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III

Interrelations of Productive Factors

ONE aspect of the structure of manufacturing concerns the relative use made of different productive elements. The analysis in Chapter II of the distribution of productive resources among different classes of manufactured goods touched on the character of these relations. We now deal directly with the relative importance of productive factors, as they are identified for these groups and for the individual industries reported in the 1929 Census. Whereas previously we have been interested in absolute totals (total number of wage earners or aggregate wages paid, for example), the interrelations of productive factors within the manufacturing establishment or industry now concern us. We first present measures of the relative importance of elements of manufacturing cost. Use is made of the estimates of Chapter II in this section, since ratios of certain of the aggregates there presented provide average measures of relative manufacturing cost for different classes of goods. Some use is also made of these aggregates in the second major division of this chapter, which examines certain direct measures of the role of different productive factors, particularly the number of wage and salaried workers and capital investment. The first section, however, and particularly that part relating to fabrication costs, treats of the use of productive factors in the light of the relative payments for their use.

ELEMENTS OF MANUFACTURING COST AS MEASURES
OF THE APPARENT CONTRIBUTIONS OF DIFFERENT
PRODUCTIVE FACTORS

Manufacturing costs as percentages of value of product

In Chapter II the cost of materials entering into processes leading ultimately to finished consumption goods was separated from the cost of materials associated with capital goods, and totals for each type of goods were then computed. Likewise the total value of product for these goods was secured and also totals for the other elements of cost. Ratios of different cost items to value of product can be simply computed from these aggregates (Table 12).

Material costs, which include the cost of purchased fuels, comprised the largest single element in the value of manu-

Table 12

Elements of Cost as Percentages of Value of Product, 1929
Manufacturing Industries classified according to
Ultimate Use of Product

Ultimate Use	Material Costs	Total Value Added	Wages	Salaries	Overhead Costs other than Salaries, plus Profits
Consumption goods	56.8	43.2	14.3	4.8	24.1
Capital goods *	49.9	50.1	20.3	5.8	24.0
Construction materials	50.2	49.8	20.1	5.6	24.1
Producers' supplies	57.0	43.0	14.0	4.9	24.1
All manufactures *	54.9	45.1	15.9	5.1	24.1
Consumption goods					
Foods	68.1	31.9	7.6	2.5	21.8
Wearing apparel, etc.	54.1	45.9	18.5	4.8	22.6
Household goods	47.9	52.1	19.9	6.2	26.0
Transportation	61.9	38.1	14.0	3.1	21.0
Publications	28.4	71.6	17.9	15.1	38.6
Other	40.5	59.5	12.8	9.5	37.2

* Steam and electric railroad repair shops have been excluded from the aggregates in calculating these ratios because of the serious underreporting of overhead costs in these industries. Value of product in these industries represents, in general, the cost of materials plus wages and salaries paid to shop employees. There is no sum covering the other overhead expenses or profits as in other industries (*Census of Manufactures, 1929, II, 1247*).

factured products in 1929. In all industries combined, cost of materials was approximately 55 per cent of value of product.¹ Material costs were relatively high (57 per cent of value of product) in industries making consumption goods, as compared with such costs in industries making capital goods (50 per cent). The ratios for construction materials and capital goods are approximately the same as are the ratios for producers' supplies and consumption goods. This agreement is interesting in view of the fact that construction materials for the most part ultimately serve capital purposes while producers' supplies contribute largely to the production of consumption goods. Examination of the ratios for the other components of value of product reveals a similar relationship among these groups for the items wages and salaries. Here, however, the larger relative expenditure is identified with the manufacture of capital and construction goods. Costs of overhead (less salaries but including profits) reveal no appreciable differences among the four major groups. Providers of materials, it appears, are relatively the more important, so far as their share of sales value is concerned, in the manufacture of consumption goods and related products. Manufacturing labor, on the other hand, accounts for a relatively larger share of the value of capital goods.

Variations in these cost relations within the consumption goods group may be explored by examining the ratios for the six major subgroups in Table 12. Foods and the transporta-

¹ Despite changing prices and the changing composition of manufacturing output, the ratio of cost of materials to selling value for all manufactures has not varied much since the turn of the century. In the following table, cost of materials, wages, and overhead plus profits are shown as percentages of aggregate value of product for five selected years. (The 1929 figures differ slightly from those of the text.)

Year	Value of Product	Cost of Materials	Wages	Salaries and other Overhead Costs, plus Profits
1899	100.0	57.6	17.6	24.8
1909	100.0	58.7	16.6	24.7
1919	100.0	60.0	16.8	23.2
1929	100.0	54.7	16.5	28.8
1935	100.0	57.4	16.5	26.1

tion group have, relatively, the highest payments for materials, the household goods, wearing apparel, and publications groups the highest wage payments. Salaries are greatest, relatively, in the publication group, as are other overhead costs.

No similar subdivisions by type of product are available for the capital goods group. But we do have, from Chapter II, the subdivision of both capital and consumption goods according to stage of manufacture and durability in use. In Table 13 the relative importance of different costs is shown for these divisions of capital and consumption goods.

Table 13
 Elements of Cost as Percentages of Value of Product, 1929
 Additional Groups and Subgroups of Manufacturing Industries ¹

Economic Group	Material Costs	Total Value Added	Wages	Salaries	Overhead Costs other than Salaries, plus Profits
<i>Classification based on Stage of Manufacture and Ultimate Use of Product</i>					
Finished goods, total ²	53.7	46.3	15.2	5.4	25.7
Consumption goods	56.1	43.9	13.3	5.0	25.6
Capital goods	42.6	57.4	22.1	7.3	28.0
Unfinished goods, total ²	57.5	42.5	17.4	4.4	20.7
Consumption goods	59.0	41.0	17.0	4.2	19.8
Capital goods	56.8	43.2	18.5	4.5	20.2
<i>Classification based on Durability in Use</i>					
Durable goods, total	51.1	48.9	19.6	5.4	23.9
Capital and construction goods	49.3	50.7	20.7	5.8	24.2
Consumption goods	54.3	45.7	17.8	4.6	23.3
Semidurable goods	54.9	45.1	18.0	4.7	22.4
Transient goods	59.3	40.7	10.4	5.0	25.3

¹ Excluding steam and electric railroad repair shops (see footnote to Table 12).

² Both the finished and the unfinished goods totals include construction materials and producers' supplies, not here given.

Finished capital goods have the same relatively low material costs but relatively high wage costs, as percentages of sales, observed for the capital goods group as a whole. The pattern for unfinished capital goods, on the other hand, is

more nearly that of consumption goods. As the totals for unfinished and finished goods show, the overhead item is relatively the higher at the finished stage regardless of the type of product. Wages are the much higher, relatively, for capital goods in the finished goods group, and by a smaller margin in the unfinished goods total also.

When we turn to the durable goods division, we find no great similarity between durable consumption goods and durable capital goods² with respect to costs. Rather there is closer agreement between the cost patterns of the durable and semidurable consumption goods groups. In each, material costs are higher percentages of total cost than they are in the capital goods division, though considerably below those for transient goods.³ The transient goods group includes the food industries, where the manufacturing contribution is frequently restricted to simple processing operations. As was seen in Table 12, the cost of materials in the foods group exceeded two-thirds of the total value of product.

The figures in Tables 12 and 13 are ratios of aggregate costs to aggregate values of the particular types of product discussed in Chapter II. Differences between the figures are significant because the groups to which they relate are totals of manufacturing enterprises. On the other hand, the aggregates have been secured by grouping individual industries according to certain classification schemes. The extent of industry to industry variation in these cost ratios is shown by the records of individual industries.

In preparing the data for the following tables, the 326 manufacturing industries of 1929 have been classified according to the capital-consumption goods division.⁴ Seventy-

² Here capital goods include all manufactured construction materials.

³ Transient goods include most producers' supplies as well as goods directly associated with consumption purposes.

⁴ The same analysis could be made with varying success for each classification discussed in Ch. II. It is not necessary to do so, however, to demonstrate the industry to industry variation in the ratios of aggregates. The detailed industries measures in Ap. II and their classification in Ap. I make it possible for the interested investigator to extend the analysis to other classifications. The capital-consumption goods division seems most significant for our industry study.

two industries have been classified as dominantly capital producing, while 254 industries are considered to make consumption goods chiefly. The minor divisions of construction materials and producers' supplies are merged into the two major groups.⁵ The arbitrary assignment of whole industries

Table 14

Cost of Materials, Wages, and Overhead Costs plus Profits as Percentages of Value of Product, 1929

326 Manufacturing Industries classified according to Ultimate Use of Product

Percentage of Value of Product	Classification of Industries ¹ according to					
	Cost of Materials		Wages		Overhead Costs plus Profits ²	
	Consumption goods	Capital goods	Consumption goods	Capital goods	Consumption goods	Capital goods
0-4.9	1	..	15	2	..	..
5.0-9.9	..	..	41	4	3	5
10.0-14.9	4	2	43	7	10	1
15.0-19.9	4	2	40	19	11	5
20.0-24.9	7	2	52½	18½	32	4
25.0-29.9	13	5	29	11	40	9
30.0-34.9	24½	7½	19½	4½	51½	8½
35.0-39.9	20	15	6	3	47½	9½
40.0-44.9	27½	8½	7	1	27	16
45.0-49.9	41	6	..	..	11	8
50.0-54.9	24	6	..	1	5	3
55.0-59.9	30	6	1	1	8	2
60.0-64.9	15	4	..	..	6	1
65.0-69.9	20	2	..	..	1	..
70.0-74.9	2	..	..	..	..	..
75.0-79.9	5	3	..	..	..	..
80.0-84.9	10	..	..	..	1	..
85.0-89.9	4	2	..	..	..	..
90.0-94.9	2	1	..	..	..	..
Median (per cent)	48	41	19	21	33	37
Avg. deviation from median	13	13	8	7	9	10
Avg. deviation as percentage of median	27	32	42	33	27	27

¹ Two industries, lumber and timber products and electrical machinery, have entered each classification with half weight.

² Includes all salaries.

⁵ See Ap. I for the identification of the 72 capital goods industries. Two large industries, lumber and electrical machinery, have been divided equally between the two groups.

to one group or another differs sharply from the analysis by parts that contributed the estimates of Chapter II. However, the industry ratios in Table 14 do reveal interesting variations from industry to industry with respect to relative manufacturing costs.

Ratios of cost to sales value vary considerably in both the total of all industries and in the two groups of industries examined in Table 14. The different items of cost, as percentages of sales, vary over as wide ranges for consumption goods as for capital goods industries. The average deviation from the different median percentages are also approximately equal. For the cost of materials item these median percentages are 48 and 42 in the consumption and capital goods groups respectively. As has been demonstrated above, material costs are higher, relative to value of product, in consumption goods industries than in industries making capital goods. On the other hand, the costs of wages and overhead (here including salaries) are relatively greater in the capital goods industries.

The median industry measures of Table 14 differ somewhat from the general averages of Table 12. One reason is the arbitrary character of the industry classification compared with the detailed analysis of industry totals that underlies the group averages. A more important reason is that the measures in Table 14 give no greater weight to the larger industries, as do the over-all ratios.⁶ In this connection the tabulation of the ratios of different items of cost to value of product for the largest 20 manufacturing industries in 1929 is of interest (Table 15).

Looking first at the ratios of cost of materials to value of product in Table 15 we find that in the two printing and publishing industries (newspapers and periodicals, and book and job printing) these costs are relatively low, being only

⁶ Manufacturing industries vary greatly in size, as the tabulation shows. There is no marked industrial bias in the relation of number of industries to number of wage earners. The number of industries in the Census food group comprised 9.8 per cent of all industries, they employed 8.5 per cent of all wage earners in 1929. In the textile

Table 15

Cost of Materials, Wages, and Overhead Costs plus Profits
as Percentages of Value of Product, 1929

20 Selected Manufacturing Industries

Industries Ranked by Value Added ¹	Cost of Materials	Wages	Overhead Costs plus Profits ²
1 Foundry and machine shop products * (1,4)	37	25	38
2 Iron and steel: Steel works and rolling mills (4,3)	57	21	22
3 Printing and publishing, newspaper and periodical (17,7)	23	15	62
4 Electrical machinery, apparatus, supplies (6,6)	42	20	38
5 Motor vehicles, not incl. motorcycles (7,1)	65	10	25
6 Lumber and timber products * (3,12)	33	33	34
7 Bread and other bakery products (11,10)	48	18	34
8 Clothing, women's * (13,8)	55	14	31
9 Printing and publishing, book and job (14,16)	26	25	49
10 Cigars and cigarettes (19,14)	33	8	59
11 Motor vehicle bodies and motor vehicle parts (8,9)	56	24	20
12 Steam railroad repair shops (5,13)	44	50	6
13 Cotton goods (2,11)	59	21	20
14 Petroleum refining (26,5)	77	5	18
15 Furniture, incl. store and office fixtures (12,20)	45	26	29
16 Clothing, except work, men's, youths', and boys' (15,22)	49	20	31
17 Meat packing, wholesale (18,2)	87	5	8
18 Boots and shoes, other than rubber (10,19)	53	23	24
19 Knit goods (9,23)	51	23	26
20 Paper (20,18)	59	15	26
Median (per cent)	50	21	28

¹ The rank indicated is that in the total of 326 industries. The numbers in parentheses following the industry title refer to rank by number of wage earners and value of product respectively.

² Includes all salaries.

* Not elsewhere classified.

23 and 26 per cent of total value of product. On the other hand, material costs bulk very large in meat packing (87 per cent) and petroleum refining (77 per cent). Matching these extremes are high percentages of salaries and overhead for the two publication industries and low ratios for both wages and overhead in meat packing and petroleum. In the last-named industries, wage payments were but 5 per cent of value of product. The wage figure is highest (50 per cent) for steam railroad repair shops, but the figure is biased because the estimated value of product excludes profits and makes inadequate allowance for overhead. The medians of the measures for these 20 industries are 50 per cent of total value of product paid for materials, 21 per cent for wages, and 28 per cent as payments for salaries and other items of overhead plus profits.

Fabrication costs as percentages of value added

As we have seen in the preceding section, the most important single item of cost in most industries in 1929 was the cost

group were 16.3 per cent of all industries, 19.3 per cent of all wage earners. The greatest disparities are in the chemicals and allied products group, which included 10.1 per cent of all industries but only 3.2 per cent of all wage earners, and in the machinery group, which included 4.9 per cent of all industries but 12.3 per cent of all wage earners.

Wage Earners per Industry, 1929 (thousands)	No. of Industries	Percentage Distribution by Industries	Percentage Distribution by Wage Earners
0.0- 4.9	132	40.5	3.1
5.0- 9.9	55	16.9	4.4
10.0- 14.9	35	10.7	4.7
15.0- 19.9	21	6.4	4.1
20.0- 24.9	14	4.3	3.6
0.0- 24.9	257	78.8	19.9
25.0- 49.9	31	9.5	12.2
50.0- 74.9	10	3.1	6.7
75.0- 99.9	8	2.5	7.8
0.0- 99.9	306	93.9	46.6
100.0-199.9	9	2.8	14.4
200.0-299.9	5	1.5	12.0
300.0-399.9	3	0.9	12.3
400.0-499.9	3	0.9	14.7
Total	326	100.0	100.0

of materials. Material costs represent contributions of productive factors outside the particular industry to which they apply. In the total value of product of all industries, cost of materials is a duplicating item because of the transfer of unfinished products from industry to industry. The analysis of the contributions of productive factors in manufacturing is incomplete without comparisons excluding cost of materials. Indeed, from many points of view, cost comparisons are of distinctly greater significance when made on this restricted basis.

By using once again certain aggregates of Chapter II we compute measures of the relative contributions by different productive factors in manufacturing operations alone. By definition, the total of these contributions (using the term without ethical implication) is the value added by manu-

Table 16

Fabrication Costs as Percentages of Value Added, 1929

Manufacturing Industries classified according to Ultimate Use of Product

Economic Group	Wages	Salaries	Overhead Costs other than Salaries, plus Profits
Consumption goods	33.0	11.1	55.9
Capital goods*	40.4	11.7	47.9
Construction materials	40.3	11.2	48.5
Producers' supplies	32.6	11.3	56.1
All manufactures*	35.2	11.3	53.5
Consumption goods			
Foods	23.7	8.0	68.3
Wearing apparel, etc.	40.4	10.4	49.2
Household goods	38.2	11.9	49.9
Transportation	36.8	8.1	55.1
Publications	25.0	21.1	53.9
Other	21.5	16.0	62.5

* Steam and electric railroad repair shops have been excluded in the calculation of these ratios because of the underreporting of overhead costs (see footnote to Table 12).

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 facture. Accordingly in Tables 16 and 17 wages, salaries,
 and overhead costs other than salaries, plus profits, are shown
 as percentages of value added for the various groups of
 manufacturing industries discussed previously.

The similarity noticed in Table 12 of the cost ratios for
 consumption goods and producers' supplies, on the one hand,
 and capital goods and construction materials, on the other,
 appears also in Table 16. Wage payments were relatively
 heavier in the capital and construction goods industries (40.4
 and 40.3 per cent of all value added in contrast to a ratio of
 33.0 per cent for consumption goods). Conversely, overhead
 expenses other than salaries but including profits were rela-
 tively greater in the consumption goods and producers' sup-
 plies groups. The six subdivisions of the consumption goods

Table 17

Fabrication Costs as Percentages of Value Added, 1929
 Additional Groups and Subgroups of Manufacturing Industries

Economic Group	Wages	Salaries	Overhead Costs other than Salaries, plus Profits
<i>Classification based on Stage of Manufacture and Ultimate Use of Product</i>			
Finished goods, total*	32.8	11.7	55.5
Consumption goods	30.2	11.4	58.4
Capital goods	38.6	12.6	48.8
Unfinished goods, total*	40.9	10.3	48.8
Consumption goods	41.5	10.4	48.1
Capital goods	42.8	10.4	46.8
<i>Classification based on Durability in Use</i>			
Durable goods, total	40.2	11.0	48.8
Capital and construction goods	40.8	11.4	47.8
Consumption goods	39.0	10.1	50.9
Semidurable goods	39.9	10.4	49.7
Transient goods	25.7	12.2	62.1

* Both the finished and the unfinished goods total include construction materials and producers' supplies, not shown separately.

total help to locate in foods and the miscellaneous group the source of these relatively large expenditures for overhead other than salaries.

In both the consumption and capital goods divisions, those industries that relate to the finished manufacturing stage have the higher percentage of value added attributed to the overhead item, the lower ratio for wage payments. A possible explanation of this relationship is that the manufacture of standardized finished products is marked by greater use of machine production with its attendant high labor productivity. What is more probable is that included among overhead charges are certain distributive costs borne by the manufacturer⁷ that will of course be larger when the market is scattered, when the consumer can be influenced by sales effort, and when competition is keen. These conditions are more common in the marketing of finished than unfinished products⁸ and when the good is destined for consumption than capital purposes. Still another possible reason for relatively high overhead costs for finished goods is that as later production stages are reached, the form of the manufactured product becomes more varied and larger inventories become necessary. Moreover, the per unit value of the inventory increases at the later stages, requiring for approximately the same physical inventory a greater investment and a heavier overhead charge. Finally, excise taxes are more frequently levied on finished manufactured products, and taxes are included in the overhead item. Several of these observations apply with more force to finished consumption goods than to finished capital goods. It will be noted that the difference between the overhead item for unfinished and finished consumption goods is considerably more than the difference for capital goods.

Salary payments, and by implication salaried workers, are

⁷ See the next section of this chapter for a discussion of the components of the residual item, value added less wages and salaries.

⁸ To the extent that the unfinished products flow directly into plants under the same ownership, almost no distributive costs of the kind we have in mind will be present.

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 relatively no more important in the manufacture of capital goods than in the manufacture of consumption goods. Slightly more importance is placed on salaried workers at

Table 18

Fabrication Costs as Percentages of Value Added, 1929

Unweighted Distributions of Manufacturing Industries
 classified according to Ultimate Use of Product

Percentage of Value Added	Classification of Industries according to					
	Wages		Salaries		Overhead Costs other than Salaries, plus Profits	
	Consumption goods	Capital goods	Consumption goods	Capital goods	Consumption goods	Capital goods
0-4.9	..	..	5	1	..	2*
5.0-9.9	3	..	55½	18½	..	..
10.0-14.9	15	..	112½	23½	..	..
15.0-19.9	21	..	69	21	..	..
20.0-24.9	17	5	9	7	..	1
25.0-29.9	28	13	2	..	2	3
30.0-34.9	27½	10½	..	1	10	1
35.0-39.9	45	19	..	..	25	5
40.0-44.9	43	12	1	..	49½	7½
45.0-49.9	29½	3½	..	..	39	13
50.0-54.9	19	3	..	..	27½	15½
55.0-59.9	5	2	..	..	27	11
60.0-64.9	1	2	..	..	19	10
65.0-69.9	..	..	..	..	18	2
70.0-74.9	..	..	..	..	15	1
75.0-79.9	..	..	..	..	16	..
80.0-84.9	..	..	..	..	3	..
85.0-89.9	..	2*	..	..	3	..
Median (per cent)	36.7	36.7	13.0	13.5	50.3	51.5
Arith. avg. (per cent)	35.0	37.1	13.2	13.8	53.2	50.6
Avg. deviation from median	9.9	7.1	3.4	4.3	11.1	7.9
Avg. deviation as percentage of median	27.0	19.3	26.2	31.9	22.1	15.3

* Railroad repair shops, steam and electric. Because of the faulty reporting of overhead other than salaries (plus profits) in these industries, the two extreme ratios are excluded from the averages given at the foot of the table.

the final manufacturing stage, as is to be expected if the problems of distribution are greater at this stage.

The relatively high wage payments in the capital goods industries have already been commented upon. Approximately the same relationship applies to all durable goods and to semidurable goods as well. It is in the third group, transient goods, that wage payments are relatively low percentages of value added. Similarly there are no wide dif-

Table 19

Fabrication Costs as Percentages of Value Added, 1929

Weighted Distributions of Manufacturing Industries classified according to Ultimate Use of Product

(each entry is the value added by manufacture, in millions of dollars, in the corresponding industries of Table 18)

Percentage of Value Added	Wages		Salaries		Overhead Costs other than Salaries, plus Profits	
	Consumption goods	Capital goods	Consumption goods	Capital goods	Consumption goods	Capital goods
0-4.9	..	..	946	161	..	722 ¹
5.0-9.9	368	..	8,026	2,783	..	..
10.0-14.9	1,263	..	9,696	4,738	..	..
15.0-19.9	3,012	..	3,055	775	..	..
20.0-24.9	1,175	39	1,446	95	..	31
25.0-29.9	3,008	485	17	..	27	293
30.0-34.9	3,014	1,000	..	1	125	2
35.0-39.9	4,260	1,503	..	..	2,092	63
40.0-44.9	2,219	2,489	146	..	4,088	846
45.0-49.9	2,989	1,940	..	..	2,469	3,924
50.0-54.9	1,959	93	..	..	3,452	1,714
55.0-59.9	64	33	..	..	3,828	340
60.0-64.9	1	249	..	..	601	413
65.0-69.9	..	..	..	..	3,363	44
70.0-74.9	..	..	..	..	1,409	161
75.0-79.9	..	..	..	..	707	..
80.0-84.9	..	..	..	..	317	..
85.0-89.9	..	722 ¹	..	..	854	..
Avg. percentage of value added ¹	33.5	41.3	11.8	11.1	55.6	49.0

¹ The two extreme ratios relating to railroad repair shops, steam and electric, have been excluded from the averages.

ferences in the overhead plus profits item, relative to value added, for durable and semidurable goods. A notably higher percentage is evident for transient goods, however.

Again we shall seek to add to our information about the elements of value added by classifying the 326 manufacturing industries into the consumption goods-capital goods divisions utilized previously. In Table 18 the unweighted distributions are presented; in Table 19 the distributions are weighted according to value added.

The distributions of Tables 18 and 19 confirm the results derived from the more carefully determined aggregates relating to the manufacture of capital goods and consumption goods (cf. Table 17), although the present comparisons include data for the producers' supplies and construction materials groups. Wages, relative to value added, again tend to be higher, and overhead costs lower, for capital goods industries. Salary payments as percentages of value added are much the same in both groups. There is of course considerable variation in each set of industry measures. While the average percentages at the foot of each table, and the weighted ratios given in preceding tables, define the over-all relationships, they must not be taken to apply to all industries that manufacture the particular class of products to which the averages relate. There were many industries, producing a considerable fraction of total value added, for which the ratios depart noticeably from the general averages. That the unweighted and the weighted averages are not closer is evidence of this variation, as well as of differences by size of industry.⁹ Variations in these relative costs with reference to size of establishment are discussed in Appendix VIII.

Elements of overhead costs other than salaries, plus profits

Roughly one-half of the value added by manufactures in

⁹ We may refer again to the largest 20 industries in 1929. The following comparison relates to both percentages of value added and of value of product for 1929 and 1935. In most industries material costs and wage payments were higher and overhead plus profits lower in 1935, by relatively small amounts, differences explained in large part by lower profits in the later year.

1929 was paid out as wages and salaries. One element of the residuum is profits, and while Census of Manufactures data do not indicate their magnitude, some information on profits and items of overhead costs is to be found in the corporation statistics gathered in the administration of the federal corpo-

(footnote⁹ continued)

Industry		Percentage of Value Added		Percentage of Value of Product		
		Wages	Overhead costs plus profits*	Materials	Wages	Overhead costs plus profits*
1 Foundry and machine shop products	1929	40	60	37	25	38
	1935	48	52	39	29	32
2 Steel works and rolling mills	1929	47	53	57	21	22
	1935	54	46	57	23	20
3 Printing and publishing, newspaper	1929	19	81	23	15	62
	1935	20	80	20	16	64
4 Electrical machinery	1929	34	66	42	20	38
	1935	34	66	39	21	40
5 Motor vehicles	1929	28	72	65	10	25
	1935	38	62	76	9	15
6 Lumber and timber products	1929	49	51	33	33	34
	1935	53	47	38	33	29
7 Bread and other bakery products	1929	35	65	48	18	34
	1935	44	56	54	20	26
8 Clothing, women's †	1929	31	69	55	14	31
	1935	37	63	49	19	32
9 Printing, book and job	1929	34	66	26	25	49
	1935	33	67	28	24	48
10 Cigars and cigarettes	1929	12	88	33	8	59
	1935	8	92	32	5	63
11 Motor vehicle bodies and parts	1929	54	46	56	24	20
	1935	60	40	65	21	14
12 Steam railroad repair shops	1929	88	12	44	50	6
	1935	89	11	46	48	6
13 Cotton goods	1929	52	48	59	21	20
	1935	61	39	61	24	15
14 Petroleum refining	1929	22	78	77	5	18
	1935	30	70	80	6	14
15 Furniture	1929	47	53	45	26	29
	1935	50	50	48	26	26
16 Clothing, except work, men's †	1929	39	61	49	20	31
	1935	45	55	48	23	29
17 Meat packing	1929	36	64	87	5	8
	1935	41	59	86	6	8
18 Boots and shoes, other than rubber	1929	49	51	53	23	24
	1935	55	45	52	27	21
19 Knit goods	1929	48	52	51	23	26
	1935	59	41	49	30	21
20 Paper	1929	36	64	59	15	26
	1935	39	61	60	16	24

* Includes all salaries. † The 1929 and 1935 figures are not strictly comparable.

ration income tax. Although the data pertain only to corporations (91.5 per cent of total value added by manufacture in 1929 was produced, however, in establishments under corporate ownership or control), and also manufacturing corporations often engage in nonmanufacturing activities, the figures of Table 20 suggest the relative magnitude of profits, of taxes, of depreciation, and certain other costs included in our aggregate of overhead costs plus profits.

Cost of materials, wages, and salaries (including officers' salaries), as reported in 1929 by manufacturing establishments to the Bureau of the Census, accounted for 75.9 per cent of total value of product. Approximately the same items as reported by manufacturing corporations in the Treasury returns comprise 74.5 per cent of the total.¹⁰ Our present interest, however, is in the other items represented in value of product. In the 1929 Census returns these items amount to 24.1 per cent of total value of product; in the Treasury returns, 25.5 per cent. Although these percentages suggest a close relationship between the Census and Treasury statistics it must not be presumed that any great similarity in these data exists. Examination of the material reveals fundamental

(*footnote*⁹ *concluded*)

The persistence of the above cost ratios from 1929 to 1935 can be tested by a modification of the correlation technique. The modification consists in the stipulation that the 1929 and 1935 ratios be identical to show perfect correlation (+ 1.0). The formula employed,

$$V = \frac{\Sigma(R_{29} - R_{35})^2}{N \sigma_{R_{35}}^2}$$
, where R_{29} and R_{35} are the percentage ratios in 1929 and 1935 respectively, gives the following measures:

	Cost of Materials	Wages	Overhead Costs plus Profits
Percentage of value of product	+ .97	+ .96	+ .96
Percentage of value added	..	+ .93	+ .93

The agreement of the general order of magnitude of these ratios in 1929 and 1935 is evident.

¹⁰ If the base of this last figure were gross sales alone, rather than total compiled receipts, this percentage would be somewhat higher. Unfortunately a satisfactory comparison on this basis is not possible for 1929. Note also that all salaries reported to the Census have been included with wages and cost of materials.

Table 20

Net Profits and Elements of Cost, 1929
Corporations engaged in Manufacturing

	Percentage of Compiled Receipts less Divi- dends and Interest Received ¹	Percentage of Total less Cost of Goods Sold and Officers' Compensa- tion ²	Percentage based on Census of Manufac- tures (approx- imately compar- able)
Cost of goods sold ³	72.9	..	74.5
Compensation of officers	1.6	..	1.4
Interest paid	1.0	3.9	} 24.1
Taxes, incl. income taxes	1.6	6.4	
Depreciation	2.4	9.6	
Depletion	0.4	1.5	
Bad debts	0.4	1.5	
Miscellaneous	14.3	55.9	
Net profits, after tax	5.4	21.2	
Total	100.0	100.0	100.0

¹ Total compiled receipts of manufacturing corporations exceed gross sales by reason of \$2,988 million received from nonmanufacturing operations or in the form of interest, rents, dividends, or net profit on sale of capital assets. Of this total, \$675 million of tax-exempt interest and dividends has been excluded in the calculation of the above percentages. Unfortunately, there is no way to distinguish the costs or profits resulting from manufacturing operations alone. Total compiled receipts in 1929 were \$72,224 million, gross sales \$69,236 million. Total value of product reported by manufacturing establishments with corporate ownership or control was \$64,901 million. The discrepancy in sales probably arises from the greater scope of the corporate data, in that they include sales of nonmanufactured products and undoubtedly are often in terms of prices at some stage beyond the factory door. Moreover, the Census figures exclude establishments with value of product less than \$5,000. The Census figures have greater duplication in the value of product total (for example, the estimated value of both pig iron and steel is reported) than have the corporate reports, especially in view of the prevalence of consolidated tax returns for affiliated corporations.

² The exclusion of cost of goods and officers' salaries from the Treasury figure of compiled receipts approximates the Census item 'overhead less salaries plus profits'.

³ Cost of goods sold is reported as cost of manufacturing or producing goods—chiefly wages, salaries, cost of materials, and supplies—plus cost of merchandise bought for sale plus change in inventory during the year. Change in value of inventory enters only in part into the item 'cost of goods sold' (materials plus wages plus salaries) taken from the Census of Manufactures. On most schedules reporting manufacturers were instructed to report as value of product the sales (shipments) for the year, and to report as cost of materials the total cost of all purchased materials consumed during the year. However, materials purchased rather than consumed were reported by some manufacturers. Since little or no account was taken of changing values of inventories,

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differences in definition, in scope, and in classification, and discrepancies that are deep-reaching and elusive. In the absence of other information, however, we have made use of the Treasury figures in conjunction with data drawn from the Census, and have sought comfort in the belief that ratios from the two sources are more comparable than are the absolute figures.

Chief among the items of overhead cost other than salaries¹¹ appearing in the corporation reports is the item 'miscellaneous deductions' admitted by the income tax administrators. Thus less than half (44 per cent) of the overhead less salaries item can be identified on the basis of these data. Taxes, including the federal levies on net income, amounted in 1929 to 6 per cent of overhead less salaries but including profits, and less than 2 per cent of total sales. Interest payments are about half as large as tax payments, being 3.9 per cent of the overhead items we have isolated. Depreciation charges, so far as they are reported, amount to roughly 10 per cent, bad debts to 1.5 per cent of overhead less salaries. Net profits, after income taxes were paid, were 21.2 per cent of the same base (5.4 per cent of total compiled receipts less dividends and interest received). These are average figures, of course. For corporations that made profits the average rate of return was much higher.

As is to be expected, there are industrial differences in arising either from changing quantities or revaluations due to price changes, the Census and Internal Revenue figures are not directly comparable. It goes without saying that the Internal Revenue figures are better for accounting purposes. In the absence of other data, and because 1929 was not a year marked by severe changes in either prices or stocks, the Census data are adequate for the general purposes at hand. All salaries reported by the Census are here included under cost of goods.

¹¹ Some part of salary payments must be considered direct costs of manufacturing operations. Wide fluctuations in the number of clerical workers employed by manufacturers undoubtedly occur as volume of output changes. No data bearing on the relative number of salaried employees doing clerical work are available in the 1929 reports, but in 1933 manufacturers reported (on standard schedules) that 55 per cent of the total salary bill (or \$706 million) was paid to clerks and other subordinate employees. However, the compensation of salaried officers of corporations was not included in the 1933 totals, although it was in 1929. Officers' salaries for 1933 were reported to the Treasury Department as an identical sum, \$706 million. Including officers' salaries in the 1933 total would reduce the figures for subordinate employees to approximately 35 per cent of all salaries.

Table 21

Corporation Statistics on the Cost of Manufacture, by Industrial Groups, 1929

(entries are percentages of total compiled receipts less dividends and interest received by manufacturing corporations)

Industrial Group	Cost of Goods Sold	Officers' Compensation	Interest Paid	Taxes, incl. Income Tax	Depreciation	Misc. Deductions*	Net Profits after Tax
Total manufacturing	72.9	1.6	1.0	1.6	2.4	15.1	5.4
Foods, beverages, and tobacco	80.0	0.9	1.0	1.1	1.5	12.1	3.4
Textiles and textile products	80.6	2.4	0.9	1.1	1.9	11.5	1.6
Leather and leather products	81.5	2.0	0.7	1.0	1.1	11.8	1.9
Rubber and related products	75.7	0.8	1.7	1.0	2.6	17.4	0.8
Lumber and wood products	73.6	2.7	1.6	1.8	2.8	15.6	1.9
Paper, pulp, and products	72.3	2.1	1.9	1.9	3.5	13.1	5.2
Printing and publishing	60.6	4.4	1.1	1.8	2.2	23.0	6.9
Chemicals, etc. (incl. petroleum refining)	62.3	0.9	1.2	2.4	4.2	21.4	7.6
Stone, clay, and glass products	65.1	2.9	1.2	2.0	4.5	17.5	6.8
Metals and metal products (incl. automobiles)	72.1	1.4	0.8	1.8	2.4	13.6	7.9
Other manufacturing industries	67.5	3.2	0.9	1.4	2.1	21.3	3.6

* Includes depletion and losses on bad debts. Depletion is an appreciable item in two groups only: lumber and wood products (1.8 per cent) and chemicals (1.7 per cent).

these elements of costs of manufacturing corporations. While we have no data for single industries, we do have the ratios for major groups of industries (Table 21). Unfortunately, insufficient detail prevents the combination of the data into the capital-consumption goods division.

The major manufacturing costs are materials and the wages and salaries expended in fabricating them. Even so, these basic costs ranged in 1929 from but 60.6 per cent in corporations engaged in printing and publishing to 81.5 per cent in corporations making leather and leather products. Miscellaneous deductions are highest for the printing and publishing group and lowest for textiles and leather products. In all groups this miscellaneous item is large and must be examined further. Depreciation on fixed capital ranges from 1.1 per cent of compiled receipts for leather goods to 4.5 per cent for stone, clay, and glass products. Profits are lowest, as a percentage of receipts, for rubber products (0.8) and highest for the large metal and metal products group (7.9). These percentages should not be confused with rates of earning on investment. Rather they relate to sales, and in industries where the manufacturers' contribution is slight, relative to those producers who have preceded them in the productive process, the percentage of sales retained as net profit is likely to be small. It is low in industries where a high turnover means a low profit per unit of sale. Differences in these average rates of profits on sales obviously reflect losses suffered by some corporations within the group, and also the varying amounts of income received from non-manufacturing operations.¹²

¹² The entries in Tables 20 and 21 are percentages, not of sales, but of total receipts less tax-exempt dividends and interest received. Some part of the income received from other than manufacturing operations could be deducted from the total net profit figure in order to arrive at figures comparable with return on the gross sales of manufactured product. Gross profits other than from sales ranged from 10.7 per cent of total sales of chemicals to 1.9 per cent for leather products—amounts sufficiently large to explain much of the industrial difference noted in the profits ratio if we were sure there were no offsetting costs directly chargeable against these incomes.

Beginning in 1933, corporations were requested to report separately the cost of operations yielding a gross profit wherein inventories are not an income-determining factor. Prior to 1933 such costs, as determined by a slightly different definition of

Although in general, profits comprise the largest single item in the overhead plus profits total, they did not account in most groups in 1929 for as much as one-fifth of the total. Allowance for depreciation of capital equipment was an even less important item. As shown in Table 20, over half of what we have termed overhead other than salaries plus profits was unexplained by the reports to the Treasury.¹³ We must look to sample studies of records of individual companies for further information on these unidentified expenses.

There are no studies of manufacturers' operating costs contemporaneous with the period we have been surveying. However, in 1934 a sample study of the 1933 experience was made by the Research and Statistical Division of Dun and Bradstreet, Inc.¹⁴ Although the results are fragmentary and relate to a depression year, they yield some information on the relative magnitude of the items of overhead cost that now concern us.

This 1933 sample study of operating costs covered the records of 1,709 concerns in 58 manufacturing industries.

nonmanufacturing operations (the 1929 schedule refers simply to "operations other than . . . manufacturing"), were included among 'miscellaneous deductions'. In 1933 the ratio of these nonmanufacturing costs to the sum of these costs and the gross profit reported was .34; in 1934 it was .29. The bulk of the incomes (and costs) from nonmanufacturing operations occur in the printing and publishing, and chemical subgroups.

¹³ Reports filed for operations in 1933 and 1934 indicate the magnitude of two items included among miscellaneous deductions in 1929. Rent paid on business property was 3.4 per cent of sales less cost of goods in 1933, 3.1 per cent in 1934. 'Cost of other operations' was 9.6 and 1.8 per cent of sales less cost of goods in 1933 and 1934 respectively, the high 1933 figure resulting chiefly from the method of reporting income in the printing and publishing group. In 1929 the amount spent for rent must be considerably below the 1933-34 figures since the dollar sales volume was much greater in 1929. As for 'costs of other operations', the similarity in the 1929 and 1934 ratios of 'income from other operations' to gross sales (.013 and .011 respectively as against .05 for 1933) suggest that 1.8 per cent is closer to the probable 1929 ratio than is 9.6 per cent.

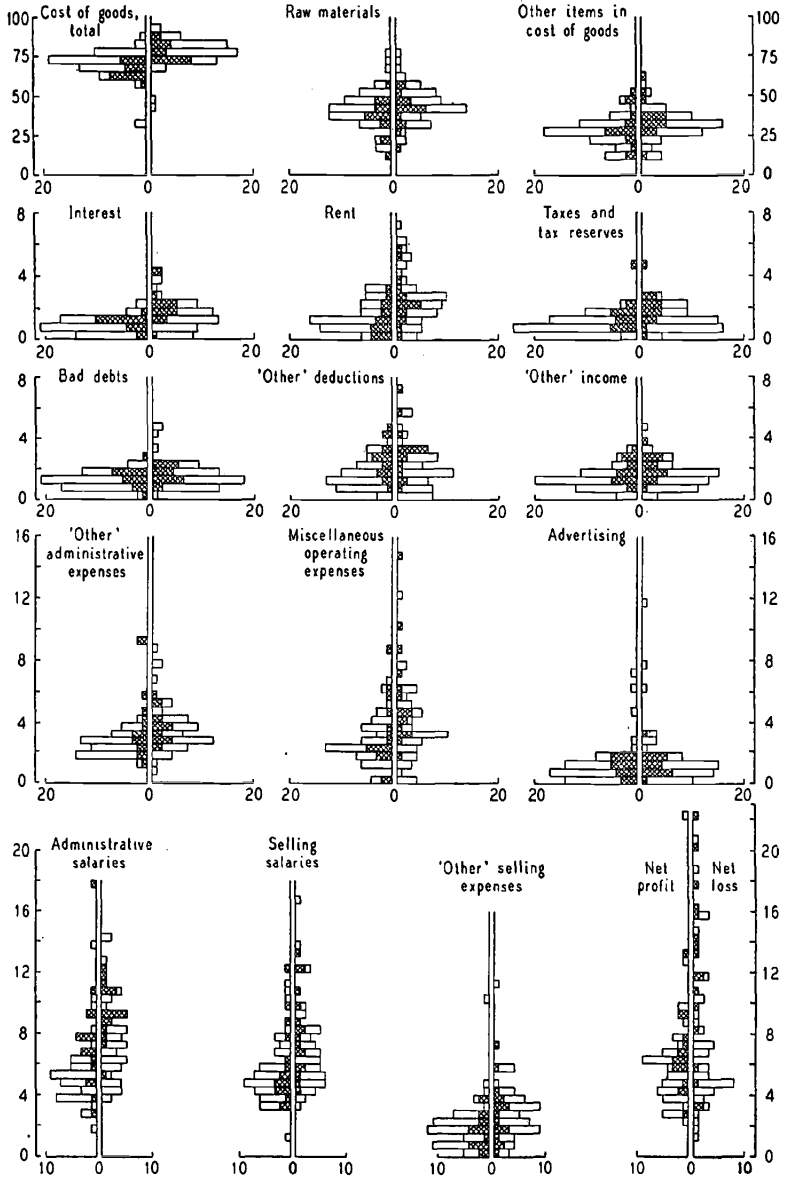
The Treasury officials have at no time tabulated the various items reported under 'miscellaneous deductions'. In response to an inquiry it was suggested that the following items are included under 'miscellaneous deductions': "repairs, losses by fire, storm, etc., salaries and wages not elsewhere reported, stock that actually became worthless during the taxable year, general administrative and selling expense, and other overhead charges . . ." (a letter from the Assistant to the Director of Research and Statistics, U.S. Treasury Department, July 30, 1937). Being a miscellaneous group, all sorts of adjustments are probably incorporated in the item.

¹⁴ *Manufacturing Survey, 1933* (Dun and Bradstreet, New York, 1934).

Chart I

EXPENSES OF MANUFACTURING COMPANIES, 1933
RATIOS OF ELEMENTS OF COST TO SALES IN 58 INDUSTRIES

Frequency distributions to the left of vertical relate to industry averages for concerns reporting profits, those to the right, concerns reporting losses. Shaded areas refer to capital goods industries. The horizontal scale relates to number of industries, the vertical scale to percentage of sales. The first three items are plotted with a smaller vertical scale than are the other items.



Their total net sales in 1933 were \$824,440 thousand, which is roughly 3 per cent of the value of products reported by all manufacturing establishments in the Census of that year.¹⁵ Of the 1,709 concerns included, 787 reported a net loss for 1933. Since separate figures are given for the concerns reporting net income and for those reporting losses, there are twice 58, or 116, sets of ratios of cost to net sales. Frequency distributions of these ratios (Chart I) suggest both the general magnitude of the factor considered and the variation from industry to industry. The chart indicates the different levels of the ratios for concerns making profits and those suffering losses,¹⁶ as well as distinguishing between consumption and capital goods industries. The measures available for these sample industries are not exactly com-

¹⁵ The 58 industries represented may be classified as follows: *Foods*: confectionery; dairy products; flour and feed; food products, canned goods and groceries; meats and meat products. *Textiles*: women's coats and suits; dresses; hosiery; men's clothing; men's furnishings; rugs and carpets; tents, awnings, and canvas; underwear and pajamas; upholstery and draperies; work clothing. *Lumber products*: building materials (wood); caskets; furniture; lumber; moldings and frames; wooden boxes; wooden specialties. *Paper products*: paper and paper products; paper boxes; stationery and office supplies. *Chemicals*: cosmetics; drugs; paint, varnish, and enamel. *Rubber products*: rubber goods. *Leather products*: leather goods; shoes; luggage. *Stone, clay, glass*: brick and tile; cement and concrete products; plate and window glass and mirrors. *Iron and steel products*: castings and forgings; furnaces and boilers; hardware; iron and steel products; plumbing and heating supplies; sheet metal; stoves and ovens; tools. *Nonferrous products*: cutlery and silverware; jewelry. *Machinery*: agricultural implements; electrical apparatus; electrical household apparatus; industrial machinery; miscellaneous machinery; refrigerators. *Transportation*: automobile parts and accessories; transportation machinery. *Miscellaneous*: brooms and brushes; fishing tackle; mattresses, springs and bedding; notions; scientific instruments. It will be noticed that most of the industries make finished products. Semifinished materials such as cotton goods, pig iron and steel, copper smelting, are inadequately represented. The petroleum and coke industries are not covered, nor are printing concerns and railroad repair shops.

The scope of the individual reports may exceed that of the Census of Manufactures; since the Census enumerators were instructed to exclude salaries of salesmen whenever the value of product could be determined for the manufacturing department alone. But if the value is as reported by the selling department, then all salesmen, whether on salary or commission, are covered in the Census reports.

¹⁶ Each entry in the frequency tables upon which Chart I is based is an unweighted average for the varying number of concerns in the industry sample. Thus the 2 entries for the agricultural implements industry are averages for the 8 concerns that reported profits and the 27 concerns that reported losses. No attempt at weighting is made, either for the industry figures or for the frequency charts, but so far as different types of industry have significantly different ratios there is weighting proportionate to the relative number of such industries included in the sample. Since the average percentages are unweighted, their sum usually is not exactly 100.

parable with the Treasury data. Depreciation allowances are shown separately in the corporate returns, but are here included in 'cost of goods sold minus raw materials'.¹⁷ While there is reason to believe that with this exception the item cost of goods sold is fairly comparable with the item of that name in the Treasury tabulations, we cannot be sure. If there is general comparability, then the item 'miscellaneous deductions' of the 1929 Treasury data should be approximately equivalent to the following groups recognized in the present survey: (1) advertising; (2) selling salaries, commissions, traveling; (3) other selling expenses; (4) rent; (5) administrative and office salaries (except officers' salaries); (6) other administrative expenses; (7) miscellaneous operating expenses; (8) all other deductions. Comparison with the 1933 Treasury figures, for totals only, is possible if we add rent to miscellaneous deductions from the 1933 Treasury reports (as was done in 1929) and secure a ratio of the total to gross sales. This ratio, 18.3 per cent, does not agree closely with the median of the distribution of the above listed items from the sample, 24.6 per cent, perhaps because of the character of the data. In any event, we must conclude that the median percentages relating to overhead costs drawn from the sample are on the whole somewhat higher than would be true for all manufacturing concerns.

The items of overhead disclosed by these sample figures in 1933 are chiefly salaries and other expenses. In most instances administrative salaries total more than selling salaries, although salesmen's expenses are included in the latter. Administrative salaries range from approximately 1.7 per

¹⁷ Note also that the Treasury statistics include gross rather than net income from other operations in compiled receipts and the costs of these operations in miscellaneous deductions. The treatment of salaries and wages is probably the same in the sample and in the Treasury data. 'Cost of goods' as defined by the Treasury "includes salaries and wages only when shown specifically in item 2c [relating to cost of goods] on the face of the return. Salaries and wages which may be allocable to item 2c but which were reported elsewhere on the return were tabulated as 'miscellaneous deductions'" (*Statistics of Income, 1933*, p. 27). The 1929 Census schedule asked for the salaries paid "managers, superintendents, and other responsible administrative employees; foremen and overseers; clerks, stenographers, bookkeepers, and other clerical employees on salary". See also footnote 25, Ch. III.

cent of sales to approximately 17.6 per cent, with no pronounced concentration within these limits. Selling salaries and related payments vary as greatly, but tend to average less. The medians, calculated with equal weight given to profitable and nonprofitable concerns,¹⁸ are 6.3 per cent for administrative salaries and 5.7 per cent for selling salaries. Together these salary payments account for over one-tenth of net sales. The cost of selling is perhaps higher for the concerns covered in this sample than for all manufacturing companies, since the industries represented are chiefly engaged in making finished goods, and costs of distribution, particularly 'selling' costs, are probably greater for finished products than for the semifinished goods sold in a relatively narrow market.

The cost of selling includes, of course, other expenses than salaries. Advertising costs are separated in our data. In almost every industry covered in the sample, less than 2 per cent of sales is spent for advertising purposes, the median expenditure being 1.0 per cent. For a few consumer goods in the sample, largely of the luxury class, the expenditure on advertising is high, particularly for drugs, cosmetics, and fishing tackle. These are 1933 figures, it must be remembered, and it is possible that more was spent on advertising in 1929. On the other hand, there has perhaps been a tendency to increased advertising effort on the part of manufacturers.¹⁹

¹⁸ According to Treasury data, more than twice as many corporations reported no net income in 1933 as had net income. When gross sales are compared, however, this relationship is reversed, suggesting that the larger corporations continued to prove profitable even during depression years (cf. National Bureau *Bulletin* 55, Profits, Losses and Business Assets, 1929-1934). In smaller concerns, officers' compensation is frequently in lieu of profits, as is indicated by the large number of concerns that report losses every year.

¹⁹ Additional information on manufacturers' advertising expenditures is to be found in the analysis of advertising budgets of cooperating companies made by the Association of National Advertisers, Inc., and the National Industrial Advertisers Association. From reports of 464 national advertisers (omitting 2 groups, financial and travel and transportation) the typical ratio of the 1929 advertising expenses to total sales volume was computed for 14 groups of consumers' products and 5 groups of industrial products, chiefly, though not exclusively, capital goods (*The Advertising Budget*, 1931, p. 15, and *An Analysis of 285 National Advertising Budgets, 1932-33*, pp.

'Other selling expenses' range higher than advertising costs, though below salaries. The median percentage is 2.2. An arbitrary addition of the three median percentages relating to selling cost gives 8.9 per cent as a rough measure of the extent to which receipts from sales were spent by the manufacturers in the sample in disposing of their goods.²⁰

Overhead includes items of cost besides selling expenses. Administrative salaries have been mentioned. Rent is reported as requiring amounts ranging in some industries well over 3 per cent of 1933 sales, though the median percentage

128-29, Association of National Advertisers, Inc.). The ratios in the first group range from 21.2 per cent for drugs and toilet articles to 3.1 per cent for textiles; in the second group from 6.3 per cent for chemicals to 2.0 per cent for general industrial goods. Medians of the group averages for 4 years compare as follows:

Budgeted Advertising Expense as Percentage of Net Sales				
	1929	1930	1932	1933
Consumer advertisers				
14 industrial groups	4.4	4.6	..	..
24 industrial groups	..	..	5.9	5.6
Industrial advertisers				
5 industrial groups	2.6	2.8	..	..
9 industrial groups	..	..	3.1	3.2

The annual *Survey of Industrial Advertising Budgets* of the National Industrial Advertisers Association gives 2.3 per cent of sales as the average expenditure on advertising of industrial products in 1929.

Examination of these various surveys results in the conclusion that variation in expenditure is about as indicated by the Dun and Bradstreet sample, with the same industries showing heavy advertising expenditures, and consumers' goods industries spending more than those making industrial products. No marked changes from year to year are visible, but the selection favors companies maintaining their advertising program. Thus the 1932-33 survey of the National Advertisers Association is based on 257 returns, whereas 72 additional concerns reported that their advertising expenditures had been either drastically reduced or discontinued entirely. On the whole, the concerns here represented are considerably larger than those reported in the text, and the greater average expenditure on advertising may well be the result, since small concerns cannot enter the national field. That the surveys cited were focused on advertising alone is another reason for the higher averages, for probably certain items are included in the advertising budget that would be classified elsewhere in other studies.

²⁰ This figure stands in contrast with a median of 11.8 per cent (unweighted arithmetic average: 9.4 per cent) of sales spent for distribution expenses in 1935 as reported by manufacturers to the Bureau of the Census (*Distribution of Sales of Manufacturers, 1935*, pp. 23 ff). Approximately 40 per cent of all manufacturers reported distribution expenses for 1935. Total payroll expenses accounted for 4.1 per cent and other distribution expenses 5.3 per cent of total sales. How closely these figures parallel the 1929 (or 1933) experience we have no way of telling. They do indicate no greater distribution expenses, relative to sales, for manufacturers of consumption goods

is 1.8. Since 1933 the Treasury Department has reported 'rent paid on business property' in addition to the items of Table 20. For all manufacturing corporations this item

than for manufacturers of capital goods. This conclusion is evident in the frequency distributions based on the reported industry ratios.

	PERCENTAGE OF SALES							Median
	0-	5-	10-	15-	20-	25-	30-	
All Industries	4.9	9.9	14.9	19.9	24.9	29.9	34.9	11.8
Consumption goods industries, total	29	69	78	42	23	4	1	11.6
Selected industries, total distribution expense	6	25	34	13	6	1	1	11.8
Payroll	37	44	5	..	..	..	..	5.7
Other distribution expense	24	52	7	3	..	..	..	6.9
Capital goods industries, total	6	21	18	10	8	3	..	11.8
Selected industries, total distribution expense	2	9	7	1	2	1	..	10.4
Payroll	14	6	1	1	..	..	..	4.1
Other distribution expense	11	10	..	1	..	..	..	5.2

A survey of the operating costs of 90 manufacturers in Minneapolis, St. Paul, and Duluth shows sales expense to have increased from 10.9 per cent of sales in 1926 to 13.3 per cent in 1930 (*Operating Results of Manufacturing Plants in Minnesota, 1926-1930*, University of Minnesota Employment Stabilization Research Institute, December 1932). In 1929 selling expenses averaged 11.8 per cent of sales, with considerable variation among the types of concern represented. In the order of the number of concerns covered, the 1929 percentages are: machinery and metal products, 9.3; wood products, 5.4; foods, 9.7; miscellaneous, 18.6; paper and printing, 15.3; textiles, 11.5.

Another survey, *An Analysis of the Distribution Costs of 312 Manufacturers*, conducted by the Association of National Advertisers with the cooperation of the National Association of Cost Accountants, reports that for 19 groups of industries making consumers' products (chiefly consumption goods) in 1931, total costs of distribution ranged from an arithmetic average of 38.8 per cent of net sales for the drugs and toilet articles group to 16.5 per cent for radio equipment and supplies. The median was 26.4 per cent. The median percentage of sales for direct selling costs (salaries, commissions, etc., traveling expenses, office expenses) was 11.3; advertising and sales promotion, including salaries, 6.0; transportation costs, 1.3; warehousing, 0.9; credit and collection expense, 1.2. The median percentage for total distributive costs of the 10 industry groups making industrial products was 19.8; for the largest group, machinery and machine tools, 25.8. The median for direct selling costs was 10.1 per cent; advertising and sales promotion, 2.2 per cent; transportation costs, 1.5 per cent; warehousing, 0.7 per cent; credit and collection expense, 0.8 per cent. The average size of the reporting companies is large, 78 of the 312 concerns having sales of over \$5 million. There is no clear evidence in the survey, however, that larger concerns had higher or lower distributive costs in proportion to their sales. The differences between these figures and those of the text and for Minnesota just cited may lie in the peculiarities of the several samples (see preceding footnote). In view of the fair agreement between the sample figures discussed in the text and the Treasury and Census data it does not seem that the high distributive costs here suggested could be generally representative.

86 STRUCTURE OF MANUFACTURING PRODUCTION amounted to 0.9 per cent of gross sales in 1933. Though this is below the average for our sample, the magnitudes are of the same general order.²¹

Two miscellaneous items, 'other administrative expense' and 'miscellaneous operating expense', each account, on the average, for about 3 per cent of sales. There is of course wide variation in these ratios and the significance of any average derived from them is correspondingly reduced. The same may be said of the concluding expense item, labeled simply 'other deductions'.

If all the items of overhead cost are combined, the median value is 28.1 per cent of sales (the sum of the medians for the 11 individual items is 28.5).²² The order of importance of the components of overhead (but with depreciation charges excluded) is as follows: (1) administrative and office salaries; (2) selling salaries, commissions, traveling; (3) miscellaneous operating expenses; (4) other administrative expenses; (5) other selling expenses. These are followed by a group of expenses with medians ranging between 1.8 and

²¹ The following comparison between the Treasury and sample data is possible, though inexact.

	Percentage of Sales		
	Treasury returns	1933	Sample (median)
	1929	1933	1933
Interest	1.0	1.4	1.1
Rent	. .	0.9	1.8
Bad debts	0.4	1.0	1.3
Federal income tax	0.8	0.6	} 1.2
Other taxes	0.9	2.9	
Net profits, before tax			
Corporations reporting net income	+ 9.1	+ 7.1	+ 5.8
Corporations reporting no net income	- 6.8	- 10.6	- 6.9

²² The simple median for cost of goods as a percentage of sales is 74.3. This figure and 28.1 sum to more than 100, but offsetting a part of the excess is the credit item 'other income', whose median percentage of sales is 1.4. There remains no balance for profits, but since the median loss exceeded the median gain (+ 5.8, - 6.9) this conclusion is not inconsistent with the sample totals. Rough averages of course cannot be relied upon to give perfect agreement of all the parts and, as was pointed out earlier, such internal consistency does not hold true for the basic industry averages.

The ratio of these overhead items to gross sales based on 1933 Treasury statistics is 24.9 per cent; including depreciation charges it is 29.9. The residual group, overhead costs plus profits from the Census returns, which include depreciation charges, was 29.6 per cent of sales in 1933 when all salaries are included, 25.3 when salaries are excluded.

1.0 per cent: rent, bad debts, taxes, advertising, interest, and other deductions.²³

The division of the 58 industries into capital and consumption goods subgroups reveals no striking differences, as examination of Chart I indicates. Of course, the sample is not large, and its behavior becomes more erratic as we examine subgroupings. Cost of materials are relatively less in the capital goods group but, in general, no clear differences are apparent. Approximately the same relative amount seems to be spent by manufacturers on sales effort—advertising and selling salaries—in both sections of the sample. The comparison suggests that manufacturers of capital goods have at least average distributive costs. This conclusion is supported by the 1935 Census figures on distribution expenses of manufacturers, though several sample studies indicate that in capital goods industries distributive costs are considerably below those encountered in consumption goods industries.²⁴

The evidence provided by this analysis of the operating expenses of 1,709 manufacturing concerns in 1933 can hardly be accepted as definitive. The ratios do help to indicate the approximate importance of the different overhead cost elements but the qualifications imposed by the character of the data should not be overlooked. Where comparison is possible, the ratios agree fairly well with similar measures based on the all-inclusive data of the Census of Manufactures and the Treasury Department. But until we have complete information on the magnitude of these overhead costs of manufacturers, we must rely on sample surveys. The present figures have the merit of suggesting the importance of selling and administrative expenses in what we term 'overhead plus profits' indicating that, even at the manufacturing stage, the productive system starts to build up the distribution costs

²³ Also included among residual costs in the 1929 Census is the cost of mill or shop supplies (lubricating oil, minor replacement parts) reported at earlier Censuses with materials.

²⁴ See footnotes 19 and 20. The 1935 Census findings are summarized in footnote 20.

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that bulk so large by the time the goods reach ultimate consumers.

USE OF LABOR AND CAPITAL IN MANUFACTURING
OPERATIONS, 1929

Wage earners and salaried employees

Preceding sections have indicated something of the importance of wage and salary costs in manufacturing. This section compares certain direct measures of labor's role in manufacturing operations. Table 22 shows, for 1929, the relative importance of wage and salaried employees in the manufacture of different types of goods, and presents averages of the value of product and value added per wage earner. Salaried employees²⁵ of manufacturing industries comprise, in the aggregate, approximately 15 per cent of all wage earners employed. The proportion is somewhat higher in industries making consumption goods and producers' supplies, and somewhat lower in the capital goods and construction materials industries. In industries making finished products there are relatively more salaried employees than in industries at earlier manufacturing stages. The finished consumption goods industries employ relatively more salaried workers than do the finished capital goods industries,

²⁵ 208,363 salaried employees working in central administrative offices of manufacturing corporations are not included in the present discussion since they are not classified by industries. Neither their number nor their salaries (\$600,437,000 in 1929) have been included in the Census totals since 1921.

The Bureau of the Census bases its classification of salaried employees on the character of the work done. On this point the *Instructions for Preparing Manufactures Reports*, Census of Manufactures, 1929, read as follows (p. 36): "No person should be reported as a salaried employee merely because he is hired by the week or month instead of by the day. The distinction should be based primarily upon the character of work done rather than upon the unit of time which is the basis of compensation. Wage earners are not confined to those who receive day wages, although most wage earners are paid on this basis. It will doubtless be found, for instance, that engineers and firemen in mills and pressmen in newspaper offices are often employed by the week or the month, but they should be classed as wage earners rather than as salaried employees. Time keepers, messenger boys, etc., in printing establishments, and the like, whose work is closely related to that of persons who would ordinarily be called clerks, stenographers, and salesmen may be classed as salaried employees. Drivers on delivery wagons and newsboys or carriers should not be included in the reports."

All data on salaried employees relate to December 1929; the data on number of wage earners are averages for the year.

but this relationship is reversed in the unfinished goods division. The highest percentage of salaried employees is in the transient goods group of the classification according to durability in ultimate use. In this group salaried employees were about one-fourth of the number of wage earners, in sharp contrast to the 10 per cent ratio in the semidurable goods group.

Table 22

The Role of Wage Earners in
Manufacturing Production, 1929

Economic Group	Salaried Employees as a Percentage of Wage Earners	Value of Product per Wage Earner	Value Added per Wage Earner ¹
<i>Classification based on Ultimate Use</i>			
Consumption goods	15.9	\$8,674	\$3,743
Capital goods	14.3	6,529	3,309
Construction materials	13.7	6,644	3,310
Producers' supplies	16.9	9,195	3,955
All manufactures	15.4	7,969	3,607
<i>Classification based on Stage of Manufacture and Ultimate Use</i>			
Finished goods, total ²	17.1	8,159	3,797
Consumption goods	18.2	9,314	4,088
Capital goods	15.4	5,633	3,228
Unfinished goods, total ²	11.9	7,578	3,218
Consumption goods	10.8	7,245	2,973
Capital goods	12.7	7,951	3,438
<i>Classification based on Durability in Use</i>			
Durable goods, total	14.0	6,957	3,423
Capital and construction goods	14.0	6,461	3,304
Consumption goods	13.9	8,090	3,695
Semidurable goods	10.0	5,958	2,686
Transient goods	24.7	12,489	5,085

¹ Value added by manufacture is used as a measure of manufacturing output and represents the contribution of all productive factors in manufacturing operations. Value added per wage earner does not measure the value imputed to manufacturing labor alone.

² Includes construction materials and producers' supplies.

Greatest sales (value of product) per wage earner, in the first classification of Table 22, are in the producers' supplies group; the consumption goods group is second. Finished goods industries have larger per capita sales than unfinished goods industries, as might be expected from the higher unit value of their product. The ratio is relatively low for finished capital goods, but this reflects the heavy labor requirements of these industries.

Classified according to durability of product, sales per wage earner are heaviest in the transient goods group. In fact, the ratio for this group exceeds all others in Table 22. Even if the number of salaried employees and of wage earners are combined, in recognition of the importance of salaried employees in this group, the average per capita sales for the transient group is still exceptional. In view of the high material costs as well as high overhead costs in these transient goods industries, this result might be expected, since where material costs are high, relatively more of the labor participation in production has taken place at a prior stage. But even when we exclude the prior stages of production in comparing the value added by manufacturing operations with the number of manufacturing wage earners, the transient group continues to show a striking per capita value. The lowest ratios are for the semidurable goods group—again as might be expected. Per capita product tends to be low when labor is a relatively important factor (in terms of magnitude of the items) in the operations, and to be high when the capital factor (embodying previous labor) assumes a relatively larger share of the production load. For this reason it is necessary to consider the use of labor in relation to the capital investment in manufacturing. Before turning to the consideration of the capital factor, however, let us examine the extent of industrial variation in the relative importance of wage and salaried employees.

Two manufacturing industries, both in the printing and publishing group (newspaper and periodical, and music pub-

lishing), employed more salaried workers than wage earners in 1929. In 11 industries the ratio of salaried employees to number of wage earners was over one-half (see Table 23).

Table 23

Salaried Employees as a Percentage of Wage Earners, 1929
326 Manufacturing Industries

Ratio of Salaried Employees to Wage Earners (per cent)	Number of Industries ¹		
	All industries	Consumption goods	Capital goods
0.0- 4.9	2	2	..
5.0- 9.9	55	44½	10½
10.0-14.9	71	54	17
15.0-19.9	79	60	19
20.0-24.9	49	42½	6½
25.0-29.9	25	17	8
30.0-34.9	18	9	9
35.0-39.9	5	5	..
40.0-44.9	3	3	..
45.0-49.9	8	6	2
50.0-54.9	2	2	..
55.0-59.9	3	3	..
60.0-64.9	1	1	..
65.0-69.9	..	..	..
70.0-74.9	..	..	..
75.0-79.9	..	..	..
80.0-84.9	2	2	..
85.0-89.9	..	..	..
90.0-94.9	1	1	..
115.2	1	1	..
174.5	1	1	..
Median (per cent)	17.2	17.2	17.3
Average deviation	8.7	9.2	6.9

¹Two industries, lumber and electrical machinery, are entered in both the consumption and capital goods classifications, with half weight.

The median relationship of wage earners and salaried employees for industries making chiefly consumption goods is

17.2 per cent; capital goods, 17.3 per cent. These unweighted figures compare with ratios of 15.9 per cent and 14.3 per cent derived from the estimates of total number of workers of both classes in operations leading to the manufacture of these goods. The discrepancy between the weighted averages based on total figures and the medians of the unweighted distribution (the unweighted averages are even higher than the unweighted medians) suggests that salaried employees are less numerous, relatively, in the larger industries.²⁶

The role of capital in manufacturing production

We have estimated that approximately \$50 billion was invested in manufacturing enterprises in 1929.²⁷ In relation to manufacturing production of that year, as measured by value added by manufacture, capital was equivalent to about 18 months' output. In relation to sales, the annual capital turnover was 1.4 times. The average over-all investment per wage earner was \$5,680. Measures of this sort are indicative of the role of capital in the manufacturing structure. We turn now to a consideration of the industrial differences that an examination of such measures reveals.

Ratio of capital to sales

The estimates of total invested capital utilized in manufacturing different kinds of goods and the comparable totals of

²⁶ The ratios of salaried workers to wage earners (in percentages) for the largest 20 industries of 1929 are given below. The median for this subsample (11.3 per cent) is indeed less than the median for the full group of all industries, although the distribution is marked by wide extremes.

Cotton goods	3.3	Motor vehicles	12.0
Lumber and timber products	5.6	Furniture	12.7
Knit goods	6.7	Clothing, women's	14.8
Steam railroad repair shops	8.1	Petroleum refining	17.1
Cigars and cigarettes	8.7	Meat packing	19.1
Motor vehicle bodies and parts	9.0	Foundry and machine shop products	19.3
Steel works and rolling mills	9.4	Electrical machinery	23.1
Boots and shoes	9.5	Printing and publishing, book and job	31.5
Clothing, excl. work, men's	10.5	Printing and publishing, newspaper and periodical	115.2
Bread and other bakery products	11.2		
Paper	11.4		

²⁷ See Ch. I and II and especially Ap. VI. Note the reasons there given for not including accounts receivable among total capital assets.

value of products, discussed in Chapter II, provide ratios of capital to sales (Table 24).

Relative to value of product, the capital investment in manufacturing industries varies rather widely according to the type of product. It is relatively high in industries making

Table 24

Capital Investment as a Percentage of
Value of Product, 1929

Manufacturing Industries classified according
to Ultimate Use of Product

Ultimate Use	Fixed Capital	Circulating Capital	Total Capital*
Consumption goods	31.9	22.5	64.4
Capital goods	38.8	24.2	70.1
Construction materials	60.1	26.0	95.0
Producers' supplies	53.9	22.7	91.9
All manufactures	38.3	23.2	71.3
Consumption goods			
Foods	28.3	18.9	56.1
Wearing apparel, etc.	26.5	25.4	59.3
Household goods	38.4	27.1	75.0
Transportation			
Motor cars	28.0	20.5	53.2
Supplies and other	65.8	28.1	107.5
Publications	34.2	13.6	68.3
Fuel, mfd.	55.1	28.4	117.3
Other	45.6	35.1	113.8

* Includes miscellaneous assets; cf. Ap. VI.

construction materials and producers' supplies. It is relatively low in industries making capital goods. The fabrication of consumption goods requires, on the whole, even less capital per dollar of product. Only certain types of consumption goods, particularly transportation supplies (chiefly tires and petroleum products), manufactured fuels, and miscellaneous consumption goods, show relatively high ratios of total capital

to sales. Circulating capital—cash and inventories—is not a widely differing percentage of sales among the larger groups. Among the subgroups of consumption goods, the publications, food, and transportation subgroups have low, and the miscellaneous group high, ratios of circulating capital to sales. Fixed capital, for larger subgroups, is relatively highest in the transportation supplies and household goods groups. In examining the measures of fixed capital it should be remembered that the basic corporation figures often include assets not directly associated with manufacturing operations, particularly holdings of various natural resources. Evidence of such holdings is found in the charges for depletion included in the tax returns by manufacturing corporations. The groups most affected appear to be lumber and petroleum products; accordingly the high ratios for construction materials and producers' and transportation supplies of Table 24 must be somewhat discounted.

Approximate division of the capital estimates into the groups just summarized has been possible despite the broad industrial classification of the corporate tax records. Unfortunately we can learn little or nothing of the detail behind these totals, nor can we make other combinations of the data. Moreover, the difficulties that arise from the necessity of adapting figures from corporate balance sheets to the limits of the Census of Manufactures definition of establishment and industry make it well to seek elsewhere for additional information on the use of capital in manufacturing operations.

In each census year through 1919 information on capital invested was collected as a part of the Census of Manufactures. These figures were not reported after 1919 because it was believed that difficulties of definition led manufacturers to varying interpretations of the scope of the question on investment and, more disturbing, that the inadequacy of their records frequently made the responses little more than guesses. Because of these defects, and because of changes in

capital structure since 1919, little use can be made of the early census data on capital investment. Total capital reported for manufacturing in 1919 was \$44.5 billion; total value of products was \$62.4 billion, and value added by manufacture, \$25.0 billion. The ratio of capital to sales was 71.2 per cent.²⁸

In two important industrial states, Massachusetts and Pennsylvania, the state authorities have continued to compile data on capital investment in manufacturing establishments. The figures are probably more reliable than were those for all manufacturing in 1919, because of continued efforts to improve their collection. Moreover, largely as a result of prodding by the federal corporate tax authorities, business men now keep more adequate records.²⁹

The estimates for Massachusetts are available for even-numbered years since 1920, and data for 1928 have been used as an approximation to the situation existing in 1929.

²⁸ Instructions to those taking the 1919 Census were to report capital actually invested whether owned or borrowed, but to exclude that rented. Liabilities were not to be deducted and charges were to be made for depreciation only if they appeared on the books of the concern. Value of 'good will' and of patent rights was to be excluded wherever possible. Estimates were to be made whenever an enterprise reported both manufacturing and nonmanufacturing activities, yet gave a single figure for capital investment.

²⁹ On the other hand, the increasing integration of industry and the spread of the enterprises' activities beyond state boundaries must mean that many difficult problems of estimation have had to be faced in getting state totals. The Massachusetts inquiry is identical in wording with that formerly used in the federal census asking for ". . . the total amount of capital, both owned and borrowed, on the last day of the business year reported. All the items of fixed and live capital may be taken at the amounts carried on the books . . ." Both the value of rented properties and the value of securities and loans representing investment in other enterprises are excluded. The data are reported (though not published) under four headings: land, buildings, and fixtures; machinery and tools; materials, stocks in process, finished products, fuel and miscellaneous supplies; cash, accounts receivable, and sundries (Form M-1). Special compilations for 1928 discussed below indicate the importance of these different capital items. See also the preceding footnote for special instructions relating to the old federal schedules which doubtless continue to apply to the Massachusetts inquiry. Since no state census is taken in years covered by the federal census, no comparison of coverage is possible.

The Pennsylvania questionnaire instructs manufacturers to report the "amount of money actually invested in plant and equipment. Include value of land used in connection with plant" (Form S-1). It will be seen that the capital reported in the Pennsylvania Census is rather narrowly defined, omitting as it does all circulating capital as well as the intangibles excluded in the federal and Massachusetts inquiries. Accordingly, the absolute level of the ratios here given is somewhat lower than it would be were a more inclusive definition of capital adopted. In 1919 the capital invested in manufactures in Pennsylvania was reported as less than \$4 billion in the state census, over \$6 billion in the federal census. No similar comparison is available for Massachusetts for the reason noted above.

The Pennsylvania data are reported annually, and therefore are available for 1929. These two states contributed approximately one-sixth of the value added by all manufacturing operations in the United States in 1929; in 1919 they ac-

Table 25

Relation of Capital Investment to Sales

200 Manufacturing Industries, Massachusetts, 1928,
and Pennsylvania, 1929

Capital as a Per- centage of Sales ¹	Number of Industries ²		
	Total	Consumption goods	Capital goods
0.0- 9.9	..	..	..
10.0- 19.9	3	2	1
20.0- 29.9	8	6	2
30.0- 39.9	20	19	1
40.0- 49.9	31	27	4
50.0- 59.9	27	23	4
60.0- 69.9	28	21	7
70.0- 79.9	19	15	4
80.0- 89.9	23	18½	4½
90.0- 99.9	8	5	3
100.0-109.9	9	5	4
110.0-119.9	2	1	1
120.0-129.9	6	4	2
130.0-139.9	4	4	..
140.0-149.9	2	1	1
150.0-159.9	4	2	2
160.0 and over ³	6	3½	2½
Total	200	157	43
Median (per cent)	64	61	76
Average deviation	25	24	30

¹ See footnote 29, Ch. III, for definitions of capital used in the Massachusetts and Pennsylvania state censuses.

² The division of the 200 industries into the capital-consumption goods groups parallels the similar division of the 326 industries of the federal census, cf. Ap. I. Two industries, lumber and electrical machinery, are placed with half weight in each group. Most construction materials are classed with capital goods.

³ These industries are: lumber (165); locomotives (165); fertilizer (182); textile machinery (197); manufactured gas (229); ice (287).

counted for one-fifth of both total capital investment and total value added. Since the states are the older centers of industrial activity, there may be some bias in the figures on capital. This bias, in relation to the other states, would be present if there has been considerable writing off of capital assets, or if the capital has been fully offset by depreciation charges though remaining in use. It is probably true also that the fixed capital in these states is, on the average, older than in the country as a whole, and the reported values are therefore more heavily weighted by the price levels of the earlier years.

Of the 200 industrial comparisons between sales and capital investment based on the Massachusetts and Pennsylvania censuses only 33 showed the investment to exceed annual sales in the years studied (Table 25).

The industry ratios vary from less than 0.2 to over 2.8, which means that in some industries capital was less than 20 per cent of annual sales, and in one industry, ice manufacture, the capital invested was over 280 per cent of sales. Most of the ratios are less than 1, the median being .64 (i.e., 64 per cent).

The variations evident in the general distribution persist when groups of industries making capital and consumption goods are formed, although the scatter is much more pronounced in the ratios for capital goods industries. (This group here includes the major construction materials.) In general the tendency is for higher values of the ratio in the capital goods group, as is suggested by a median of 76 per cent as against 61 per cent for consumption goods. These unweighted measures agree fairly well with the average ratios of Table 24, particularly since the present group of capital goods includes the major construction materials with their relatively high capital ratios.

A clue to the source of some of the industrial variation may be found in an examination of particular industry fig-

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 ures. Differences in the general level of the ratios for these
 different industry groups are indicated in Table 26.

Among the industrial groups with relatively high ratios
 of capital to sales are petroleum and coke, stone, clay, and

Table 26

Relation of Capital Investment to Sales,
 by Broad Industrial Groups

Massachusetts, 1928, and Pennsylvania, 1929

Industrial Group	No. of Indus- tries	Capital as a Percentage of Sales		Measure of variation ¹ (per cent)
		Average (weighted)	Median (un- weighted)	
Dominantly consumption goods				
Foods	18	55.0	52.5	44.8
Textiles	32	65.8	47.6	93.6
Leather and leather products	8	44.3	46.1	57.3
Paper and printing	15	75.8	57.3	47.5
Chemicals	19	64.9	56.9	49.3
Petroleum and coke	4	106.4	148.4	.. ²
Rubber goods	2	72.7	73.8	.. ²
Dominantly capital goods				
Stone, clay, and glass	12	108.3	83.6	35.3
Lumber and timber products	14	74.2	70.2	63.5
Iron and steel	20	62.8	78.6	50.4
Nonferrous metal products	14	56.5	56.6	28.8
Machinery	10	93.5	102.1	29.0
Transportation equip- ment	9	62.8	68.6	55.5
Total ³	200	..	64.1	62.7

¹ The interquartile range (the range of the mid-half of the items) as a percentage of the median.

² Not computed because of small number of industries.

³ Includes 23 industries classed as miscellaneous.

glass, machinery, rubber, and lumber and paper products. The ratio is low in foods where, as we have seen, raw material is the principal item of cost. It is low in the leather and textile groups where the labor and material costs are high. There is considerable variation, however, within each group, as the measures in the last column of the table show. In textiles particularly there are wide variations. The primary processes of textile manufacture, such as the spinning and weaving of cotton and woolen cloth, require extremely heavy investment. In the manufacture of final textile products, clothing in particular, the ratio is low, because of the greater importance of labor (and of materials) in the final selling price. There is wide variation in this textile group, as is shown by a range of the central half of the ratios almost equal in size to the median (93.6 per cent). This device of comparing the range of scatter with the median affords some comparison of groups and the total. In two groups, textiles and lumber products, the measure of variation is greater than for the total of all industries considered together. In two groups the measure is relatively low: nonferrous metals and products and machinery. But even here the variation is considerable.

Approximately the same extremes and much the same industrial ranking are found when we examine the ratio of capital to sales for 73 groups of large corporations (Table 27).³⁰ The highest ratio is in the 11 concerns manufacturing beverages for the full period 1919-28, when the capital investment (here measured as capitalization) averaged over twice annual sales. At the other extreme is meat packing with a ratio of .2, and flour with a ratio of .3. The ratio for meat packing is low partly because the greatest portion of the sales price goes for material, but also because of the natural obstacles to mechanization. In beverages, on the other hand, there is a high degree of mechanization, and also great investment in inventory and in goodwill. These factors affect

³⁰ Based on data for 2,046 manufacturing corporations analyzed by R. C. Epstein in *Industrial Profits in the United States* (National Bureau of Economic Research, 1934). A definition of capital somewhat narrower than that we have adopted is employed.

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Table 27

Ratio of Capitalization to Sales

Selected Manufacturing Corporations, United States *

Industry	No. of Corporations		Industry	No. of Corporations		
	1928	1919-1928		1928	1919-1928	
Dominantly consumption goods			Misc. printing and publishing			
Beverages	11	1.8	2.2	17	0.7	
Petroleum refining	52	1.6	1.3	23	0.6	
Misc. chemicals	26	1.6	1.4	Misc. leather products	29	0.6
Ceramics	48	1.6	1.4	Rubber products	26	0.6
Blank paper	35	1.4	1.2	Dairying	26	0.5
Pianos	11	1.3	1.0	Cleaning preparations	16	0.5
Crude chemicals	9	1.3	1.2	Motor vehicles	32	0.5
Weaving woolsens	31	1.2	1.0	Package foods	19	0.4
Carpets	18	1.1	0.9	Flour	32	0.3
Book and music publishing	17	1.1	0.9	Meat packing	23	0.2
Proprietary preparations	56	1.1	0.9	Dominantly capital goods		
Confectionery	21	1.0	0.8	Railway equipment	25	2.1
Cotton weaving	49	1.0	0.9	General factory machinery	23	1.9
Misc. paper products	23	1.0	0.8	Engines	11	1.9
Firearms	11	1.0	1.0	Portland cement	21	1.8
Misc. metal products	45	1.0	1.2	Textile machinery	18	1.7
Misc. food products	27	0.9	0.8	Printing machinery	12	1.5
Misc. textiles	54	0.9	0.7	Lumber manufacture	64	1.5
Job printing	46	0.9	0.8	Castings and forgings	99	1.3
Hardware	40	0.9	0.8	Tools	30	1.2
Toys	12	0.9	0.8	Misc. stone and clay products	27	1.1
Silk weaving	17	0.8	0.7	Millwork	17	1.1
Cotton converting	18	0.8	0.7	Wire and nails	20	1.0
Furniture (non-metal)	55	0.8	0.8	Heating machinery	42	1.0
Cardboard boxes	33	0.8	0.6	Office machinery	13	1.0
Stationery	20	0.8	0.9	Misc. machinery	32	1.0
Paints	42	0.8	0.7	Scientific instruments	23	1.0
Jewelry	24	0.8	0.7	Planing mills	26	0.9
Toilet preparations	9	0.8	0.6	Glass	18	0.9
Misc. special mfg.	43	0.8	0.7	Electrical machinery	54	0.9
Baking products	17	0.7	0.7	Road machinery	22	0.9
Canned goods	16	0.7	0.7	Mining machinery	12	0.9
Tobacco	23	0.7	0.7	Bolts and nuts	15	0.9
Cotton spinning	12	0.7	0.6	Sheet metal	20	0.8
Men's clothing	25	0.7	0.7	Nonferrous metals	48	0.8
Knit goods	42	0.7	0.6	Total	2,046	0.9
Boots and shoes	25	0.7	0.6			0.8
Misc. lumber products	28	0.7	0.6			
Newspapers and periodicals	20	0.7	0.8			

* The ratios are based on compilations of the records of 2,046 large manufacturing

the ratio in varying combinations and help to explain its wide variations. Differences between these and similar measures in preceding tables are partly to be explained by unlike definitions of capital.³¹ The figures of Table 27 rest on estimates excluding funded debt.

Table 27 provides a ready comparison of the ratios of capital to sales at the end of the post-War decade with the average standing for the decade. These ratios seem to be strikingly stable, despite modifications introduced by varying conditions of prosperity, by changing price levels, and by changing capital investment. Unfortunately we do not have measures indicating the variation over the decade, and it may be only by chance that the 1928 ratios approximate the average standing as closely as they do. In 19 industries the average and the 1928 ratios are identical; in all save one or two instances they are quite similar. The average deviation is but 15 per cent of the average 1928 ratio. In general the 1928 ratio is above the average for the decade ending in 1928. This is in accord with the trend toward greater capital investment and lower prices of manufactured goods that marked the post-War period.

Ratio of capital to value added

For certain purposes, comparisons of capital investment with some nonduplicating item such as 'value added' are prefer-

corporations analyzed by R. C. Epstein in *Industrial Profits in the United States* (National Bureau of Economic Research, 1934). The figures here presented are computed directly from the original data. 'Capital' as used in these ratios is stockholders' equity and therefore excludes funded debt. Since funded debt is relatively small in most manufacturing industries, Dr. Epstein believes its inclusion would not modify the ratios appreciably. (He estimates for all manufacturing corporations total capitalization thus defined at \$53.9 billion in 1928, total capital at \$59.8 billion. Total sales were \$64.4 billion, the ratio of total capital to sales being .93.) As they stand, these sample ratios average considerably above the ratios for the two states shown in Table 25. This may be because of the narrower definition of capital in the state reports, particularly Pennsylvania (see footnote 29), special conditions in these states causing the ratios to be low, and the fact that Dr. Epstein's sample comprises for the most part large corporations and relates to 1928, when sales were below the 1929 levels. The data are inadequate, however, to test the relation of size of enterprise to the ratio of capital to sales.

³¹ See Epstein, *op. cit.*, Ch. 45, The Valuation of Assets: Capitalization Problems, for a discussion of problems associated with this topic.

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 able to the familiar ratio 'sales to capital', or its reciprocal,
 'capital as a percentage of sales'. Accordingly we turn our
 attention to ratios of this sort for the various capital-consump-
 tion goods divisions of the capital estimates based on the
 corporation records of the United States Treasury Depart-
 ment (Table 28).

Table 28

Capital Investment as a Percentage of Value Added, 1929
 Manufacturing Industries classified according
 to Ultimate Use of Product

Ultimate Use	Fixed Capital	Circulating Capital	Total Capital*
Consumption goods	74.0	52.2	149.2
Capital goods	76.6	47.8	138.4
Construction materials	120.7	52.2	190.7
Producers' supplies	125.2	52.8	213.6
All manufactures	84.5	51.3	157.5
Consumption goods			
Foods	88.7	59.1	175.6
Wearing apparel, etc.	57.7	55.4	129.2
Household goods	73.6	51.9	143.8
Transportation			
Motor cars	70.4	51.5	133.6
Supplies and other	202.6	86.4	331.0
Publications	47.7	19.0	95.3
Fuel, mfd.	114.4	58.0	243.6
Other	68.3	52.6	170.4

* Includes miscellaneous assets; cf. Ap. VI.

As the base of the ratios is shifted from value of product to value added, the apparent relative importance of capital in the consumption goods industries is increased. Of the four major groups, capital goods have the lowest ratio of capital to value added, though for fixed capital alone the ratio is slightly above the ratio for the consumption goods total. Among the subgroups of consumption goods it is in the fuel

and transportation supplies groups that the role of capital is relatively most important, though again the ratios must be discounted somewhat because of nonmanufacturing investments.

Turning once more to the state census data for detailed ratios, we have for Massachusetts³² the comparisons of Table

Table 29

Ratio of Capital Investment to Value Added,
Massachusetts, 1928

Selected Manufacturing Industries *

Industry	Ratio of Capital to Value Added	Value Added as a Percentage of Value of Product
All manufactures	1.8	48
Dominantly consumption goods		
Cotton goods	3.4	44
Woolen and worsted goods	2.9	38
Paper and wood pulp	2.8	43
Dyeing and finishing textiles	2.3	38
Leather, tanned, curried, and finished	1.8	35
Rubberized goods, incl. tires	1.6	41
Printing and publishing	1.0	69
Boots and shoes, other than rubber	0.9	47
Bread and other bakery products	0.7	50
Dominantly capital goods		
Textile machinery and parts	2.9	68
Cutlery (excl. silver and plated cutlery) and edge tools	1.8	86
Foundry and machine shop products, n.e.c.	1.6	67
Electrical machinery, apparatus and supplies	0.9	63

* These 13 manufacturing industries are the most important in the state. Value added in each industry was over \$25 million in 1928, and in 1929 ranged between 52 per cent (cutlery) and 4 per cent (foundry and machine shops) of the value added by manufacture in the entire country.

³² Value added is not reported in the Pennsylvania census.

29. Differences in the ratio of capital to value added for different industries correspond to those noted in the comparison with value of product. The departures from this earlier comparison, so far as the data relate to the same establishments, will be in proportion to the variations of the entries

Table 30

Ratio of Capital Investment to Value Added,
Massachusetts, 1928

Frequency Distribution of 57 Manufacturing Industries
classified according to Ultimate Use of Product

Ratio of Capital to Value Added	Number of Industries *		
	Total	Consump- tion goods	Capital goods
0.0-0.4	..	..	..
0.5-0.9	3	2½	½
1.0-1.4	21	17	4
1.5-1.9	19	14	5
2.0-2.4	8	6	2
2.5-2.9	4	3	1
3.0-3.4	1	1	..
3.5-3.9	1	1	..
Total	57	44½	12½
Median ratio	1.6	1.6	1.7
Average deviation	0.5	0.5	0.4

* Electrical machinery, apparatus, and supplies is entered in each classification with half weight.

in the second column, showing value added as a percentage of value of product. The industries here given are not many, yet they show the variation and the general pattern of the capital ratio. It is high in primary textile manufacture (cotton, woolen and worsted goods), low in the manufacture of breadstuffs and boots and shoes. Such industries as textile machinery, shown to be heavily dependent upon capital in the earlier tabulations, appear again as industries with high

ratios of capital to value added. The variation within the general groups is indicated more clearly in the frequency distribution of ratios of capital to value added computed for 57 manufacturing industries in Massachusetts (Table 30).⁸³

Ratio of capital to number of wage earners; horsepower per worker

In that capital as currently measured is an amalgam of goods purchased and valued at various price levels (unless the valuations are on the basis of replacement costs) any comparison with items reflecting current price levels is subject to qualification. A contrast of capital with some physical element of the manufacturing process is useful therefore in picturing the significance of capital in manufacturing. The most important of such ratios is that which relates the investment to the number of workers. This is in some ways a sensitive ratio, for, other things being equal, an added investment (fixed capital) will tend to reduce the relative number of wage earners. A highly mechanized industry will probably have relatively few workers and the ratio will be high. Under opposite conditions, the ratio will be low. If we recognize and allow for this contributory relationship between the two items we compare, the following figures on 'capital per capita' in various industries will prove helpful in indicating the relative roles of these major productive factors in manufacturing. The first comparison (Table 31) is based on the aggregates of Chapter II. The capital estimates, it will be remembered, have been derived from the corporation records of the Treasury Department. The horsepower-wage earner comparison is based entirely upon the Census of Manufactures statistics as analyzed in Chapter II.

On the average, about \$3,000 of fixed capital is the equipment with which the manufacturing employee worked in 1929. The group average is lowest for capital goods indus-

⁸³ Only industries reporting value added of more than \$5 million in 1928 are included in this comparison.

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tries, highest for producers' supplies. Where the role of labor is quite important, capital investment per worker is less, e.g., in the wearing apparel subgroup of consumption goods. We have had repeated evidence of the large number of wage

Table 31

Capital Investment and Horsepower of Primary Movers,
per Wage Earner, 1929¹

Manufacturing Industries classified according
to Ultimate Use of Product

Ultimate Use	Per Capita Investment			Horsepower
	Fixed capital	Circulating capital	Total capital ²	
Consumption goods	\$2,771	\$1,955	\$5,585	3.7
Capital goods	2,534	1,583	4,578	5.1
Construction materials	3,994	1,727	6,310	7.6
Producers' supplies	4,952	2,087	8,450	8.2
All manufactures	3,049	1,850	5,681	4.9
Consumption goods				
Foods	4,261	2,840	8,442	4.9
Wearing apparel, etc.	1,544	1,483	3,459	2.1
Household goods	2,364	1,669	4,621	3.8
Transportation				
Motor cars	2,818	2,061	5,349	5.2
Supplies and other	10,164	4,336	16,607	6.4
Publications	3,264	1,299	6,524	4.7
Other	5,265	3,469	12,296	5.6

¹ For data underlying these ratios, see Ch. II and Ap. VI.

² Includes miscellaneous assets.

earners in these industries, particularly those fabricating textiles. Food manufacture, on the other hand, requires a high capital investment per wage earner.

Fixed capital investment involves more than direct production equipment, of course. The next section will endeavor to indicate something of the relative importance of land and

buildings and of machinery in the fixed capital total. Our present figures, however, relate to the composite. Some measure of the application of power to manufacturing processes, relative to the labor factor, is to be had in the ratio of horsepower to number of wage earners. This comparison, which of course is greatly influenced by the peculiar uses of power

Table 32

Horsepower per Wage Earner, 1929

Manufacturing Industries classified according to Stage of Production, Ultimate Use, and Durability of Product

Economic Group	Horsepower per Wage Earner	Economic Group	Horsepower per Wage Earner
Finished goods, total *	3.9	Durable goods, total	5.4
Consumption goods	2.8	Capital and construc- tion goods	5.9
Capital goods	3.2	Consumption goods	4.1
Unfinished goods, total *	6.8	Semidurable goods	2.7
Consumption goods	5.5	Transient goods	6.3
Capital goods	8.0		

* Includes also construction materials and producers' supplies.

equipment, indicates that the capital goods industries possess a greater power capacity per wage earner than consumption goods industries. This is in contrast to the greater fixed capital investment in the latter group. But in general the capital and horsepower ratios are not dissimilar. Producers' supplies and construction materials are by the power criterion still the relatively heaviest users of capital.

Although subject to various qualifications,³⁴ the per capita horsepower comparisons are suggestive. In Table 32 are summarized the ratios for certain groups for which capital estimates are not available. In general, the results are not unlike those obtained when the aggregate power capacity in

³⁴ The horsepower ratios are subject to two major qualifications: (1) they are unduly influenced by peculiar needs of certain industries, e.g., the need for great pressures; (2) the basic statistics are affected by certain biases arising from the use of purchased electric current (see Ch. I).

these several groups was compared (Ch. II). Outstanding is the typically greater per capita use of power in industries at the earlier stage of manufacture, the low ratio for semi-durable goods, the relatively high ratio for transient goods.

Ratios of capital and horsepower to number of wage earners for particular industries can be calculated from the de-

Table 33

Capital Investment and Horsepower per Wage Earner
Major Industrial Groups, Pennsylvania, 1929

Industrial Group	Capital per Wage Earner	Horsepower per Wage Earner	Rank in Col. (1)	Rank in Col. (2)
Chemicals and allied products	\$12,052	8.5	1	3
Metals and metal products, primary	7,872	18.4	2	1
Foods and kindred products	6,036	5.4	3	5
Paper and printing	5,316	4.7	4	6
Clay, glass, and stone products	5,225	9.1	5	2
Metals and metal products, secondary	4,995	6.2	6	4
Lumber and its manufactures	3,554	4.2	7	7
Leather and rubber goods	3,060	2.7	8	8
Textiles and textile products	1,981	1.3	9	9
Tobacco and its products	1,140	0.3	10	10

tailed state estimates. These data on industry-to-industry variation may be supplemented by certain information on differences within particular industries. Since no data on horsepower were collected in the Massachusetts Census, the comparisons in Tables 33-35 relate only to Pennsylvania. Although the definition of capital differs somewhat from that used in compiling the national figures from the Treasury Department, the Pennsylvania data are satisfactory for comparisons within the table.

When measured against the labor requirement of the industry, the heaviest use of capital in Pennsylvania is in the chemical industries group, which here includes as its most important component the refining of petroleum products. In industries where considerable manual effort is required, where mechanized processes have not made headway against

the peculiar circumstances of the manufacturing process, the average capital per wage earner is low. Thus, in the leather and rubber group, and more noticeably in the textile and tobacco groups, the per capita investment is low. The tobacco group for Pennsylvania is weighted by the cigar industry, in which the labor requirement in 1929 was heavy and the capital requirement light.

Table 34

Capital Investment per Wage Earner, Pennsylvania, and
Horsepower per Wage Earner, Pennsylvania and
United States, 1929

Selected Manufacturing Industries

Industry	Pennsylvania		United States
	Capital per wage earner	Horsepower per wage earner	Horsepower per wage earner
Dominantly consumption goods			
Gasoline	\$17,974	6.8	..
Ice, manufactured	16,922	33.2	33.5
Oils	15,025	11.3	..
Chocolate and cocoa products	13,061	10.5	10.1
Beverages	12,105	6.7	5.3
Ice cream	10,533	9.1	10.3
Chemicals, other than petroleum prod- ucts	8,050	9.0	..
Oilcloth and linoleum	7,341	8.5	8.1
Canned and preserved goods	6,929	1.8	2.2
Paper, pulp, and products	5,569	8.6	13.6
Printing	5,503	2.3	1.9
Tobacco products, other than cigars	4,804	0.9	..
Dyeing and finishing textiles	4,281	4.3	3.8
Meat packing	4,220	3.9	4.3
Sheets, iron and steel	4,211	11.2	..
Carpets and rugs	4,167	2.0	2.0
Cotton goods	4,137	3.0	5.3
Leather, sole and tanned	4,124	3.8	4.6
Woolen and worsted and felt goods	3,954	3.0	3.9
Motor vehicles	3,902	1.6	3.2
Other leather products	3,863	4.3	..
Confectionery	3,712	2.1	1.8
Bread and other bakery products	2,911	1.9	1.8
Tin and terneplate	2,644	5.9	..
Furniture	2,502	3.1	2.6
Automobile parts	2,322	4.2	3.7
Hosiery, all	1,992	0.6	0.6
Boots and shoes	1,664	0.8	0.7

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(Table 34 concluded)

Industry	Pennsylvania		United States
	Capital per wage earner	Horsepower per wage earner	Horsepower per wage earner
Dominantly consumption goods (concluded)			
Silk goods, incl. rayon	1,657	1.3	..
Silk and rayon, yarns and thread	1,571	2.6	..
Underwear	1,519	0.6	1.4
Radios and parts	1,407	0.8	..
Clothing, men's	900	0.2	0.3
Cigars	851	0.3	..
Clothing, women's	800	0.2	0.2
Shirts	563	0.3	0.3
Median	4,039	3.0	..
Dominantly capital goods			
Pig iron	\$19,658	79.4	..
Coke	15,027	19.7	19.1
Cement	13,926	36.6	35.5
Bars, iron and steel	10,026	24.0	..
Billets, blooms, and slabs	9,854	19.3	..
Engines, railroad	9,034	13.9	8.9
Plates, iron and steel	8,825	24.3	..
Railroad supplies	8,553	6.5	..
Steel shapes	8,069	21.5	..
Ingots, iron and steel	7,883	17.7	..
Electric machinery, apparatus, and supplies	7,483	4.7	2.7
Cars and parts, railroad	6,817	6.6	6.0
Wire and wire products	6,445	10.9	6.7
Lumber, planing mills	5,833	8.0	7.5
Machinery and parts	4,795	4.7	..
Boilers, tanks, stacks, drums	4,772	6.9	..
Terra cotta	4,705	4.1	..
Bolts, nuts, washers, and rivets	4,553	7.2	4.1
Pipes and tubing	4,329	10.3	..
Brick	4,211	6.3	5.7
Hardware and specialties	4,081	2.3	2.2
Glass and products	3,660	5.3	4.7
Plumber supplies and fittings	3,537	2.0	3.6
Structural iron and steel	3,537	5.3	4.8
Castings, iron and steel	3,511	4.8	..
Median	6,445	7.2	..

Average horsepower per wage earner varies from industry to industry in approximately the same manner as does total capital investment. However, certain industries have extra heavy demands for power, and so affect the averages. Particularly is this true of the primary stages of metal manufactures, chiefly, of course, the refining of ores and the rolling

of iron and steel. The power requirements of this group place it first in importance, reversing and by as wide a margin, the relative ranking based on the capital investment of the group and that of chemicals. The clay, glass, and stone products group also moves up in importance when horsepower is considered, influenced by the heavy power needs of industries such as cement. This industrial group moves from fifth place in the ranking based on capital investment to second in importance in terms of power capacity; in general, however, the rankings are similar.³⁵

Certain of the industries falling within the industrial groupings of Table 33 are shown separately in Table 34, classified according to ultimate use of their products. These individual industry measures relate only to Pennsylvania, as noted, and can hardly be taken to represent any general 1929 relationships that held true for the country at large. However, we can secure ratios of horsepower per wage earner from the federal Census, and for those industries for which the data seem comparable, both Pennsylvania and United States ratios are given. In almost every instance there is close agreement between the state and the countrywide ratios of horsepower to number of wage earners.³⁶

The highest of the individual industry ratios of capital to number of wage earners is for blast furnaces, with an investment in plant and equipment of almost \$20,000 for every wage earner employed. At the opposite extreme is the investment (fixed capital) of less than \$600 for each wage earner making shirts. The range in horsepower requirement is even larger and the same industries are at the extremes. Factories manufacturing men's and women's clothing average 0.2 horsepower per worker, and those making shirts 0.3, but pig iron blast furnaces had an average of 79.4 horsepower per worker. Within this range there is considerable variation. In general it will again be observed that the primary stages of

³⁵ The coefficient of rank correlation for these 10 pairs of items is $+0.84$.

³⁶ The degree of correlation of the 38 industry comparisons is measured by a coefficient of $+0.98$.

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manufacture require the heavier capital investment per wage earner. There is a relatively heavier per capita investment in the making of cloth than in its fabrication into articles of clothing, in tanning leather than in making boots and shoes, in sawing lumber than making furniture, in paper making

Table 35

Intra-Industry Variation in the Ratio of Capital to Number of Wage Earners

Minor Areas of Pennsylvania, 1929

Industry	State Average Capital per Wage Earner (<i>thousands of dollars</i>)	No. of Ratios for Minor Areas	Range (<i>thousands of dollars</i>)	Average Deviation from State Average	
				Thousands of dollars	Per- centage
Dominantly consumption goods					
Ice, mfd.	16.9	13	22.9	4.8	28.4
Carbonated and soft drinks, incl. cereal beverages	12.1	9	32.3	5.5	45.5
Ice cream	10.5	13	16.1	4.4	41.9
Newspaper, peri- odical, and job printing	5.5	18	6.1	1.4	25.5
Bread and other bakery products	2.9	18	2.1	0.5	17.2
Furniture	2.5	13	2.4	0.6	24.0
Hosiery, silk	2.0	6	1.5	0.4	20.0
Silk goods, incl. rayon	1.7	14	2.2	0.5	29.4
Boots and shoes	1.7	9	1.6	0.5	29.4
Dominantly capital goods					
Cement	13.9	3	7.5	3.0	21.6
Machinery and parts	4.8	18	6.4	1.2	25.0
Pipes and tubing	4.3	6	5.4	1.7	39.5
Brick, building	4.2	14	10.1	1.5	35.7

than in printing, in industries refining metals than in those fabricating metal products. This is not an unexpected relationship; for as products reach stages close to the final consumer the influence of his varied tastes becomes more pronounced, resulting in stylized goods which require relatively

more labor to produce. At the earlier stages the manufacturer's attention is devoted to the refining of raw materials, often on a large scale and often possible only by means of processes requiring heavy capital investment.

The variation among industries with respect to the ratio of capital to labor is undoubtedly matched by variation within a single industry, from establishment to establishment, and from locality to locality. Examination of ratios of capital to wage earners for particular industries computed for various political subdivisions of the State of Pennsylvania provides some information on the degree of intra-industry variation. Unfortunately the subdivision reports are not given in full detail for every industry and variations in the character of the products manufactured make comparisons for certain industries dubious. Comparisons over as large an area as seems feasible are given in Table 35. The average departure from the state-wide figure appears to be as much as 25 per cent.

Elements of capital investment, Massachusetts

Approximately 10,000 manufacturing establishments in Massachusetts reported their capital investment in the 1928 state census. Reference has been made in preceding sections to the aggregate investment of these concerns; this section will summarize briefly information on the components of the total gained by a study of the individual returns.³⁷ The survey was made chiefly to determine the magnitude of these components, since we know of no comparable source of information on the elements of fixed capital. In Table 36 the four divisions of capital reported in the Massachusetts census (1) land (adjusted to include the estimated value of rented property), buildings, and fixtures, (2) machinery and tools, (3) inventories, (4) cash, accounts receivable, and

³⁷ Through the cooperation of Roswell Phelps, Director of Statistics, Massachusetts Department of Labor and Industries, the National Bureau secured a special transcription of the individual census reports on capital investment and number of wage earners in 1928. Identity of the concerns was not disclosed, the several items being copied onto cards by the Department's clerks. The measures are described at greater length in Ap. IX.

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Table 36

Elements of Capital Investment * in
Manufacturing Industries

Massachusetts, 1928

	Land, Build- ings, and Fixtures (1)	Machinery and Tools (2)	Inventory (3)	Cash, Accounts Receivable, and Sundries (4)	Total Capital (5)
<i>(Millions of Dollars)</i>					
All manufactures	853	629	697	774	2,953
Consumption goods	514	421	497	529	1,962
Capital goods	146	110	119	119	494
Construction materials	27	17	23	29	96
Producers' supplies	167	81	58	96	401
Finished goods	451	293	400	478	1,622
Unfinished goods	402	335	297	296	1,330
Durable goods, total	247	180	233	266	926
Capital and construc- tion goods	172	127	143	148	590
Consumption goods	75	53	90	118	336
Semidurable goods	278	283	334	315	1,210
Transient goods	329	165	130	192	816
<i>Percentage of Total Capital</i>					
All manufactures	28.9	21.3	23.6	26.2	100.0
Consumption goods	26.2	21.5	25.4	26.9	100.0
Capital goods	29.6	22.2	24.1	24.1	100.0
Construction materials	28.1	17.7	24.0	30.2	100.0
Producers' supplies	41.6	20.2	14.5	23.7	100.0
Finished goods	27.8	18.1	24.7	29.4	100.0
Unfinished goods	30.2	25.3	22.3	22.2	100.0
Durable goods, total	26.7	19.4	25.2	28.7	100.0
Capital and construc- tion goods	29.2	21.5	24.2	25.1	100.0
Consumption goods	22.3	15.8	26.8	35.1	100.0
Semidurable goods	23.0	23.4	27.6	26.0	100.0
Transient goods	40.3	20.2	16.0	23.5	100.0

* The total for all industries in this table differs from the figure published by the Massachusetts Department of Labor and Industries because an estimate of the value of rented land, buildings, and fixtures, is included (see Ap. IX). If these estimates are excluded, the entries in col. 1 become: 635; 407, 108, 23, 97; 357, 278; 194, 131, 63, 213, 228; and in col. 5: 2,735; 1,855, 456, 93, 332; 1,528, 1,207; 873, 548, 324, 1,146, 716.

sundries are shown for all Massachusetts industries and for various economic groups.

The aggregates of Table 36 necessarily reflect the characteristics of manufacturing in Massachusetts. That is, the various industries are combined by a distinctly different set of weighting factors than governs all manufacture in the United States. In particular, the consumption goods group in Massachusetts is heavily weighted by the textile and boots and shoes industries. The capital goods group is not well represented and is confined chiefly to finished equipment industries. Accordingly, the reader should not apply the results in any exact manner beyond the boundaries of the state.

Of the four items of capital listed in Table 36, machinery and tools seem to be of least importance in the total, but by a slight margin. Approximately one-fifth of total capital in Massachusetts manufacturing establishments takes this form. The value of rented machinery (in contrast to rented buildings and fixtures) is not included in the totals, however, and in one industry, boots and shoes, would be a relatively large item. The largest percentage of total capital appears as land, buildings, and fixtures,³⁸ though in some industries, particularly durable and semidurable consumption goods, both inventory and cash and receivables are larger. The value of inventories in most instances comprised between 20 and 30 per cent of total capital assets.

Some interesting differences in capital needs are observed in Table 36. The heavy capital investment in industries making producers' supplies noted earlier seems to be explained, in Massachusetts at least, by the heavy investment in land and buildings (the sample is quite small, however). In industries whose products are at the unfinished stage, the investment in machinery and tools is relatively high, as our earlier results might suggest. In finished goods industries, on the other hand, cash, receivables, and sundries are distinctly

³⁸ This is true despite the probable understatement of the value of rented property, since the adjustment made to cover rented property concerned only companies that reported no real estate whatever.

116 STRUCTURE OF MANUFACTURING PRODUCTION higher, relatively. These items of circulating capital are greater also for durable goods, though inventory is relatively of most weight (27.6 per cent of all capital) in the semi-durable goods industries. In this same group, which is domi-

Table 37

Role of Capital in Manufacturing Industries

Massachusetts, 1928

	Percentage of Value of Product					Value of Machinery and Tools per Wage Earner
	Total capital	Land, build- ings, and fixtures	Machin- ery and tools	Inven- tory	Cash, accounts receivable, and sundries	
All Manufactures	92	26	20	22	24	\$1,163
Consumption goods	82	22	18	21	22	1,048
Capital goods	111	33	25	27	27	1,349
Construction materials	90	25	16	22	27	953
Producers' supplies	140	58	28	20	33	2,036
Finished goods	79	22	14	19	23	897
Unfinished goods	115	35	29	26	26	1,570
Durable goods, total	95	25	19	24	27	1,089
Capital and construction goods	107	31	23	26	27	1,278
Consumption goods	80	18	13	22	28	806
Semidurable goods	86	20	20	24	22	1,008
Transient goods	98	39	20	16	23	1,753

nated of course by the various textile industries, we find a high percentage of total capital in the form of machinery and tools. The greatest relative investment in land and buildings is in the manufacture of transient goods.³⁹

The various elements of capital may be contrasted with value of sales (Table 37). This comparison supplements the data on capital turnover discussed in a preceding section. In addition, Table 37 includes measures of the per capita use of machinery in Massachusetts manufacturing. In general it

³⁹ A division of these groups according to stage of production (Table b, Ap. IX) reveals a high plant investment for unfinished capital goods, higher inventories and cash relative to total capital for finished goods manufacture.

Table 38

Per Capita Use of Machinery and Tools in Manufacturing Industries
Massachusetts, 1928

Classification of Establishments Manufacturing Finished and Unfinished Goods

Value of Machinery and Tools per Wage Earner* (thousands of dollars)	Finished Goods				Unfinished Goods									
	Consumption Goods				Consumption Goods									
	Total	Durable	Foods	Other non- durable	Capital Goods	Construc- tion Materials	Producers' Supplies	Total	Durable	Foods	Other non- durable	Capital Goods	Construc- tion Materials	Producers' Supplies
0.1- 1.0	3,553	645	1,260	1,648	702	539	149	999	241	..	738	145	17	291
1.1- 2.0	549	98	256	195	216	137	42	239	56	..	183	59	3	248
2.1- 3.0	197	26	94	77	59	27	10	88	15	..	73	21	4	110
3.1- 4.0	109	12	64	33	30	16	2	50	6	..	44	11	..	39
4.1- 5.0	62	6	37	19	21	13	1	19	2	..	17	6	..	28
5.1- 6.0	31	..	21	10	6	3	3	15	..	..	15	2	..	18
6.1- 7.0	23	4	16	3	8	3	..	13	3	..	10	..	..	4
7.1- 8.0	12	..	8	4	4	2	2	4	1	..	3	..	..	4
8.1- 9.0	5	..	4	1	..	2	..	2	..	..	2	..	..	2
9.1-10.0	12	3	6	3	6	2	..	3	1	..	2	1	..	1
10.1-11.0	4	..	3	1	1	..	..	1	..	..	1	..	..	..
11.1-12.0	3	..	1	2	1	..	..	..	..	..	..	..	..	2
12.1-13.0	2	..	1	1	..	..	..	2	2	..	..	..	..	3
13.1-14.0	4	..	3	1	..	1	..	..	..	..	..	..	..	..
14.1-15.0	4	..	2	2	1	..	..	..	..	..	..	..	..	3
15.1-20.0	12	1	4	7	1	..	1	2	..	..	2	..	..	..
over 20.0	11	..	3	8	1	..	..	3	1	..	2	1	..	1
Total	4,593	795	1,783	2,015	1,057	745	208	1,440	328	..	1,112	246	24	754

* Entries in the higher brackets are of limited significance since they frequently result from a large plant being operated by a skeleton working force.

will be found that the measures agree reasonably well with estimates presented earlier. Capital investment is most important in the producers' supplies industries, particularly capital invested in land and improvements. The relative use of machinery in the unfinished goods group is high, as it is also in the capital and producers' goods groups. In the classification according to durability, the transient goods group shows the greatest per capita investment in machinery.

The per capita use of capital in manufacturing processes varies widely from industry to industry; it varies also between factory and factory. From the detailed records of the Massachusetts Census we learn something about the typical ratio of the per capita investment in machinery. This capital-labor ratio for different types of goods is shown in Table 38. The entries are the number of concerns with the indicated proportion between capital and number of wage earners. In all, 2,704 concerns were classified as making unfinished goods, 7,202 as making finished goods. For 839 establishments, however, no ratio was computed, because either one of or both the component elements, capital and number of wage earners, was not reported.

It is clear from the distributions of Table 38 that in all industrial groups the typical investment in machinery and tools is less than \$1,000 per worker. In many establishments and in many industries the ratio is higher, but in over half the concerns in every group except unfinished producers' supplies, the value of machinery did not exceed \$1,000 for each wage earner.

The frequency distributions of the use of machinery in Massachusetts complete the evidence presented on the role of capital in manufactures.⁴⁰ The purpose has been to offer some measure of the capital used in manufacturing different kinds of goods at the time of our survey, to differentiate the uses to which this capital was put, and to show its importance

⁴⁰ For further detail drawn from the Massachusetts survey, including a tabulation for the largest 15 industries of the state, see Ap. IX.

in relation to other production factors. No detailed summary is here presented either of this part of the study or the larger problem of interrelations of productive factors to which this chapter is devoted. Something of a summary of these materials will be found in Chapter IV.