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Appendix G

Derived Tables Underlying Certain  
Text Charts



TABLE G-1  
 MAJOR GROUPS AND TOTAL MANUFACTURING  
 Components of Percentage Change in Wage Earners Employed per Unit of Product,<sup>a</sup> Selected Periods

Industry	1899-1937			1899-1909			1909-1919			1919-1929			1929-1937		
	Component		Total	Component		Total	Component		Total	Component		Total	Component		Total
	A	B		A	B		A	B		A	B		A	B	
Foods	-22	-47	+26	-11	-15	+4	+15	+13	+2	-30	-33	+2	+8	+5	+3
Beverages	-35	-26	-8	-3	-7	+4	+87	+66	+22	..	..	..	..	..	..
Tobacco products	-81	-91	+10	-13	-13	-0.2	-41	-22	-19	-48	-24	-24	-32	-11	-22
Textile products	-36	-43	+7	-10	-11	+0.2	-3	-5	+3	-25	-25	+0.4	-2	-0.3	-2
Leather products	-24	-24	+0.1	-4	-4	0.0	-1	-0.5	-0.4	-15	-16	+1	-6	-6	+0.3
Rubber products	..	..	..	..	..	..	..	..	..	-50	-46	-4	-4	-4	+2
Paper products	..	..	..	..	..	..	..	..	..	..	..	..	-10	-10	+0.1
Chemical products	-56	-59	+2	-18	-17	-1	+5	+5	+0.2	-44	-42	-1	-13	-20	+7
Petroleum and coal products	-74	-64	-10	-25	-27	+2	-20	-8	-13	-57	-53	-4	-9	-8	-1
Stone, clay and glass products	..	..	..	..	..	..	..	..	..	..	..	..	-7	-5	-2
Forest products	+19	+19	0.0	+33	+34	-1	-6	-6	-0.2	-11	-12	+1	+8	+8	+0.4
Iron and steel products	-42	-43	+1	-32	-32	+0.2	+6	+5	+0.5	-36	-37	+1	+19	+19	+0.1
Nonferrous-metal products	..	..	..	..	..	..	..	..	..	..	..	..	+14	+11	+3
Transportation equipment	-63	-94	+31	-12	-0.4	-12	-41	-41	0.0	-59	-45	-14	+20	+20	-0.4
TOTAL MANUFACTURING	-55	-52	-2	-14	-8	-5	-10	-12	+2	-39	-32	-7	+1	+3	-2

For footnote see pp. 336-37.

<sup>a</sup> Total percentage change: From Appendix H ("unadjusted" figures).

Component A: Change in total attributable to average change in the employment-output ratios for component individual industries (the relative contribution of each to the total product kept constant).

Component B: Change in total attributable to average change in the relative contribution of the component individual industries (the ratios for each kept constant).

The sum of A and B may differ slightly from the total owing to the rounding of figures.

The procedure used to break down the total change is as follows:

Let  $N_0, N_1$  = number of wage earners employed in a given industry in year 0 or year 1;

$Q_0, Q_1$  = quantity of output produced in a given industry in year 0 or year 1;

$P_0, P_1$  = price per unit of output produced in a given industry in year 0 or year 1;

$P_w$  = price per unit of output in the weight base period, year 0 and year 1 combined,

$$= \frac{P_0 + P_1}{2};$$

$P_w Q_0, P_w Q_1$  = value added in a given industry in year 0 or year 1, at weight-base prices.

The aggregative measure of change in employment per unit of product,

$$\frac{\frac{\Sigma N_1}{\Sigma P_w Q_1} - 1}{\frac{\Sigma N_0}{\Sigma P_w Q_0}} = \frac{\Sigma N_1}{\Sigma P_w Q_1} - \frac{\Sigma N_0}{\Sigma P_w Q_0}$$

may be broken down into two parts, one reflecting changes in the measures for individual industries, the other the change in the relative importance of industries with different employment-output levels. That is,

$$\frac{\Sigma N_1}{\Sigma P_w Q_1} - \frac{\Sigma N_0}{\Sigma P_w Q_0} = \frac{\Sigma N_1}{\Sigma P_w Q_1} \left( \frac{P_w Q_0}{\Sigma P_w Q_0} - \frac{P_w Q_1}{\Sigma P_w Q_1} \right) + \frac{\Sigma N_0}{\Sigma P_w Q_0} \left( \frac{P_w Q_1}{\Sigma P_w Q_1} - \frac{P_w Q_0}{\Sigma P_w Q_0} \right)$$

$$\text{or} = \frac{\Sigma \left[ \left( \frac{N_1}{P_w Q_1} - \frac{N_0}{P_w Q_0} \right) \frac{P_w Q_1}{\Sigma P_w Q_1} \right]}{\Sigma P_w Q_0} + \frac{\Sigma \left[ \frac{N_0}{P_w Q_0} \left( \frac{P_w Q_1}{\Sigma P_w Q_1} - \frac{P_w Q_0}{\Sigma P_w Q_0} \right) \right]}{\Sigma P_w Q_0}$$

$$\text{or} = \frac{\Sigma \left[ \left( \frac{N_1}{P_w Q_1} - \frac{N_0}{P_w Q_0} \right) \frac{1}{2} \left( \frac{P_w Q_0}{\Sigma P_w Q_0} + \frac{P_w Q_1}{\Sigma P_w Q_1} \right) \right]}{\Sigma P_w Q_0} + \frac{\Sigma \left[ \left( \frac{P_w Q_1}{\Sigma P_w Q_1} - \frac{P_w Q_0}{\Sigma P_w Q_0} \right) \frac{1}{2} \left( \frac{N_0}{P_w Q_0} + \frac{N_1}{P_w Q_1} \right) \right]}{\Sigma P_w Q_0}$$

Footnote concluded on next page

*Footnote to Table G-1, concluded.*

Our choice of the third equation is arbitrary. The first term of the right side of the equation represents the average change in the employment-output ratios for individual industries, the change for each industry being weighted by its average relative contribution to output; the second term represents the change in the relative contribution of industries with different average employment-output ratios. When  $\frac{P_w Q_1}{\sum P_w Q_1} = \frac{P_w Q_0}{\sum P_w Q_0}$  for each industry, the second term vanishes and the first term is equal to the left side of the equation. This means that the change in the group employment-output ratio is the result exclusively of changes in

the ratios for individual industries: different ratios have not changed in respect of weight, because none of the industries has changed in importance. When  $\frac{N_1}{P_w Q_1} = \frac{N_0}{P_w Q_0}$  for each industry, the first term vanishes and the second term is equal to the left side of the equation. This means that the change in the group employment-output ratio is entirely attributable to changes in the relative contributions of industries to the group's output: ratios for individual industries have remained the same, but are weighted differently.

The measures are converted to percentages by multiplying them by 100.

TABLE G-2  
 INDIVIDUAL MANUFACTURING INDUSTRIES  
 Wage Earners per Unit of Product: Frequency Distributions of Industries by Average Annual Rates  
 of Change between Selected Years, and by Changes in Average Annual Rates of Change

Unit: 1 percent

Interval	Number of Industries with Specified Average Annual Rate of Change				Number of Industries with Specified Change in Average Annual Rate of Change			
	1899 to 1909	1909 to 1919	1919 to 1929	1919 to 1937	1899-1909 to 1909-1919	1909-1919 to 1919-1929	1919-1929 to 1929-1937	
20.0 to 20.9	1	1						
18.0 to 18.9					1			
11.0 to 11.9								3
10.0 to 10.9								1
9.0 to 9.9								4
8.0 to 8.9								1
7.0 to 7.9		1				3		7
6.0 to 6.9		1				1		8
5.0 to 5.9						4		2
4.0 to 4.9		1				1		5
3.0 to 3.9	1	3				4		14
2.0 to 2.9	4	4				7		7
1.0 to 1.9	3	3	2	5		9		7
0.0 to 0.9	3	15	2	12		6		3

Interval	Number of Industries with Specified Average Annual Rate of Change						Number of Industries with Specified Change in Average Annual Rate of Change					
	1899 to 1909		1909 to 1919		1919 to 1929		1899-1909 to 1909-1919		1909-1919 to 1919-1929		1919-1929 to 1929-1937	
	1899 to 1909	1909 to 1919	1909 to 1919	1919 to 1929	1919 to 1929	1929 to 1937	1899-1909 to 1909-1919	1909-1919 to 1919-1929	1919-1929 to 1929-1937	1919-1929 to 1929-1937	1929-1937 to 1937	
-0.1 to -1.0	8	9	3	3	3	16	5	3	3	3		
-1.1 to -2.0	11	8	7	8	8	7	1	7	1	1		
-2.1 to -3.0	7	6	9	11	11	1	2	8	3	3		
-3.1 to -4.0	7	5	11	11	11	6	4	8	8			
-4.1 to -5.0	4	2	10	11	11	1		8	1			
-5.1 to -6.0	5		4	5	5		1	8	8			
-6.1 to -7.0			4	4	4			3	3			
-7.1 to -8.0			5	6	6			1	1			
-8.1 to -9.0			4	4	4			1	1			
-9.1 to -10.0		1	1	1	1			2	2			
-10.1 to -11.0								1	1			
-11.1 to -12.0	1	1					1					
..												
-13.1 to -14.0									1			
-14.1 to -15.0									1			
..												
-19.1 to -20.0										1		
..												
-29.1 to -30.0						1						
..												
-31.1 to -32.0											1	
TOTAL NUMBER OF INDUSTRIES	53	53	66	66	71	71	53	66	66	71	71	

Source: Based on Table 4.



TABLE G-3  
 INDIVIDUAL MANUFACTURING INDUSTRIES  
 Ranked According to Change in Unit Costs, Prices and Other Economic Quantities, 1909-37<sup>a</sup>

Industry	Average Rank	Rise in Physical Output	RANK IN RESPECT OF					Decline in Selling Price <sup>b</sup>
			Rise in Aggregate Wage-earner Hours	Decline in Aggregate Wage-earner Hours per Unit of Product	Decline in Wages per Unit of Product	Decline in Value Added per Unit of Product	Decline in	
Automobiles, incl. bodies and parts	1.0	1	1	1	1	1	1	
Chemicals, industrial, incl. rayon and compressed gases	3.2	2	3	4	3	4	4	
Petroleum refining	5.5	3	2	6	11	9	2	
Beet sugar	6.1	7	10	5	5	2	7½	
Canned fish, fruits and vegetables	7.0	4	4	9	9	10	6	
Glass	7.5	5	13	2	2	6	17	
Copper	8.0	12	15	10	4	4	3	
Fertilizers	9.1	11	11½	14	8	5	5	
Paper and pulp	10.2	6	6	8	10	13	18	
Blast furnace products	12.7	15	25	3	6	8	19	
Soap	13.5	10	14	11	19	17	10	
Leather	14.5	19	20	13	15	7	13	
Lead	14.7	23	24	12	7	11	11	
Cane-sugar refining	14.8	13	9	21	20	18	7½	
Zinc	15.0	9	7	18	22	25	9	
Cement	15.5	14	17	7	12	23	20	
Steel-mill products	15.5	8	5	22	24	22	12	
Cotton goods	15.7	16	16	17	16	14	15	
Shoes, leather	16.8	17	11½	20	13	15	24	
Flour	18.5	24	21	23	17	12	14	
Lime	18.7	21	22	15	14	12	21	
Meat packing	18.8	18	8	25	25	21	16	
Woolen and worsted goods	20.7	22	18	19	23	20	22	
Carpets and rugs, wool	20.8	20	19	16	21	24	25	
Lumber-mill products	21.5	25	23	24	18	16	23	

<sup>a</sup> Changes in selling prices are from 1913 to 1937.

<sup>b</sup> Source: Based on Table 8.