

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: The Structure of Manufacturing Production: A Cross-Section View

Volume Author/Editor: Charles A. Bliss

Volume Publisher: NBER

Volume ISBN: 0-87014-035-3

Volume URL: <http://www.nber.org/books/blis39-1>

Publication Date: 1939

Chapter Title: Summary: The Pattern of Manufacturing Production

Chapter Author: Charles A. Bliss

Chapter URL: <http://www.nber.org/chapters/c6996>

Chapter pages in book: (p. 120 - 140)

IV

Summary: The Pattern of Manufacturing Production

IN 1791 Alexander Hamilton presented to the new Congress his famous report on Manufactures. In doing so, he listed some seventeen groups of manufacturing industries which, in his words, had "grown up and flourished with a rapidity which surprises, affording an encouraging assurance of success in future attempts".¹ But even Hamilton could not foresee the success that did attend these efforts, or the transition by which the industries of 1791, whose products ranged from

¹ The 17 commodity groups are: "1) *Of Skins*—Tanned and tawed leather, dressed skins, shoes, boots and slippers, harness and saddlery of all kinds, portmanteaus and trunks, leather breeches, gloves, muffs and tippets, parchment and gluc. 2) *Of Iron*—Bar and sheet iron, steel, nail rods and nails, implements of husbandry, stoves, pots, and other household utensils, the steel and iron work of carriages, and for ship-building, anchors, scale beams and weights, and various tools of artificers, arms of different kinds; though the manufacture of these last has of late diminished for want of demand. 3) *Of Wood*—Ships, cabinet wares, and turnery, wool and cotton cards, and other machinery for manufactures and husbandry, mathematical instruments, coopers' wares of every kind. 4) *Of Flax and Hemp*—Cables, sail-cloth, cordage, twine, and pack thread. 5) Bricks and coarse tiles, and potters' wares. 6) Ardent spirits, and malt liquors. 7) Writing and printing paper, sheathing and wrapping paper, paste boards, fullers' or press papers, paper-hangings. 8) Hats of fur and wool, and mixtures of both; women's stuff and silk shoes. 9) Refined sugars. 10) Oils of animals and seeds, soap, spermaceti and tallow candles. 11) Copper and brass wares, particularly utensils for distillers, sugar refiners and brewers; andirons and other articles for household use, philosophical apparatus. 12) Tinwares for most purposes of ordinary use. 13) Carriages of all kinds. 14) Snuff, chewing and smoking tobacco. 15) Starch and hair powder. 16) Lamp-black and other painters' colors. 17) Gunpowder." In addition, the report stated, there was a "vast scene of household manufacturing, which contributes more largely to the supply of the community than could be imagined without having made it an object of particular inquiry".

Hamilton's report and his correspondence on the subject of manufactures have been published under the editorship of A. H. Cole in *Industrial and Commercial Correspondence of Alexander Hamilton* (Business Historical Studies, Vol. I, A. W. Shaw Co., 1928). (Citations are from pp. 279-80.)

starch and hair powder to various articles of iron, became the manufacturing system of 1929. During the intervening one hundred thirty-eight years the scale of operations, the technology of manufacturing processes, the markets served, have all been profoundly modified, the flow of goods tremendously increased. New areas of manufacturing activity have been developed, new products undreamed of—the automobile, the various forms of electrical apparatus, petroleum and its distillates, rayon. The making of lamp-black, so encouraging to Hamilton at the turn of the eighteenth century, is today completely overshadowed by the making of carbon black (from gas instead of coal or wood tar) produced to meet the needs of the automobile tire industry. Virtually all the articles of household manufacture in 1791 are now made in factories; more and more household duties have been supplanted by services originating in the manufacturing field or have been made less burdensome by reason of investment in factory-made equipment. In every way the pattern of manufacturing production has become more elaborate.

Just over a hundred years after Hamilton's report appeared the comprehensive Census of 1899, from which the present series of Census reports date. By the turn of the century the country had rounded out its frontier, had set up its large manufacturing centers. The Census of 1899 indicated a working force of 4,713 thousand wage earners making a wide range of manufactured products. The capital invested in manufacturing plants was estimated at \$8,975 million.

Nevertheless manufacturing in 1929 stands in striking contrast to manufacturing in 1899. The most evident change during the three intervening decades has been in the scale of operations. Yet the rise of new products, the development of new techniques, the introduction of new methods have also greatly altered the structure of manufacturing. New industries have come into being. Old activities have dwindled

in importance or have dropped out of the industrial picture. Such industries as the manufacture of aircraft, rayon, mechanical refrigerators, collapsible tubes, artificial leather, and aluminum are not listed in the Census of 1899. Indeed at that time most of these products were unheard of. In 1929, on the other hand, the statistics on hammocks, horseshoes, oakum, and wood carpet were no longer deemed of sufficient importance to warrant reporting in special industrial groups. Of greater importance for the manufacturing structure at large has been the growth of certain industries, the continued decline of others.

We need hardly go back to the time of Hamilton and the country's first report on manufactures for evidence of the changing character of manufacturing operations, even though the comparison is most striking when made with that early record. Permanent shifts in emphasis as well as tentative adjustments are continually taking place within the aggregate of manufacturing activities. Yet these changes only modify, in varying degree, what we believe to be more or less persistent attributes of manufacturing operations.² For in large part the characteristics of a dynamic economy are structural, not haphazard, transient relationships. They are characteristics of a manufacturing system that has been built up over a long period; they are slow to change because of the stabilizing influence of human institutions, the stability of a slowly altering fund of capital and knowledge, and the peculiar and unyielding features of particular manufacturing operations.

²At various points in Ch. II and III some indication of changes in the different relations studied has been given. Dr. Kuznets' estimates of the value of the end-products of manufacturing (cited in Table 1) suggest that measures relating to the disposition of productive resources are subject to considerable alteration during periods of severe recession. The 1919 and 1929 ratios are almost identical, however. Indeed, the stability of the percentage apportionment between capital formation and consumers' outlay (at a later stage than that to which the capital-consumption goods ratio we have examined relates) during this full period is commented upon by Dr. Kuznets in the presentation of his measures (*National Income and Capital Formation, 1919-1935*, National Bureau of Economic Research, 1937, pp. 46-7).

The few comparisons made of the relative importance of productive factors for 1929 and other years (pp. 60, 73, 100) indicate an equally high uniformity.

The manufacturing structure might be described in various ways, with varying emphasis upon its different aspects.³ It is not our purpose to explore the concept. We simply try to suggest certain characteristics of manufacturing activities by means of a cross-section picture. It is as if from a reel of motion picture film a single still photograph had been abstracted. For we have taken, at what amounts to an instant in time, a 'still' photograph of a dynamic economy. We have done this in order to determine, for at least one short period, the various interrelations and characteristics of a most important type of productive activity. We presume no static equilibrium on the basis of our findings. We simply say that at the brink of the greatest recession in business activity of which we have record, this is what those engaged in manufacturing were doing. We present, as of 1929, no diagnosis of incipient ills. We believe that the persistent relationships of the structure we would describe have a life span longer than the average business cycle. To the degree that our measures reflect these relations they may contribute to the better understanding of all business cycles, and not alone of the major collapse that followed so closely the period to which they relate.

To two closely related aspects of the structure of manufacturing production attention has mainly been devoted: (1) the allocation of economic resources to the manufacture of different classes of goods; (2) the relative use of different productive factors. A complete cross-section view of the manufacturing structure might touch also on the extent of corporate ownership or the regional distribution of manufacturing activity. Problems of personnel, of labor relations, and of character of work might also be considered. However, objective criteria for the analysis of these and other attributes of manufacturing are not always easily determined.

³ See for example the diverse meanings given to 'structure of production' by F. A. Hayek (*Prices and Production*, London, George Routledge & Sons, 1931, p. 35) and E. A. G. Robinson (*The Structure of Competitive Industry*, Harcourt, Brace, 1932).

Moreover, certain of these phases of the problem have received detailed examination elsewhere. It has seemed well to center our attention on the two major problems stated and to utilize only readily available data that give promise of improving our knowledge of the character of manufacturing production.⁴

Rather than attempt to summarize in this concluding chapter all the detail outlined in the preceding chapters and the nine appendices, we shall state certain general propositions based on these materials, and endeavor to indicate their significance. Obviously such a method of review leaves much to be desired; it leaves unmentioned a great deal that the careful reader will have found by close scrutiny of the various tables. The following paragraphs, however, point to major findings.

A high percentage of the manufactured goods produced in 1929 was destined for human consumption. Of the aggregate sales of manufacturing establishments in 1929, somewhat over 70 per cent is identified with consumers' goods. In terms of value added, the ratio is exactly 70 per cent. For the more narrowly defined group of consumption goods, exclusive of any part of producers' supplies or construction materials, the percentages are 60 and 58 respectively. Unfortunately we have no ready means of measuring 'output' other than in these value terms, and the 'contribution' of the manufacturing enterprise is perhaps not well appraised by such market values. Moreover, we are not sure of the extent to which the flow of capital goods is diverted to replacement of existing capital or spent for expansion purposes. Nonetheless, great significance attaches to this ratio between consumption and capital goods, particularly in view of the greater cyclical

⁴ The data with which we have worked are so detailed and so voluminous that some condensation has been necessary. As a result, our analysis has only infrequently been concerned with the description of particular manufacturing processes. If the realism given by titles of individual industries and processes is missing, it is because the scope of the investigation and the desire to isolate general relationships have subordinated the individual manufacturing activity. In Ap. I and II various measures relating to the 326 industry divisions recognized by the Bureau of the Census are presented.

amplitude of the fluctuations in capital goods production. But it is just because of these different responses to changes in business activity that the 1929 proportions between the values of manufactured capital and consumption goods cannot be taken to define a persistent relationship. The general magnitudes of the different operations are evident, however. Since 1929 was on the whole a year of expanded business activity, the figure of 70 per cent of the total that we associate with consumption goods and related products is in all probability a lower limit of the measure than would be found in a less prosperous year.

The four major divisions of consumption goods industries, in order of magnitude of value added by manufacture, are wearing apparel and personal equipment, foods, household goods, and motor vehicles. Together the value added in these four groups of industries totaled 80 per cent of the value added for all consumption goods in 1929, and 45 per cent of the value added by all manufactures.

Goods with a relatively long service life (over two years) made up 43 per cent of the total value of products, 47 per cent of the total value added by manufacture. Roughly two-thirds of these durable goods were capital or construction goods; the other third being destined for consumption use. Transient goods, including all producers' supplies, contributed approximately one-third of the total (36 per cent of gross value of products, 33 per cent of value added). The third group, semidurable goods, made up 20 per cent of both gross value of product and of value added.

Most manufacturing was done in plants whose products we have classed as 'finished', that is, the products were sold for purposes other than further manufacture. The extent of intermediary fabrication (i.e., production of unfinished goods relative to the production of finished goods) was greatest in the capital goods group and in the consumers' goods transportation subgroup; it was least for certain types of consumption goods, particularly manufactured foodstuffs.

As a group it would appear that durable goods⁵ are to a relatively large degree manufactured in plants at least one stage of manufacture removed from the ultimate users. While it is true that integration of ownership bridges some part of these necessary transfers, it remains significant that in the production of durable goods there are relatively more opportunities for industrial maladjustments. The point is even more suggestive when we observe that of all groups of manufacturing industries those that make durable goods (particularly durable capital goods) call for relatively more labor effort. These durable goods industries employ roughly half the wage earners in manufacturing, which is considerably above the corresponding proportion for value of product (43 per cent). When considered with reference to the wide cyclical amplitude in the output of durable goods, these factors serve to emphasize the strategic importance of the durable goods industries in any explanation of business fluctuations.

For the most part, manufacturing involves the processing of nonagricultural materials. Value added by the fabrication of farm and animal products was but little more than one-fourth of the total value added by manufacture in 1929. On this criterion, the most important materials were metals, whose fabrication accounted for 38 per cent of total value added. The iron group alone accounted for 31 per cent. The fabrication of nonfarm materials required twice as many wage earners as did the processing of farm products. In terms of their value as they enter the first stage of manufacture, however, farm materials are unquestionably more important. Only when we examine the extent of their processing in the manufacturing industries does their importance in the manufacturing process shrink. Our estimates suggest a sixfold

⁵ We have no direct estimate of the value of products of finished or unfinished durable goods. All capital goods are durable by definition, and most of the consumers' transportation goods are durable also. Construction materials are also durable in their final use and, while for the most part they are here classified as 'finished' because they receive no further fabrication in the manufacturing system, are destined to undergo considerable change in form beyond the factory door.

increase in the value of minerals, a doubling in the value of farm products.

Measures of the apportionment of various factors in manufacturing are quite similar from group to group, and factor to factor.⁶ Subject to some variation, approximately the same proportion of different productive resources is required for the manufacture of goods of the types we have studied. This observation holds whether our measures are expressed in dollars or in physical units. The general similarity of the ratios is to be seen in the comparisons of Chart II.

Of the 8,839 thousand wage earners employed in manufacturing industries in 1929 we estimate that 4,900 thousand helped to fabricate consumption goods (55 per cent). Allowance for supplementary consumption goods groups (producers' supplies and residential construction) raises this to about two-thirds of the total. Relatively to other productive factors, a low percentage of total wage earners are employed in making consumption goods, a high proportion in making capital goods. Accordingly we conclude that capital goods require a relatively larger labor input than consumption goods. Only in the group of personal consumption goods, clothing chiefly, does the relative labor requirement exceed that for capital goods. Estimates of aggregate man hours worked in 1929 show no appreciable divergencies from the patterns just described.

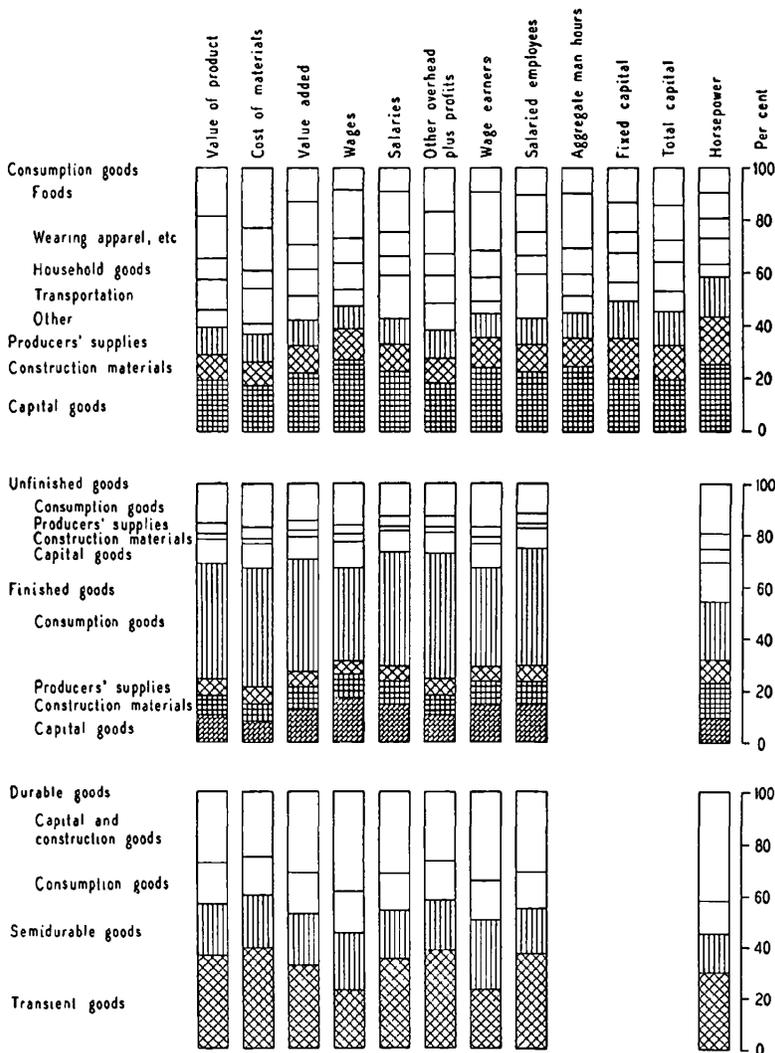
The relatively heavier 'input' of labor in capital goods manufacture holds chiefly for industries making finished products. Among industries whose products are unfinished, those making consumption goods show the relatively greater labor investment (relative to value added and other items). It is notable that while durable capital goods as a group call for a significantly greater proportion of total wage earners than of most other items, durable consumption goods do

⁶In some degree this tendency is enforced by our method of estimate. A common ratio was used to allocate items relating to a particular industry whenever diverse products made such allocations necessary.

128 STRUCTURE OF MANUFACTURING PRODUCTION

Chart II

DISTRIBUTION ACCORDING TO TYPE OF PRODUCT OF CERTAIN ITEMS RELATING TO MANUFACTURING OPERATIONS, 1929



not. Rather, it is in the group of semidurable consumption goods, chiefly textiles and textile products, that the proportion of total wage earners is large, relative to other items. When we examine wages paid, rather than number of wage earners, however, the relation is reversed, for the ratio for the subgroup durable consumption goods more closely resembles the ratio for capital goods. The durable goods industries' share of total wages exceeds the proportion of total wage earners associated with these industries. In semidurable goods industries, however, the percentage of total wages is less than the percentage of total wage earners. The average wage, of course, is lower in the semidurable goods group.

Typically, the number of salaried workers in manufacturing industries is roughly 15 per cent of the number of wage earners. The ratio is somewhat lower for capital goods, particularly unfinished capital goods; conversely, it is higher for finished consumption goods. There is clear evidence that the employment of salaried workers is relatively more frequent at the later stages of manufacturing operations. The problems of distribution are probably greater at later stages; as products become more specialized with advanced fabrication the need for salaried administrative assistants becomes greater. There are, of course, certain industries, such as the publication trades, in which salaried employees comprise a large percentage of the labor force. Most of these industries are apparently in the transient goods group, for which the ratio we have discussed reaches a peak (one-fourth of total wage earners).

The composite of overhead costs and profits, exclusive of salaries, is in the aggregate approximately one-fourth of value of product. A relatively high percentage is associated with consumption goods manufacture, particularly finished and transient goods; a low percentage is associated with capital goods, particularly finished capital goods. These variations in elements of costs are defined in later pages; it

130 STRUCTURE OF MANUFACTURING PRODUCTION
is our purpose here only to indicate the divisions of the aggregates among the several groups.

The total capital invested in manufactures in 1929 we estimate at \$50 billion. Of this amount, over one-half was used in consumption goods industries; as much as 70 per cent might be traced to the manufacture of products ultimately associated with consumption purposes. Fixed capital finds its greatest use, relative to the use made of other productive factors, in construction materials and producers' supplies; notably less fixed capital was used in the consumption goods group. Only in the foods and transportation supplies subgroups of consumption goods was there a relatively large fixed capital investment.

In the consumption goods group, however, is found the greater relative investment in circulating capital, particularly in the wearing apparel subgroup. No division of these capital items according to other classification schemes is available except on the basis of the state reports for Massachusetts and Pennsylvania. These data suggest that the ratio of capital to sales is slightly higher in the finished goods group. The ratio of capital to number of wage earners is higher for unfinished goods.

Heaviest use is made of mechanical power in the preliminary stages of manufacture. The amount of aggregate horsepower capacity of primary movers in manufacturing in industries making finished goods (54 per cent) is quite disproportionate to that of other factors: 69 per cent of value of product, 71 per cent of value added, 67 per cent of number of wage earners, and even 75 per cent of number of salaried employees.

The making of construction materials and producers' supplies occasions the relatively heaviest power installations. In unfinished capital goods manufacture (cf. steel rolling mills) the share of the total power capacity identified with unfinished industries exceeds the corresponding share of number of wage earners (33.5 against 28.5 per cent). On the

other hand, wage earners play a relatively more important role in the finished goods group. When we examine the power requirements of durable goods, we find that only durable capital and construction goods have a percentage of total horsepower greater than the corresponding percentages for other items, such as value added or number of wage earners. Durable consumption goods clearly have no exceptional need for power facilities. Nor, for that matter, have semidurable goods or transient products, except as has been suggested.

On the average, each wage earner in manufacturing establishments had available, in 1929, power equipment of roughly five horsepower. But the amount of power available varied widely from industry to industry. Per capita horsepower capacity averaged 3.7 for all consumption goods, ranging from 6.4 for the transportation supplies group to 2.1 for the wearing apparel and personal equipment group. In the capital goods group 5.1 horsepower per worker was available, in industries manufacturing construction materials 7.6, and in the producers' supplies group 8.2. Although the comparability of the basic horsepower statistics is in some doubt,⁷ the figures show with reasonable accuracy the varying importance of power in manufacturing production. Because of the different ways and quantities in which power is applied, horsepower data are not the best measures of capital use. Data based upon the assets of manufacturing corporations are better adapted to this purpose.

Fixed capital per manufacturing wage earner averaged roughly \$3,000; in Massachusetts approximately \$1,000 represented machinery and tools. The fixed capital investment was only \$1,544 for each worker in the wearing apparel and other personal goods subgroup of consumption goods. Capital goods as a group had a per capita investment of \$2,534, construction materials industries \$3,994, and pro-

⁷ See footnote 10, Ch. I, for a discussion of the merits of the Census horsepower figures.

132 STRUCTURE OF MANUFACTURING PRODUCTION
ducers' supplies \$4,952, the highest for any major group. Total capital per wage earner averaged \$5,681 for all manufactures as contrasted with the \$3,049 per capita estimate of fixed capital alone. Approximately the same increase holds for each group ratio. The consumption goods group ratios are increased most, however, on the addition of circulating and miscellaneous capital items.

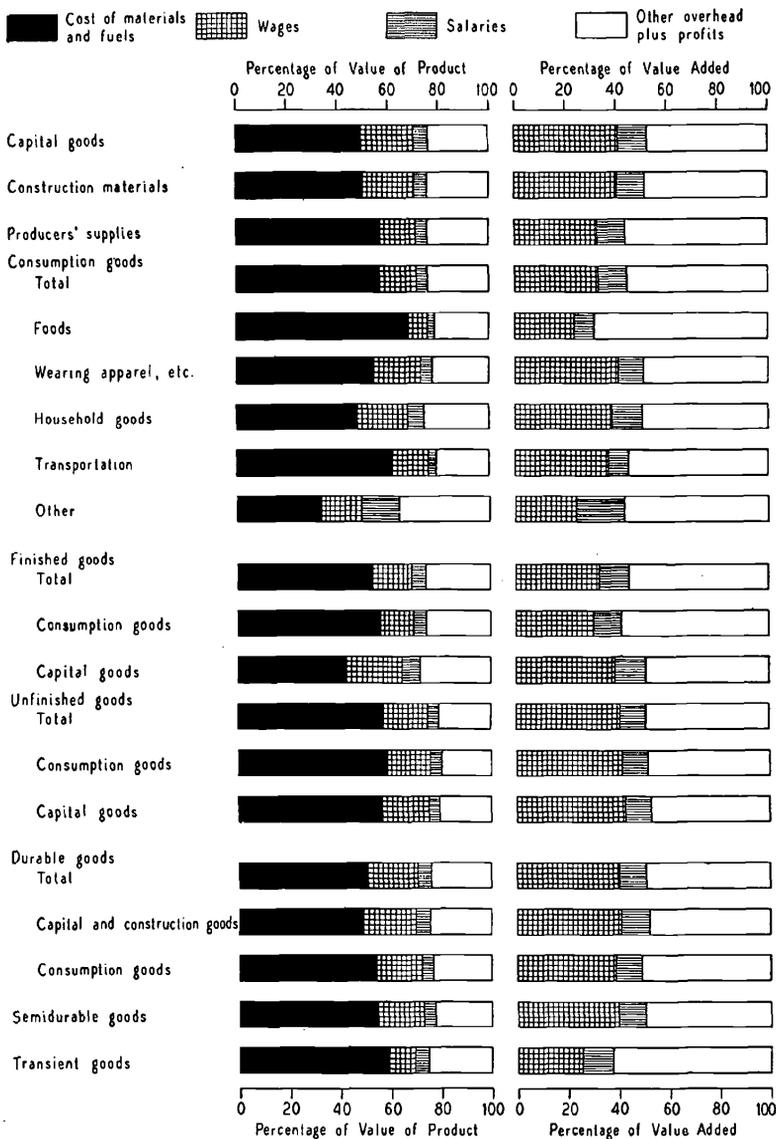
The input relations of manufacturing industries are evident in the different elements of manufacturing cost. Chart III summarizes certain measures relating to elements of value of product, value added, and the composite of overhead costs and profits.

Cost of materials (plus fuels) is the largest item of manufacturing cost. The over-all percentage of total value of product was 54.9 in 1929, although the median ratio for the 326 industries was somewhat less (47 per cent). Material costs are a smaller fraction of selling price in industries making finished goods than at prior stages of manufacture, and in industries making durable goods than in those making nondurable goods.⁸ Such costs are relatively low for all capital goods, and particularly for finished capital goods. In contrast to 54.9 per cent for all manufacturing industries, material costs in industries making finished capital goods comprised but 42.6 per cent of value of product in 1929.

Total wage payments were 15.9 per cent of sales, but the median ratio for the 326 large and small industries was higher, 19 per cent. Of the weighted ratios the highest, for the groups discussed, is that for finished capital goods, 22 per

⁸ The magnitude of these ratios is determined by the relationship between the value contributed in the industry and the value created at prior productive stages. Where the manufacturing contribution is small, as for example in food processing, material costs bulk large in the final selling price. Where the fabrication process is elaborate, and starts with simple raw materials, material costs tend to be low. So far as industrial integration results in a lengthening of the manufacturing process in a given industry, the effect may well be to diminish the importance of material costs in the selling price. However, the industrial unit of the Census is the establishment, not the corporation, and therefore much industrial integration does not affect the ratios here presented. That there are wide variations behind the group averages goes without saying. Moreover, the finished and unfinished goods groups are not directly comparable, since many finished goods industries cover the entire manufacturing process.

Chart III
ELEMENTS OF MANUFACTURING COSTS, 1929



cent. The lowest percentages are for finished consumption goods and transient goods. Again durable capital and construction materials have a common pattern distinct from that of durable consumption goods. Apparently there is closer correspondence in the elements of cost between durable and semidurable consumption goods.

For many purposes, wage payments are properly compared with costs of services originating within the manufacturing process itself, i.e., all costs except materials. Accordingly we turn to measures of fabrication costs as percentages of value added. Of this total, wages account for about 35 per cent, salaries 11 per cent, and overhead less salaries but including profits the rest, 54 per cent. Considerable variation around these general figures is observed.

In capital goods industries wage payments average 40 per cent of value added. Consumption goods industries alone pay 33 per cent of value added in the form of wages, though in the food group these payments fall to less than 24 per cent. The ratio rises to 40 per cent in the wearing apparel group. The discrepancy between capital and consumption goods is less pronounced in the group of industries making unfinished products, more striking in the finished goods division. In all groups, wages are notably a smaller percentage of value added in the finished goods division; other items, particularly miscellaneous overhead plus profits, being larger.

Salary payments appear to be a fairly uniform percentage (roughly 11 per cent) of value added for the different major groups of manufactured goods in 1929. In the consumption goods total, we know of course that they are disproportionately high for the publication group; they are somewhat below the typical figure in the foods and private transportation groups. In most instances, there are probably no significant differences in the salary ratios from group to group.

Overhead costs other than salaries but plus profits, as a percentage of value added, reveals variations complementary

to the measures just described for wage payments, the third item, salaries, showing no wide differences. These overhead costs plus profits are relatively high for consumption goods industries, particularly for foods and the items of the transportation groups. They are relatively low for the capital goods industries. The finished goods group has the higher relative burden of overhead. It has been suggested that sales effort on the part of the manufacturer is greater with finished than with unfinished goods, and if so, the overhead item would reflect such efforts. For information on the components of this residual item, typically half as great as the value added total itself, we have turned to non-Census data.

Treasury Department statistics on the income and expenses of manufacturing corporations in 1929 suggest that of the magnitude roughly corresponding to the Census item 'value added less salaries and wages' about one-fifth represented profits (one-tenth of all fabrication costs and one-twentieth of value of product). Depreciation charges accounted for roughly 10 per cent and taxes 6.4 per cent of this overhead plus profits item. The bulk of these residual costs, however, are masked in a miscellaneous item that in 1929 was 56 per cent of the overhead item. The Dun-Bradstreet 1933 survey of 1,709 manufacturing concerns provides measures of certain items of overhead cost that probably, though not surely, are included in the Treasury miscellaneous item. Selling expenses stand high among the different expense items other than cost of goods reported in the sample survey. This finding supports our belief that some costs of distribution are included in the Census overhead item. No great differences in the character of these costs are indicated for capital and consumption goods industries.

The significance of these conclusions depends upon several conditions. In general, the measures of manufacturing operations in 1929 are important because they help to define cer-

136 STRUCTURE OF MANUFACTURING PRODUCTION
tain characteristics of the manufacturing structure. But how well they do this, how important the areas they define, and how novel the information they give, are questions yet to be considered.

Certain basic measures relating to manufacturing operations hitherto not available have been especially prepared for analysis in this study. Thus the estimates of average hours worked in 1929 in different manufacturing industries provide new measures bearing on an important aspect of pre-recession factory operations.⁹ The estimates of industry-to-industry relationships in terms of product outlets (Ap. I) have made possible a new set of measures of the net value of manufactured goods by groups of industries and of the extent to which this value originates within the manufacturing system (Ap. IV). One aim of the survey has been to determine these magnitudes—net value, man hours of labor effort, capital investment—associated with manufacturing operations in 1929.

Most of the data presented in this volume refer to different groups of manufacturing industries. Accordingly, the importance of the measures rests upon the significance of the classification to which they relate. The significance of certain of our groupings has been demonstrated by other investigators. In general the groups have been selected after consideration of their meaning with reference to the source and use made of productive resources. The data we have collated relate to broad industry divisions and are descriptive of the complete groups rather than of the individual industries that comprise them. The measures refer to selected portions of the economic population, as groups.

The significance of the group measures probably varies according as they are: (1) measures relating to the relative magnitudes of the several groups (presented, for the most part, in Ch. II), or (2) measures of the interrelations of productive factors within the groups (cf. Ch. III). The relative

⁹ These data are discussed in Ch. I and II, and described at length in Ap. III.

group magnitudes are probably less persistent in the face of changing business conditions than are the interrelations of the productive factors.¹⁰ We should expect, for example, that the proportions defining the distribution of economic resources between consumption and capital goods would be somewhat different in 1933 than in 1929. However, we might expect fewer discrepancies in the relative apportionment of value of product among different items of manufacturing cost. But to the truth of this hypothesis, only similar surveys for other intervals can fully testify.

It is in the broader implications of our study, of course, that its true significance lies. While not providing a complete description of manufacturing operations, or an unequivocal measure of the elements of the manufacturing structure, the survey bears on a most important question. For it relates to “. . . the most obvious economic problem which confronts the inhabitants of any country or of the world as a whole, . . . to determine how the limited natural resources of the community, its limited flow of savings, its limited equipment of human brains and hands, is to be allocated between the infinity of different uses in which they are capable of yielding a harvest of enjoyment”.¹¹ When D. H. Robertson wrote these lines he was chiefly concerned with the guiding forces that control the disposition of economic resources. This “most obvious economic problem” we have not considered, but we have sought to determine in what actual proportions these resources were allocated in an important area of productive activity during 1929.

Some continuing knowledge of how productive resources are being utilized is important even in an economy where administrative decision does not determine their disposition. It is important for the wise decision of public policy. The economist must consider this aspect of the productive struc-

¹⁰ But note the instances of stability in certain of the ratios relating to distribution of productive resources cited in footnote 2 above.

¹¹ D. H. Robertson, *The Control of Industry* (Harcourt, Brace, 1923), p. 4.

ture in his appraisal of the composite of different productive activities, the student of business cycles must keep it in mind in his search for strategic factors in business fluctuations. The economic historian would find in a succession of cross-section studies of the productive system a wealth of information about the changing structural characteristics of the economy. Since manufacturing comprises an important segment of the productive system, the present survey of the pattern of manufacturing operations contributes to a more complete knowledge of the "obvious problem" of which D. H. Robertson wrote.

The peculiarly important role of durable goods industries has already been mentioned. Notable is the requirement in their manufacture of almost one-half of all manufacturing resources in 1929, the more frequent transfers of the unfinished product from industry to industry resulting in increased opportunities for maladjustment of supply and demand, the relatively heavy demand for factory labor and the even greater relative volume of factory pay roll. The instability in the demand for durable goods has increased significance when considered in the light of the relatively greater influence that their manufacture exerts on the wage receipts of factory labor and on the entire sequence of manufacturing operations.

One of the more striking contrasts revealed in the study is the relatively small percentage of the sum received for the fabrication of transient consumption goods that is disbursed in the form of wages and salaries. Only 38 per cent of value added was paid as wages or salaries in this group in 1929. In other groups roughly 50 per cent of value added was paid to employees, the highest percentages being in the capital and construction goods groups. The significance of this relationship is obscured somewhat since we cannot trace the destinations of the payments for items of overhead, and since a somewhat greater percentage of the original sales price is paid, relative to other groups, for materials consumed

in manufacture. It would appear, however, that an original expenditure on other types of manufactured goods might have a more immediate ramification throughout the economic system. If so, the relationship observed probably operates to retard business recovery and to accelerate the later phases of business expansion, for the relative expenditure on transient goods (foods being one major component) is greatest during periods of business depression.

The rather limited significance of the construction materials industries, as distinct from other capital goods in the manufactures total, is not without import. Granted the relatively close resemblance to the capital group in the pattern of costs and in the use made of different productive factors, the lower absolute level of the totals for construction materials (less than one-half that of capital goods in 1929) sets limits on the significance of the construction industry so far as manufacturing activity is concerned. In size, the construction materials group in manufacturing ranks with the automobile and related products subgroup of consumers' goods.

The growth of the automotive industry and the manufacturing activities it occasions vividly illustrates the changing structural composition of manufacturing and the changing "harvest of enjoyment". Index numbers have long testified to the exceptional growth of these industries but it is nonetheless striking to find approximately one-tenth of all wage earners and an equally large percentage of total capital contributing, at some stage of the manufacturing process, to the output of what is relatively a new consumers' service. The operation of the manufacturing system today is colored by the growth to maturity of the components of this major group of consumption goods industries.

No attempt has been made to establish norms for a satisfactorily operating economy. A rigid scheme of allocation of productive resources can hardly be relied upon to provide a

140 STRUCTURE OF MANUFACTURING PRODUCTION
practical basis of control. Studies of the changing pattern of production, however, should further the understanding of conditions favorable to economic stability. Such studies, covering wide areas of the economic system and relating to successive periods, would seem to be prerequisite to a far-seeing consideration of actual and desirable ways of utilizing the nation's economic resources. This cross-section view of manufacturing production in 1929 is a step in this direction.