preceding lists, group averages were used for industries falling into the following Census groups: food and kindred products, textiles and their products, paper and allied products, printing and publishing and allied products, rubber products, leather and its manufactures, machinery not including transportation equipment. For all other industries for which the needed ratios were not available, the general average drawn from all samples was used to adjust the full time hours figures. The adjustment ratios varied from 1.04 for paper and paper products to .92 for leather and leather products. The average ratio of actual to full time hours, for the entire sample, was .95.

The prevalence of 50 hours as the average nominal work week in manufacturing in 1929 has already been pointed out. No such marked central tendency is to be found in the hours actually worked. This is to be expected, for to variations in customary factory operation are added variations among industries arising from diverse conditions of business health, different policies toward maintenance of labor supply, and different conditions of productive stability. The factors bringing about these variations cannot be isolated, and indeed, in many instances we have no specific measure of the relation of actual to full time working hours. But if our estimates of actual hours are accepted they do reveal a considerable degree of uniformity. Few industries had a work week of over 53 hours, few below 43. Over half the industries had a work week ranging from 45.5 to 49.5 hours. The most common range was from 46.5 to 47.5 but the simple mean of the distribution is slightly higher, 48.0. This is also the average weighted by the number of wage earners in each industry. The 48-hour week was an actuality, though

there were many industries in which the average work week was longer, many in which it was shorter.

In the preceding section no wide difference in prevailing hours between industries producing consumption and capital goods was found. Much the same conclusion is reached for estimated actual hours between the same groups of industries. A somewhat more precise division, wherein an industry with joint products is appropriately represented in several groups, provides the comparison in Table IIIe.

Table IIIe

Estimated Hours per Week worked in the Manufacture of Consumption and Capital Goods, 1929

Ultimate Product	Estimated Average Hours per Week
Consumption goods, total	47.4
Foods	49.5
Wearing apparel, etc.	46.3
Household goods	48.1
Private transportation	47.4
Publications	46.8
Other	47.8
Capital goods	48.4
Construction goods	48.3
Producers' supplies	49.4
Total	48.0

Aggregate man hours

The length of the work week is one factor measuring labor effort; the number of workers engaged is another. The product of these two gives man hours, which is our best measure of labor effort in manufacturing. The number of wage earners as reported by the Census is an average for the 12 months of the year, so that seasonal fluctuations in number employed are compensated. But to translate weekly man hours into annual aggregates, the product of weekly hours and number of wage earners must be multiplied by 52. Aggregate man hours worked

by wage earners in manufacturing in 1929 as thus estimated are 22,037 million. The method of estimate applied to number of salaried workers places their annual aggregate man hours at 3,390 million. Together, the estimates indicate some 25 billion [5] hours spent in manufacturing in 1929. The apportionment of this aggregate, according to type of good produced, is discussed in Chapter II.

[5] Because of holidays and vacations with pay, 51 weeks per year or fewer might more properly be used in the calculation of hours actually worked per year. If the smaller multiplier is used, the man hour total becomes slightly less than 25,000 million.

An interesting check on the general accuracy of our aggregate man hours is a composite hourly rate of wages obtained by dividing the 22,037 million man hours worked by wage earners into the $11,621 million received as wages. The quotient, 53 cents, compares favorably with the estimate of 59 cents reported as the average hourly earnings for the sample industries of the National Industrial Conference Board. Examination of the industrial composition of this sample, and comparison of recent figures with the more extensive compilations of the Bureau of Labor Statistics now available, indicate that the absolute level of the Conference Board average is high. The 1929 average of 53 cents does not, therefore, seem greatly in error. The average salary rate is $1.06 per hour, on the assumption that in each industry salaried employees worked the same number of hours per week as did wage earners. If principal salaried officers of corporations as classified separately by the Census are excluded from the computations, the rate is reduced to 88 cents per hour.