

GENERAL EXPLANATIONS

1. Historical Note

The 1947 Census of Manufactures is the first to be taken since 1939. The first Census of Manufactures covered the year 1809 and a census was taken at 10-year intervals in connection with the Decennial Census of Population up to and including 1899, with the exception of 1829. It was conducted at 5-year intervals from 1904 through 1919, and every other year from 1921 through 1939 but was suspended during the war period. The 1947 census was authorized by the Fifteenth Census Act of June 18, 1929 (46 Stat. 21); present legislation provides for a Census of Manufactures to cover the year 1953 and every fifth year thereafter.

2. Area and Period Covered

The 1947 census covered manufacturing activity in the 48 States and the District of Columbia. Manufacturing activities in Alaska, Hawaii, and Puerto Rico, which had been included in the decennial censuses of 1929 and 1939, were not covered in this census.

The census covered activity during the calendar year 1947, and, as in the past, manufacturers were strongly urged to file a calendar-year report regardless of whether their records were maintained on a fiscal-year basis. Reports were obtained on a calendar-year basis from the great majority of companies in all industries except a few such as fertilizers and agricultural machinery, where the use of a 12-month period other than the calendar year is common and statistics collected by other agencies are on a fiscal-year basis. In the relatively small number of cases where the individual manufacturer was granted permission to submit a fiscal-year report, he was still required to report the employment and pay roll data on a calendar-year basis. In view of the fact that the year 1947 and the months immediately preceding and following that year constituted a period of sustained high activity in most industries, comparability of production with employment, or value added by manufacture with wages, is not appreciably affected by the fact that in some instances shipments were reported for a 12-month period different from the calendar year.

3. The Census Mailing List

In order to secure a complete list of manufacturing establishments, the 1939 census lists were sup-

plemented by lists supplied by other Government agencies, particularly the war agencies, and by trade associations. The consolidated census list was, finally, matched against the master file of the Bureau of Old-Age and Survivors Insurance of the Social Security Administration. This file was never before available for the Census of Manufactures. In all, more than a million names were processed in the course of developing the census mailing list. While this composite list was virtually complete, as subsequent tests showed, it contained a large number of nonmanufacturing, duplicate, and out-of-business establishments and it was therefore necessary to provide for a further elimination of duplicates and nonmanufacturers as well as to obtain enough production information to permit mailing of the correct form to each manufacturing establishment that operated during 1947.

For this purpose, a preliminary canvass, or "pre-canvass," of all manufacturing establishments was undertaken. The prec canvass was begun in August of 1947 and was substantially completed with the help of local postoffices and the Field Offices of the Census Bureau by the end of that year. In total, after eliminating obvious duplicates, approximately 525,000 prec canvass cards were mailed. The prec canvass provided the Bureau with the following information: Name, address, and corporate affiliation of the establishment; manufacturing processes used and type of products made; and the approximate size of the establishment as measured by its employment for a recent date. The production information permitted the elimination of thousands of nonmanufacturing establishments and, in most cases, the mailing of the appropriate report form to genuine manufacturers. Names were not eliminated as duplicates or nonmanufacturers, however, unless the evidence from the prec canvass was conclusive.

4. The Canvass

While the 1947 census report forms were distributed and for the most part returned by mail, manufacturers who did not send in a report or whose reports were incomplete or otherwise inadequate were reached by telephone or personal visit from the Field Offices of the Bureau. An important exception to this procedure was made in the case of the highly mobile eastern lumber mills which were canvassed entirely by field enumeration.

Mailing was begun late in January 1948, and continued through the first quarter of the year, with a supplementary mailing of 50,000 forms in midsummer. The field follow-up began in June and was completed by the end of the year. In all, about 325,000 report forms were mailed to possible manufacturers (exclusive of eastern sawmills). This large number was included in the original mailing to avoid the possibility of omission, even though it was known that a considerable proportion of these would ultimately prove to be duplicate names, nonmanufacturing establishments, or firms which had discontinued operations prior to 1947. In fact, only slightly more than 225,000 of these establishments were tabulated in the census. In addition, of the nearly 60,000 eastern sawmills contacted by the Field Offices, some 15,000 were included in the census tabulations of plant statistics, bringing the total number of establishments included in the census to nearly 242,000. Some 10,000 of the sawmills enumerated did not operate in 1947, and from the remaining 35,000 active mills only lumber production figures were obtained.

For the first time in the history of the Census of Manufactures, the Bureau is obtaining a direct measure of the coverage of such a census. Preliminary results of an intensive enumeration in representative sample areas indicate that for the country as a whole the census obtained and included in its tabulations reports from over 98 percent of all manufacturing employees as defined for census purposes. A large proportion of the remainder, or 200,000 employees not covered were found to be employed in small establishments which also engaged at the same location in retail trade, custom work, repair services, construction, or other non-manufacturing activities. The classification of such "marginal" establishments is difficult at best and, for those located in the coverage check, a definitive classification was made only after intensive correspondence or special interviews by field agents of the Bureau. Since, it was obviously impossible to devote as much attention to the thousands of reports received from similar establishments in the census proper, the census tabulations undoubtedly include some marginal establishments which, with more adequate information, would have been properly classified as nonmanufacturing. Final estimates and additional details on the test will be published in the General Summary Volume of the 1947 Census of Manufactures.

5. Definition of Establishment

To the extent possible, the Census of Manufactures is conducted on an establishment basis. As a rule, the term "establishment" signifies a single plant or factory and is not necessarily identical with the business unit or company which may consist of one or more

establishments. A company operating establishments at more than one location is required to submit a report for each location; also, companies engaged in distinctly different lines of activity at one location are required to submit separate reports if separate pay roll and inventory records are kept for each activity.

In practice, some flexibility was allowed in the application of these rules. Where a company did not keep separate records for two or more establishments engaged in the same line of activity and located within the same State and county, a consolidated report was usually accepted and the plants counted as a single establishment. In a very few cases where a company operated two or more plants engaged in the same line of activity within the same State but in different counties, a consolidated report was accepted but the company was requested to supply employment and pay roll figures for both establishments and all the operations of the establishment were apportioned on this basis. Where two or more plants were located in different States, separate reports were obtained, by estimate if necessary.

The requirement that distinct lines of activity at the same location be separately reported was also selectively applied. In particular instances, e.g., in the separation of blast furnaces from steel works, or that of pulp mills from paper mills—reporting manufacturers were required to provide separate reports and in many cases somewhat arbitrary values had to be assigned to materials transferred from one to another phase of an integrated industrial operation. For most industries outside the paper and products and some sections of the metals and products (including machinery) industries, consolidated reports were accepted and the plant classified in the industry accounting for the largest proportion of its shipments. Where, however, companies operated two or more establishments engaged in different lines of activity at different locations, separate reports were secured, even though this involved the assignment of somewhat arbitrary values for materials transferred from one plant to another.

In all instances in which a company operated more than one establishment as defined for census purposes, the company was considered as a multiunit company in the tabulation showing statistics by character of ownership and legal organization (chapter IV of the General Summary Volume). Conversely, a company operating only one manufacturing establishment and in addition one or more nonmanufacturing establishments was considered as an "independent" for purposes of this tabulation.

Where an establishment changed ownership during the year 1947 it was counted as a single establishment provided it continued to operate in the same line of

activity, although in some cases reports had to be secured from both owners and if these were received at wide intervals it was not feasible to tabulate them as one report.

6. Establishments Covered in the Census—Type

The 1947 Census of Manufactures covers all establishments primarily engaged in manufacturing as defined in the Standard Industrial Classification Manual, Volume I, Manufacturing Industries, dated November 1945, with certain exceptions as indicated below. A detailed comparison of the Census and Standard Industrial Classification systems, including differences within the manufacturing division, is shown in Appendix E.

The Standard Industrial Classification Manual describes manufacturing establishments as those engaged in the mechanical or chemical transformation of inorganic or organic substances into new products. These activities are usually carried on in plants, factories, or mills, which characteristically use power-driven machines and materials-handling equipment.

Manufacturing production is usually carried on for the wholesale market, for interplant transfer, or to order of industrial users rather than for direct sale to the household consumer. Some manufacturers in a few industries sell chiefly at retail to domestic consumers through the mail, through house-to-house routes, or through salesmen. Some activities of a service nature (enameling, china decorating, etc.), when performed primarily for the trade are included in the manufacturing division; when performed primarily to the order of the household consumer, they are considered nonmanufacturing.

There are indicated below the more important instances in which both census and standard classification may differ from common usage as well as those few instances in which census procedure differs from standard. A fuller discussion of such differences will be found in Appendixes C and E, and in the introductory text for the industries affected (Industry Volume).

(a) The following types of activities are defined as nonmanufacturing by the Standard Industrial Classification and are also excluded from the Census of Manufactures:

Processing on farms if the raw materials are grown on the farm and if the manufacturing activities are on a small scale without extensive use of paid labor. Also custom milling, cotton ginning, and similar activities.

Dressing and beneficiating of ores, and the breaking, washing, and grading of coal.

Jobbing by establishments which do no manufacturing but assign materials to contractors to be fabricated by them; the Census of Manufactures does, however, include jobbing in the textile, apparel, and leather industries.

Manufacturing activities of certain establishments which sell most of their products at retail on the premises, e.g., single-shop retail bakeries.

Fabricating operations performed at the site of construction by contractors.

Production by public utilities of electric light and power or of heating, cooking, and illuminating gas distributed through mains.

Custom work to the individual order of household consumers, such as custom tailoring or woodworking.

Repair and other service activities except specified services performed "for the trade." Machine shops engaged exclusively or almost exclusively in repair work and railroad repair shops are also excluded.

Engineering, design, and experimental work, except in the aircraft industry, or when carried on at establishments primarily engaged in manufacturing activities.

Educational, eleemosynary, and penal institutions engaged in some manufacturing.

(b) The following types or activities, though not universally considered to be manufacturing, are so classified by the Standard Industrial Classification and are included in the Census of Manufactures:

- Printing
- Publishing
- Custom slaughtering
- Rice cleaning and polishing
- Scouring and combing textile fibers
- Apparel contracting
- Wood preserving
- Electroplating, plating, and metal polishing
- Galvanizing
- Job stamping, casting, machining
- Lapidary work

(c) The following types of establishments are classified as manufacturing by the Standard Industrial Classification but excluded from the census, mainly because of the difficulties involved in locating the plants or securing reports in the detail required for a Census of Manufactures:

Establishments with no employees in 1947. An exception to this policy was made in the case of textile, apparel, and leather jobbers (see *d* below).

Sawmills producing less than 200 M ft. b.m. of lumber in 1947. Statistics on lumber production were, however, obtained from all such establishments.

Logging camps and logging contractors.

Fire distilling of gum naval stores.

Establishments producing cut-stone and stone products from own quarried stone.

Establishments primarily rebuilding motor vehicle parts.

(d) The following types of establishments were covered in the census though not classified as manufacturing by the Standard Industrial Classification:

Textile, apparel, and leather jobbers who do no manufacturing but who assign material to contract factories for fabrication. These were included for the purpose of providing complete information on materials, products, and value added by manufacture.

Establishments producing manufactured dairy products but also engaged in distributing fluid milk were canvassed in the census but are not included in group totals or in any of the tables in the General Summary or State Volumes. These are shown separately in the industry reports, however, primarily for the purpose of obtaining commodity statistics.

Motion picture producers and establishments processing films for motion picture producers reported in the census and statistics for these establishments are shown in the Industry Volume but are not included in group totals or in any of the tables in the General Summary or State Volumes.

(e) Military arsenals, Navy yards, and Government printing establishments were not included in the census.

7. Establishments Covered in the Census— Comparison With Other Figures

Despite the application of fairly uniform definitions of manufacturing activity, the 1947 census figures differ, in some cases rather markedly, as to region and industry from those published by other Federal agencies for the same year. These differences reflect in large part the greater emphasis in the census on securing separate reports for each establishment of companies with more than one plant, thus permitting more accurate geographic breakdowns and the exclusion from the census of nonmanufacturing activities (mining, transportation, distribution, etc.) of such companies at locations other than the manufacturing plant, and in some instances the exclusion of "general office" activities at the plant itself. The exclusion of such nonmanufacturing activities from the census is facilitated by the fact that all large manufacturers are required to submit for each establishment detailed information on input of materials and production of commodities.

Also, the greater detail on production and materials consumption received in the 1947 Census of Manufactures makes possible more rigid application of the Standard Industrial Classification rules which provide for the exclusion from manufacturing of establishments producing on a custom basis or for retail sale on the premises and of establishments engaged primarily in repair work. This factor eliminated from the census a large number of nonmanufacturing establishments. In terms of employment, the exclusion of nonmanufacturing activities was less consequential.

A minor portion of the difference between census and other figures arose from the fact that the 1947 census did not cover several manufacturing activities (see Section 6, item c), of which logging camps and logging contractors accounted for the largest number of employees.

For these reasons, the 1947 census employment figures for the United States as a whole and for most of the States are somewhat lower than those published by other agencies. Census figures, however, are some-

what higher in a comparison of census and other figures for a number of States—usually the smaller States—and in many local areas. A comparison of census and other figures for a number of cities and counties indicates a tendency for census figures to be lower in central cities and higher in surrounding areas.

8. Completeness of Coverage

Coverage of the 1947 Census was checked by a carefully conducted sample survey, which provided direct measures of the completeness of the census. Estimates developed in this study, which covered all establishments within the scope of the census except sawmills, indicate that 98.2 per cent of the manufacturing employment and 98.7 percent of total wages and salaries are included in the census tables. These figures apply to the totals for manufacturing in the United States and not necessarily to the data in individual industry, area, size or other detailed tables. In particular, the undercoverage is most pronounced among small establishments and "marginal" manufacturing industries, where the appropriate classification of individual establishments as manufacturing or nonmanufacturing is frequently difficult. Also, establishments operating during only part of the census year, and establishments not under corporate control, had heavy weight in the undercoverage totals, relative to the totals for all manufacturing.

The omitted establishments averaged approximately 12 employees each, compared with the census average of 60 employees. Very few large and individually important establishments were omitted and more than 98 percent of the establishments with 50 or more employees were covered. Thus, the approximately 10 percent undercoverage of establishments consisted mostly of very small establishments and had an exceedingly small impact on the employment, pay roll, value added by manufacture, and other primary manufacturing measures. The census figures on number of manufacturing establishments unquestionably are among the least important manufacturing statistics. In addition to their coverage qualifications, they tend to be inaccurate because of problems of definition particularly for small establishments.

Marginal industries account for only 15 percent of all manufacturing employment, but for 35 percent of the omitted employment. Approximately one-sixth of the employment undercoverage was contributed by establishments that operated during only part of the census year. Exactly comparable data are not available for the part-year operations covered in the census, but the proportion is much lower. Corporations account for 90 percent of the census employment, but for only 60 percent of the omitted employment. Nearly half of the undercoverage was

among establishments which were not included in the census mailing list. The remaining undercoverage was accounted for by manufacturing establishments which were mailed census schedules but which were not included in the census tabulations. These included establishments from whom reports were not obtained, reports incorrectly classified as nonmanufacturing, etc.

The check from which these results were derived included all recognizable commercial establishments in 10,000 small sample areas. These sample areas were city and town blocks and well defined rural segments which could be canvassed thoroughly without difficulty.

Sanborn Maps, which show and describe individual structures, were used extensively in sampling. For places of approximately 25,000 population or more, listings of three classes of blocks were available. Based on the structural descriptions on the maps. These were: 1. Factory blocks—blocks containing manufacturing establishments. 2. Commercial blocks—non-factory blocks containing commercial structures. 3. Residential blocks—blocks containing no commercial structures. In addition, listings were compiled of the factory blocks in smaller towns for which Sanborn Maps also were available.

Factory blocks in all large places within 50 miles of a Census Bureau District Office were sampled by selecting every 20th such block. Factory blocks in the more distant large places were sampled by selecting every other such place (63 in all) and every 10th factory block within the selected places. About 4,100 factory blocks were included by this procedure.

Similar procedures were used to sample the factory blocks in the smaller towns and the commercial and residential blocks in the large places, but the sampling was confined to the 68 primary sampling units previously chosen for the Bureau's Current Population Survey. Approximately 900 town factory blocks (2 percent), 1,300 commercial blocks (0.5 percent) and 900 residential blocks (0.25 percent) were included. All other territory, including non-factory town blocks and areas not covered by Sanborn Maps, was represented by a sample of 3,000 rural and miscellaneous areal segments in the 68 primary sampling units.

The names and addresses of the establishments on the census mailing list which were located in sample blocks were listed in advance of the actual field canvass. In enumerating their assigned blocks, the enumerators were required to list all other commercial establishments they found, to describe and classify the activity of each, and to interview representatives of all manufacturing, all repair, all wholesale, all warehouse and all "doubtful" establishments which had not been prelisted. (In rural sample segments, advance listing of the census mailing list

establishments was not practicable, and all commercial establishments were both listed and interviewed.) The basic question asked was, "Is anything made, processed, fabricated, or assembled at this location?" When affirmative answers were received, further questions were asked regarding employment, relative receipts from nonmanufacturing activities, other business names and addresses used and, if operations were started after 1947, the name and activity of the predecessor. Because establishment classification is difficult, all the listings were reviewed. Where there was any suspicion that a non-prelisted establishment might be engaged in manufacturing whether or not there had been an interview or regardless of the answers obtained, supplementary inquiries were made in order to obtain adequate classifying information.

Often when these establishments proved to be engaged in manufacturing, they also were found to have been included in the census mailing list. Such cases included errors in prelisting, establishments that had moved, establishments that had been enumerated under their trade names but that appeared on the mailing list under the owners' names, etc. Exact agreement of identifying information was required for all cases accepted as covered by the census mailing list. Complete 1947 Census of Manufactures reports were obtained for the establishments ultimately classified as manufacturers omitted from the census mailing list.

In order to measure undercoverage or "losses" that occurred in the collection and processing phases of the census, all the establishments on the census mailing list for the sample areas were checked against the list of establishments included in the census tabulations.

Ordinarily, considerable information was available for the establishments that did not appear in the census tabulations. Where this information conclusively showed that the establishment was out of scope, no further action was taken. Where the evidence was not absolute, additional facts were sought. For example, where respondents had clearly described their activities, and these were primarily nonmanufacturing, the case was considered satisfied. Statements that establishments were not manufacturers, unsupported by descriptions of their actual activities, however, were not accepted. Unacceptable also were explanations that the establishment had gone out of business unless a date prior to 1947 was indicated.

Census pre-canvass cards, Bureau of Old Age and Survivors records, and direct inquiries to respondents were utilized in an effort to confirm the doubtful classifications. This proved highly successful. Only 2 percent of the estimated employment undercoverage is accounted for by sample establishments

classified on the basis of scanty information. About the same employment is accounted for by similar sample cases which were considered probably out of scope, and which were not included in the estimates of undercoverage.

"Out of business" problem cases were resolved by reference to BOASI records. All such manufacturing establishments which had reported employment to that agency during any quarter of 1947 were considered "losses" from the mailing list, and included in the undercoverage estimates.

It was not feasible to obtain complete census reports from the mailing list establishments "lost" in the course of the census. Many of them were in the out of business group. Because the necessary 1947 employment and wage figures could be obtained from BOASI records, satisfactory estimates of coverage could be developed for those two measures.

The sample data were inflated to estimated totals by multiplying the individual establishment figures by the reciprocals of their sampling rates (that is, the sampling rate for the block or segment in which the establishment was located). The percentage of coverage was then calculated by computing the ratio of the census totals (excluding sawmill data) to the sum of the census figures and the estimated undercoverage.

The estimates of coverage given there are subject to the sampling errors specified in the footnote to the following table. The reliability of these estimates, as in all statistical surveys, is also affected by reporting errors and errors in the application of procedures. Because of the small scale on which the survey was conducted, greater care and closer supervision could be exercised than is possible in a larger survey such as the census. It is believed, therefore, that these errors were kept to a minimum.

Estimated Undercoverage of Employment and Pay Rolls in the 1947 Census of Manufactures, Excluding Sawmills

ITEM	Number of employees (thousands)			Salaries and wages (million of dollars)		
	All industries	Clear-cut industries	Marginal industries ¹	All industries	Clear-cut industries	Marginal industries ¹
Estimated total.....	14,159	12,007	2,092	\$39,459	\$33,875	\$5,585
Included in census.....	13,911	11,906	2,005	38,936	33,518	5,417
Undercoverage.....	*247	*161	**86	*524	*356	*168
By length of operation:						
Full year.....	*205	*131	**75	*454	*306	*148
Part year.....	**42	**30	**11	**70	**50	**20
By type of undercoverage:						
Omissions.....	**107	**02	**45	*221	*130	**01
Losses.....	*140	*09	**41	*303	*226	*77

NOTE: The estimates of undercoverage are subject to the following significant sampling errors. The chances are 95 out of 100 that the one-starred estimates will not vary from the true figure by more than 10 to 14 percent, the two-starred estimates by more than 15 to 24 percent, and the three-starred estimates by more than 25 to 40 percent.

¹ Marginal industries are those which include many establishments engaged both in manufacturing and nonmanufacturing activity. A detailed analysis of the operations of each such establishment is necessary to determine whether it is engaged primarily in manufacturing or primarily in construction, retail trade, or some other nonmanufacturing activity.

9. Change in Scope Between 1939 and 1947

In 1939 and earlier biennial censuses, establishments having less than \$5,000 value of products were designated as out of the scope of the Census of Manufactures. In the 1947 census, a different procedure was followed. No value size limit was used but, instead, no attempt was made to canvass establishments known to have had no employees during 1947, and all reports received from such establishments were discarded before tabulation. The basic reason for this decision was that in the mail canvass of 1947, the main reliance for coverage of small establishments was on the files maintained by the Bureau of Old-Age and Survivors Insurance of the Social Security Administration, which do not include establishments having no employees.

This change in procedure has not, however, appreciably affected the comparability of the figures for 1947 with those for earlier years except for the figures on number of establishments. In 1939, establishments with no employees amounted to fewer than 5,000 and accounted for about \$125 million out of a total of \$25 billion value added by manufacture. However, a substantial portion of this value added was accounted for by a small number of jobbers of the type also included in 1947. On the other hand, a partial study of the 1947 returns indicates that some 10,000 establishments with products valued at less than \$5,000 and accounting for about \$15 million value added were tabulated in that year. Moreover, the price level of manufactured goods approximately doubled between 1939 and 1947, and therefore a minimum size limit of \$10,000 for 1947 would correspond in terms of manufacturing activities to the \$5,000 size limit used in 1939. In 1947, there were tabulated some 23,000 establishments shipping products valued at less than \$10,000 and accounting in total for less than \$75 million value added by manufacture. Accordingly, it will be seen that, on balance, about 18,000 of the 67,000 increase in the number of establishments between 1939 and 1947 is accounted for by the exclusion of no-employee establishments and the inclusion of other establishments whose scale of activities was so limited as to have been eliminated from the 1939 census, but that other census figures are not thereby appreciably affected.

Establishments primarily engaged in the following activities were included in manufacturing industries in 1947 but were considered as nonmanufacturing in 1939:

Coffee and spice, roasting and grinding

Tobacco stemming and redrying

The 1947 tabulations included 400 coffee roasters (included in industry 2099, Miscellaneous Food Preparations, who employed 20,000 persons and accounted for

\$75 million of value added; and 163 tobacco stemmers and redryers, who employed nearly 26,000 persons and contributed \$72 million to the value added by manufacturing.

The 1947 census excluded the following types of establishments which were included in the 1939 census:

- Dried fruit packers
- Retail establishments manufacturing ice cream
- Independent retail bakeries, selling through a single retail outlet and not operating any house-to-house routes
- Logging camps and logging camp operations
- Contractors and building materials dealers primarily engaged in mixing and delivering ready-mixed concrete
- Quarrying departments of establishments both quarrying limestone and producing hydraulic cement and lime. The hydraulic cement and lime plants of the combined operations were retained in manufacturing
- Quarries also engaged in producing cut-stone and stone products
- Machine shops engaged exclusively or almost exclusively in repair work

Except for logging camps and logging camp contractors, the types of establishments listed above were classified as nonmanufacturing in 1947 in accordance with standard classification procedure. In all, some 10,400 establishments (including 7,700 retail bakeries), employing 78,400 wage earners and contributing \$96 million to value added by manufacture in that year, were excluded from the retabulation of the 1939 returns incorporated in the 1947 census volumes. In 1947, sawmills producing less than 200 M ft. b.m., in that year were excluded from the census but this cut-off is believed to be the approximate equivalent of the \$5,000 cut-off in that industry in 1939.

10. Definition of Industries

An industry consists of a group of establishments primarily engaged in the same line or similar lines of economic activity. In the manufacturing field, the line of activity is generally defined in terms of the products made or the processes of manufacture used. On this basis, there may theoretically be thousands of manufacturing industries corresponding to the different types of products and the processes used in their manufacture. However, industries established in this manner would be too numerous to deal with and, further, would not generally satisfy the criteria considered essential in the creation of a good system of industry classification.

Except for certain relatively minor modifications, the 453 manufacturing industry classifications used in this census were derived from the 1945 Standard Industrial Classification Manual issued by the Bureau of the Budget. The following general principles were

followed in the preparation of this system of industry classification:

- (1) The classification should conform to the existing structure of American industry;
- (2) The reporting units to be classified are establishments (for definition of establishment, cf. Section 5 above), rather than legal entities or companies; each establishment is to be classified according to its major activity;
- (3) To be recognized as an industry, each group of establishments must have significance from the standpoint of the number of establishments, volume of business, employment and pay rolls, and other important economic features.

In addition to the above principles, it is important that an industry comprise a group of establishments: (a) whose output consists, to a relatively large extent, of the products defining the industry; and (b) whose output of the products defining the industry accounts for a relatively high proportion of the total output of those products by establishments in all industries. Finally, (c) the output of the bulk of the establishments should be distributed among the various products or groups of products defining the industry; if any considerable number of establishments concentrated on the production of a single product within the group of products defining the industry, such concentration would constitute the basis for a further subdivision of the industry.

11. Classification of Establishments Into Industries

An establishment is assigned to, or classified in, an industry, generally on the basis of the principal products made. The products made by each establishment are grouped according to the industries to which they "belong" (see Appendix C, Industry Descriptions) and the group of products accounting for the principal portion of the total value of shipments of the establishment determines its industry classification. This group of products is said to be the primary products of the establishment as well as of the industry which it defines; all other products made by establishments classified in the industry are referred to as secondary products.

In some instances, a knowledge of the types and value of products shipped is not sufficient for determining the proper industry classification of an establishment. It may also be necessary to know the process used in the manufacture of the products, or the materials used, or other characteristics of the operations of the establishment. For example, an establishment primarily engaged in producing insulated copper wire is classified in Industry 3392, Wire Drawing, if it purchases copper rods, draws the rods into wire, and insulates the wire, but in Industry 3631, Insulated Wire and Cable, if it purchases copper wire and insulates it.

While some establishments produce only the primary products of the industry in which they are classified, this is rarely true of all the establishments in an industry. The general statistics (employment, pay rolls, value added by manufacture, etc.) shown for an industry, therefore, reflect not only the primary activities of the establishments in that industry, but also their activities in the manufacture of secondary products and, for that matter, their auxiliary non-manufacturing activities. For this reason the industry statistics shown throughout the census volumes and, in particular, in tables 1 through 4 of each industry report in the Industry Volume, usually cannot be directly related to the product statistics (table 6 in each industry report) showing shipments by all industries of the primary products of that industry. The extent to which industry and product statistics can be matched with each other is indicated in a transition table (table 5) which shows on the one hand the proportions by value of the primary and secondary products shipped by the industry and on the other, the value of the primary products of the industry made as secondary products in other industries.

In a classification system dividing the manufacturing field into some 450 separate industries to which establishments are assigned on the basis of their principal activity, a certain amount of overlapping production by one industry of products of other industries, is bound to arise. Such overlapping is particularly prevalent in such industry groups as apparel, furniture, and metal fabricating, where establishments within each group, employing the same basic types of machinery and fabricating operations, produce a wide variety of products belonging to a number of different industries. For 1947, the average amount of overlapping for all industries was approximately 10 percent in both directions, compared with from 15 to 20 percent for the furniture and metal fabricating (except transportation equipment) groups of industries. The greater the degree of overlapping, the less meaningful are the relationships between general and product statistics for the particular industry. Measures of overlapping production for each of the 1947 industries are shown in Appendix C, Industry Descriptions; these measures are derived from table 5 of the Industry reports. In a number of instances, the Standard Industrial Classification was modified for use in this census to minimize the extent of overlapping for certain industries. (See 1947 Census Deviations from Standard Industrial Classification, Appendix E.) As indicated in Section 5, Definition of Establishment, the census attempts for some industries to secure separate reports for large plants engaged in more than one line of activity in order to

compile "cleaner" industry statistics by reducing the extent of overlapping production in each of the industries affected.

As the number of separate industry classifications for manufacturing has increased over the years there has been a greater likelihood of year-to-year shifts of the industry to which a particular establishment is assigned on the basis of the principal products made. An establishment whose value of output consists of 55 percent creamery butter and 45 percent natural cheese in one year is classified in the creamery butter industry for that year; if, in another year, the proportions are reversed (45 percent creamery butter and 55 percent natural cheese), it appropriately belongs in the natural cheese industry. Such shifts, when affecting a number of large establishments, may be reflected in an apparent abnormal increase or decline in activity for the industries affected, whereas, in fact there may have been little change.

Census experience in applying the industrial classification system to establishment reports indicate that on the whole the system does conform to the structure of industry. However, a number of industries were found to be of relatively little economic significance. Some of them, such as Industry 2014, Sausage Casings; 2296, Linen Goods; 2864, Natural Dyeing Materials; and 3335, Primary Refining of Magnesium, were merged with other industries. (For a complete list, see Comparison of 1947 Census with Standard Industrial Classification, Appendix E.) No attempt was made to make similar combinations for a number of other relatively unimportant industries.

There were also difficulties encountered in the assignment of industry classifications to certain types of establishments. In some of the borderline areas between manufacturing and other major divisions of the classification system, it is not possible to attain the same degree of precision in assignment of establishments to industry classifications, nor as complete industry coverage as in other areas of the manufacturing division. This is particularly true for manufacturing industries, products of which are also made to a significant extent by establishments engaged primarily in nonmanufacturing activities. Since no reports were obtained from such primarily non-manufacturing establishments which fall outside the scope of the Census of Manufactures, national totals for the output of these products as published in the table 6's will be understated to the extent of their production. Where this type of understatement is important, e.g., venetian blinds, awnings, millwork, dried fruit, and prepared feeds, it is pointed out in the textual material preceding the tables for each of the industries affected.

12. Groups of Industries

The Standard Industrial Classification system used in this census groups the 450-odd individual manufacturing industries mentioned above into 141 subgroups comprising one individual industry or a small number of closely related individual industries and further into 20 major industry groups comprising several industry subgroups. Each individual industry is designated by a 4-digit code, each industry subgroup by a 3-digit code identical with the first three digits of its component industries, and each major industry group by a 2-digit code identical with the first two digits of its component industry subgroups. For brevity, individual industries are sometimes referred to as 4-digit industries, subgroups as 3-digit industries, and major industry groups as 2-digit industries.

In all the summary industry tables as well as in the State or area tables by industry, subtotals for industry subgroups and major groups are shown where possible, and codes for each industry level are shown at the left of the industry name. Where a 3-digit industry subgroup comprises only one 4-digit industry, only the 4-digit industry name and code are shown. In order to save space in these tables, shorter titles have been substituted for many of the titles shown in the Standard Industrial Classification.

As indicated in Section 14 below, a more prominent place has been given to groups of industries in this as compared with earlier censuses. The principal reasons for this change in emphasis are threefold: (1) Most important for census purposes, States, or local areas can frequently be compared at broader industry levels, where no comparative data can be published at the 4-digit level; (2) the census data are frequently used as "bench-marks" for other series on manufacturing for which the coverage is not adequate or the production data not sufficiently complete to justify publication of the statistics on a 4-digit basis; and (3) the limitations attaching to year-to-year comparisons of 4-digit statistics (cf. Section 10 above) do not apply in equal degree to 3- and 2-digit statistics. A minor shift in the character of an establishment's production may change its 4-digit industry classification, where its 3-digit classification is frequently, and its 2-digit classification nearly always, unaffected.

13. Statistics for 1939 and Earlier Years

The changes in the scope of the census between 1939 and 1947 have already been discussed in Section 8 above. No attempt was made to eliminate from the 1939 tabulations data for establishments reporting no employees in that year, but, as indicated, this adjustment would have been small and is partly offset by

the inclusion in the 1947 census of data for establishments whose scale of activity was so small as to have been eliminated by the \$5,000 value of products limitation in 1939 and earlier years. It was, of course, impossible to include in the 1939 tables any figures for the two industries (coffee and spice roasting and grinding and tobacco stemming and redrying) covered in 1947 but not in 1939. On the other hand, the statistics for industries covered in 1939 but not in 1947 have been eliminated from the 1939 tables. In some instances the 1939 returns did not supply sufficient information to permit a completely satisfactory distinction between "manufacturing" and "non-manufacturing" activities as defined in 1947; the lack of comparability between 1947 and 1939 statistics arising from this difficulty would be small on an over-all basis, though in small counties or industry-State combinations there might well be some distortion of the 1939-1947 relationship introduced by differences in the classification of identical establishments in the two years.

Within the manufacturing area proper, there were significant changes in industry definitions and in the criteria used for classifying establishments into individual industries. These changes are described in full in Appendix D. As in former years, the most basic general statistics (number of establishments, production workers and their wages, cost of materials, value of products, and value added by manufacture) were retabulated for all industries affected by changes in definition. Other data such as the number and salaries and wages of all employees, inventories, capital expenditures, etc., were not retabulated for 1939. Total employment and salaries and wages are shown for all industries not affected by changes in definition and estimated figures are shown for States and metropolitan areas; for all other comparable 1939 general statistics, the reader is referred to the 1939 census volumes.

Whenever possible, these basic general statistics, in addition to those for total employment and pay rolls, have been shown for census years back to 1899. In general, the series for each industry was carried back as long as comparability was not affected by more than 10 percent as a result of the change in definition. Comparability was measured in terms of the difference between the original and retabulated value added by manufacture figures for the year in question. If the difference was less than 10 percent, the earlier years were considered comparable with the later years and were shown in the series; if the difference exceeded 10 percent, the earlier years were considered noncomparable and the series was discontinued at the point of change. It was not possible to apply this 10 percent rule to industries for which

the schedules were not retabulated following changes in definition, and in such cases the determination of comparability was usually based on the relative importance of the products involved in the change for the year in question. Figures for years earlier than 1939 were taken from the published volumes. In general, significant differences resulting from changes in definition have been explained in headnotes or footnotes; minor changes are merely indicated by the footnote "Revised." In a few instances, figures for some years have been eliminated to save space.

In a number of instances, comparable 1939 industry data are not available because of differences in census procedure in the two years, e.g., in 1947 separate reports were required of all manufacturers producing paper and board and further converting them into paper and board products in an integrated operation. In 1939, many such manufacturers filed consolidated reports and the integrated operation was classified in the Paper and Board Industry. It was not, however, feasible to retabulate the 1939 reports. Consequently, relative to 1947, the 1939 employment and other industry figures are overstated for the Paper and Board Industry and understated for some of the converting industries. The general statistics for the major industry (2-digit) group, Paper and Paper Products, are, however, comparable for the two years. All such instances are noted in the text for the industries affected.

Two instances of changes in census procedure should be noted particularly since they affect the industry figures for nearly all States. In the bakery industries, 1939 production-worker employment, the only 1939 figure shown by State and by industry, is high relative to 1947 because in the earlier year driver-salesmen were classified as production workers whereas in 1947 they have been included with salaried employees. The effect of this change may be indicated by noting that for the country as a whole production-worker employment "declined" from 180,000 to 150,000 between 1939 and 1947, whereas total employment rose from 217,000 to 233,000. Value added by manufacture was not, of course, affected by this change in the method of reporting. In the dairy products industries the increase in both value added and employment from 1939 to 1947 is somewhat understated because in 1939 separate reports were obtained from the manufacturing departments of plants distributing fluid milk whereas in 1947 the whole plant was treated as "nonmanufacturing" in accordance with standard classification procedures, and excluded from the tables presented in the State and General Summary Volumes. In consequence, the 1939 figures may be too high by 25 percent as compared with 1947. For the Food and Kindred Products Industry Group as a whole the effect of these

two factors is to overstate the 1939 production-worker employment by 7 to 8 percent relative to 1947.

It was not feasible to retabulate 1939 data for the State Volume even in the detail employed for industries. On an individual industry basis, it was feasible to retabulate only production-worker employment and that only for the State (table 4); consequently, no 1939 industry comparisons are available for metropolitan areas or principal industrial counties. Value added by manufacture was also retabulated for the State by major industry group (table 3) and for each of its subdivisions on an over-all basis. For the State and its standard metropolitan areas (table 1), wages of production workers were retabulated and the number and salaries and wages of all employees were estimated for 1939 on the basis of their relationship to production workers and wages in that year.

14. The Census Report Form

Although only one form was required from each establishment, the diversity of manufacturing activities made it necessary to use more than 200 different report forms to canvass the various industries included in the 1947 census. For convenience, however, these may be classified into four types:

(a) Most of the 200 forms represented variations of the "standard" form. This form called for detailed general statistics, and in addition contained inquiries adapted to the requirements for information on production of commodities, materials consumption, and equipment in use for one or several manufacturing industries (cf. Appendix B).

The production and materials section of each form was the result of intensive study of the 1939 census reports and extensive consultation with other Federal agencies, manufacturers, and trade associations in an effort to provide the most useful information consistent with the ability of manufacturers to report the desired data.

Nearly two-thirds of all manufacturers reporting in the census used one variety or other of the standard form. One variety of the standard form was the "general" schedule which was used in a number of industries producing commodities which could not be specified in significant detail.

(b) A "short" form, designed to cover very small plants outside the lumber industry was originally mailed to 15,000 establishments which reported in the prec canvass that they employed only one person during 1947 or went out of business in that year, but was finally used for approximately 40,000 establishments accounting for 200,000 employees or 1.4 percent of total employment in manufacturing. This form (cf. Appendix B) contained a product section similar to that on the "general" schedule but requested in addition only the following general information: Total employment as of four months of the year, salaries and wages, and total cost of materials. In order to simplify the presentation of the main census tables, production workers and wages were estimated by assuming that there were no salaried employees in establishments with fewer than ten employees, and by applying ratios derived from the 1939 census in the few cases in which employment was ten or more. Man-hours were derived by assuming a 2,000-hour year for production workers so estimated.

(c) A short form was specifically designed for sawmills producing between 200 M ft. b.m. and 1,000 M ft. b.m. of lumber during 1947. The form contained a product inquiry somewhat less detailed than that used by larger mills, and a materials consumed inquiry identical with that on the standard lumber form, but the general information requested was the same as that requested on the short form, except that total employment was requested for each month of the year. This form was used by 10,000 sawmills accounting for 75,000 employees. All employees reported on this form were assumed to be production workers and man-hours were again assumed to average 2,000 per employee-year.

(d) A short form was also designed for the use of smaller establishments in all printing and publishing industries, except book and magazine publishing. This form was used by some 15,000 establishments with 75,000 employees, most of which had reported in the precavass that they employed more than one but less than ten employees in 1947. (Establishments employing one person in the printing and publishing industries received the regular short form.) The product section of this form was again less detailed than the standard form for these industries, and the general information requested was the same as that contained in the regular short form. Since, however, employment is generally stable in these industries employment data were estimated and tabulated for the eight months not reported on the form. The ratio of production workers to total employees obtaining for the smaller establishments in each of these industries in 1939 was used to derive the number of production workers, their wages and hours of work.

The practical importance of the use of these short forms is as follows: The statistics on number of establishments, average employment, and pay rolls, cost of materials, value of shipments, and value added by manufacture, where shown, represent all establishments covered in the census; the monthly employment statistics represent all establishments reporting on the standard forms and the short sawmill and printing forms; all other general statistics cover only establishments reporting on the standard forms. Where figures for which coverage is not complete are shown, the tables either include an appropriate measure of coverage or a cross-reference to another table which does include such a measure.

The principal exception to this last statement is that for expenditures for plant and equipment. Since this item was tabulated by State and by industry it was not considered feasible to include a coverage measure in every instance in which this figure is shown. In using the expenditures figures it should, therefore, be noted that establishments reporting on this item accounted for 97.5 percent of the employment in all census establishments, and that for the United States as a whole the percent coverage is better than 95 percent for all major industry groups, except Lumber, and Printing and Publishing, and on an individual industry basis is less than 90 percent only for: Sawmills (81 percent), Commercial Printing (85 percent), Machine Shops (84 percent) and for 22 smaller industries whose aggregate employment was less than 200,000 in 1947.

Product cards were not punched for establishments reporting on the short form, and in consequence all product detail was lost in tabulation. This accounts for a substantial portion of the "products not specified by kind" in certain industries (table 6 of the Industry Volume).

Although short forms were received from establishments in nearly all industries, it was considered desirable for purposes of tabulation and presentation, to eliminate them in those industries containing only a handful of such forms. In all such instances a standard report was built up from the basic information reported on the short form. This accounts for the fact that only about 150 industries are shown as including short form reports. The percentage of estimate involved in this procedure was usually a fraction of 1 percent.

15. Disclosure of Data for Individual Companies

The Bureau of the Census is prohibited by law from publishing any statistics that disclose information reported by individual companies. In this as in all recent censuses the practice has been as follows:

(a) It is not a disclosure to show the number of establishments, even down to one, as to locality, industry classification, or approximate size;

(b) Employment figures may be shown for any industry or locality represented by three or more companies;

(c) Value figures may be shown for any industry, locality or product represented by three or more companies; provided also that one or two companies do not produce a very large proportion of the combined output of these companies;

(d) Care is taken to provide against the probability of disclosure by subtraction. If, for example, the subtraction of the statistics for a city from that for a county in which it is located would isolate a group of establishments not meeting the tests indicated in (b) and (c), the data for the city are withheld.

An important change was, however, made in the handling of data which could not be shown in full detail in this census as compared with earlier censuses. Previously, preference was given to State-by-industry figures. Consequently, regional figures for an industry were available only if all States within a region were shown separately, or if the sum of the States which could not be shown separately did not constitute a disclosure. Conversely, industry group data were available for a State only if all industries within the group were shown separately or if the sum of the industries which could not be shown did not constitute a disclosure.

In the 1947 census, preference has been given to regions and the nine Census divisions over individual States in table 2 of each Industry report and to industry groups over individual industries in table 4 of each State report. This change in procedure was

made because (1) it was considered preferable to show regional data for an industry even at the cost of withholding data for another, usually the least important, State in a region, rather than to show all publishable data for the individual States and group the disclosure States throughout the United States in an "all other" category; and (2) by giving preference to industry group statistics over individual industries within each State, the extent to which individual States can be compared on an industry classification basis is greatly increased. For example, it is frequently possible to compare data for two States at the 3-digit industry group level when no comparative data can be published for any 4-digit industry component of this group.

Table 2 of each Industry report shows summary general statistics for each geographic Census division and State for which this information could be shown. For industries with few establishments or considerable geographic concentration it has frequently been necessary to use geographic regions broader than the traditional nine Census divisions, in order to show all plants by some geographic location. For this purpose the following combinations of Census divisions have been used in the Industry reports:

Northeast	South
New England	South Atlantic
Middle Atlantic	East South Central
North Central	West South Central
East North Central	West
West North Central	Mountain
	Pacific

For each producing State not shown separately in table 2 of the Industry reports, a footnote indicates the number of establishments and, ordinarily, in parentheses, the number of employees for States represented by three or more companies. In some instances, however, the number of employees also had to be withheld in order to avoid disclosing (by subtraction) the number of employees in other States represented by only one or two companies.

Table 4 of each State report shows the industry data for the State. As indicated above, in constructing this table preference was given primarily to the Major Industry (2-digit) Group, for example, Food and Kindred Products; secondarily, to the 3-digit industry group, Dairy Products; and lastly, to the individual (4-digit) industry, Creamery Butter. Where information cannot be shown for a 4-digit industry, it is also withheld for another industry, usually the least important, in the same 3-digit group, in order to avoid disclosure by subtraction. Similarly, information for a 3-digit group will often be withheld to permit the publication of data for the 2-digit major

group in the same State. When 3-digit information is withheld for this reason, it will sometimes happen that information for one or more 4-digit industries within that 3-digit group can be shown without prejudice to the 2-digit major group. This will explain many cases in which a 4-digit industry is shown and the corresponding 3-digit industry suppressed in many tables. In other instances, data for a 4-digit industry only are shown because this was the only 4-digit industry for which reports were received within the 3-digit group.

Table 6 of Chapter I of each census volume shows the number of production workers and value added by manufacture for industries and industry groups and major groups by geographic division and region.

It is obvious that table 2 of the Industry reports and table 4 of the State reports could not be prepared independently. For example, figures for a 4-digit industry are frequently eliminated from table 4 of the State report, not to protect the 3-digit information for the State but to protect the 4-digit information for the region (table 2 of the Industry reports). Similarly, 2- and 3-digit information for the State is sometimes withheld to protect 2- or 3-digit figures for the division in table 6, Chapter I of each volume.

In addition to the preference of regions over States, the following priorities were assigned to the lesser geographic areas: States were given preference over standard metropolitan areas (table 5 in the State reports), standard metropolitan areas over principal industrial counties (table 6 in the State reports), principal industrial counties over other counties (table 2 in the State reports), and counties over urban places (table 2 in the State reports).

Information has also been withheld in all the tables mentioned in this section for those 4-digit industries and 3-digit groups in which less than 100 manufacturing employees were reported. The reasons for this are threefold: Earlier census experience shows that as often as not information cannot be shown for smaller "publication cells" without disclosing the operations of individual establishments and some time and money were saved by limiting the "disclosure analysis" required for such cells. Secondly, it was considered desirable to omit lines of relatively little significance in order to make the State tables easier to use. Finally, a not-inconsiderable number of small establishments were inadvertently omitted from the 1947 census (sec. 4) and, it was not possible to review the reports of smaller establishments with the care given to the larger plants; on an industry or State basis, the effect of these considerations is negligible, but the data for any particular "cell" consisting of a small number of small plants are subject to some qualification.

The effect of the change in the Bureau's handling of the "disclosure" problem is illustrated by the following table:

ITEM	Publishable under 1939 "disclosure" rules		Actually published under 1947 "disclosure" rules	
	Number of lines	Percent of value added by manufacture	Number of lines	Percent of value added by manufacture
California:				
2-digit groups.....	9	33	17	97
3-digit subgroups.....	91	70	99	90
4-digit industries.....	327	97	201	79
Louisiana:				
2-digit groups.....	9	73	17	100
3-digit subgroups.....	40	71	43	92
4-digit industries.....	82	94	43	62
Maryland:				
2-digit groups.....	15	90	20	100
3-digit subgroups.....	51	36	66	55
4-digit industries.....	131	45	77	38

If, as in earlier years, preference had been given to States and individual industries, statistics could have been shown for 327 California industries accounting for 97 percent of the value added by manufacture for the State; whereas, statistics have actually been shown for 201 industries accounting for 79 percent of the State's value added. On the other hand, 3-digit information has been published for 90 percent as against 70 percent and 2-digit information for 97 percent as against 33 percent of the State's value added under the procedures followed in earlier years. At the same time, industry information has frequently been shown for the Pacific Division, where otherwise it would have been necessary to include the data for Washington or Oregon or both States and in some cases the data for one or more of the Mountain States in an "All other States" total. In the case of California, the most important industrial State in a division consisting of only three States, most of the "suppressions" have been made in order to protect the divisional or regional data for individual industries, rather than to protect the industry group data for the State. Since Maryland is included in a division consisting of nine States, most of the "suppressions" in this State have been made to protect the industry group data for the State itself. In these three States the number of lines omitted because they covered fewer than 100 employees ranged from 16 to 23, but in no case was the value added by manufacture for all omitted lines as much as one-half of one percent of the State total.

Under the 1947 disclosure procedures, comparative industry group data for these three States are available except for three industry groups accounting for less than 3 percent of California's value added, whereas under the procedures used in earlier years, comparative data at any industry level would have been available in less than half the cases in terms of value added.

16. Standard Metropolitan Areas

In addition to the legally constituted units—States, counties, cities—Census of Manufactures statistics have been tabulated for those standard metropolitan areas having 40,000 or more manufacturing employees in 1947. The standard metropolitan areas replace the industrial areas shown in earlier censuses. Industrial areas, as defined in previous years, were groups of contiguous counties having large numbers of manufacturing wage earners. The standard metropolitan areas, on the other hand, are integrated economic and social entities which contain not only highly industrialized counties but also adjoining counties which, though primarily residential in character, contribute significantly to the industrial counties' labor force.

The areas used in this census represent a part of a larger list of standard metropolitan areas defined by the Census Bureau for use in the Censuses of Manufactures, Business, and Population and are recommended by an Inter-Agency Committee on Standard Metropolitan Areas of the Budget Bureau for use throughout the Federal Government. The general concept applied was that an area should be an integrated economic and social entity, with an attendant large volume of daily travel and communication between the central city and the outlying parts of the area. (This usually resulted in a standard metropolitan area considerably more restricted than the market or trading area.) The following principles were used in applying this general concept to the definition of individual areas:

(a) Each standard metropolitan area must include at least one city of 50,000 or more; the area as a whole must have a total population of at least 100,000. Areas may cross State lines.

(b) Where two cities of 50,000 or over are within 20 miles of each other, they will ordinarily be included in the same area.

(c) Each county included in a standard metropolitan area must have either 10,000 nonagricultural workers or 10 percent of the nonagricultural workers in the area, or more than one-half of the county's population must have been included in the "metropolitan district" as defined by the Bureau of the Census. In addition, nonagricultural workers must constitute at least two-thirds of the total employed labor force of the county.

(d) Each peripheral county included in a standard metropolitan area must be economically and socially integrated with the central counties of the area. A peripheral county has been regarded as integrated (1) if 15 percent of the workers living in the county work in the central county of the area, or (2) if 25 percent of those working in the county live in the central county of the area, or (3) if telephone calls from the county to the central county of the area average 4 or more toll calls per subscriber per month.

In New England, where areas have been defined on a town rather than on a county basis, the same principles were applied insofar as they were applicable. Item (c) was not applicable to towns. As a substitute, a population density criterion of 150 persons

per square mile or, where strong integration was indicated, 100 persons per square mile, was adopted in considering towns for inclusion in an area.

These criteria were selected largely because investigation indicated that they were the only measure of integration on which usable data might be obtained for a substantial proportion of the problem areas under consideration. Preliminary field investigation indicated that comparative statistics measuring the proportion of dollars spent at retail in the central city by inhabitants of the peripheral counties or the proportion of bank deposits held in the central city by individuals and businesses in the peripheral county, were impossible to obtain. Where satisfactory data on even the measures listed in paragraph (d) above were lacking, considerable reliance was necessarily placed on informed local opinion.

The requirement that each area consist of county units sometimes results in the inclusion in a standard metropolitan area of a considerable amount of territory which would not ordinarily be considered "metropolitan," much less "industrial." It is recognized that metropolitan areas could be more accurately defined in terms of minor civil divisions, but the value of areas so defined is limited by the fact that most types of economic and social data are available only on a county basis. Moreover, so far as the Census of Manufactures is concerned, the inclusion in the metropolitan area of large tracts of agricultural or forest land is of little importance, since their contribution to the industrial activity of the area is negligible. In New England, metropolitan areas consist of towns because they, rather than counties, are the basic political and statistical unit in this region of the country.

A total of 87 metropolitan areas had been officially defined by the Inter-Agency Committee at the time the Census of Manufactures was tabulated, but these included all the areas that could qualify as "industrial" in character. Of these, only 53 met the 40,000-manufacturing-employee minimum established to determine those areas for which separate tabulation, by complete industry detail, would appear in the census volumes. A list of these 53 areas, showing their constituent counties (or towns) is included as a supplement to table 3, Chapter I of each census volume.

Each standard metropolitan area is designated by the name of the principal city in the area. In addition to the name of the principal city, the area title may include a maximum of two additional names, provided that the cities each have a population of one-third or more of the principal city and a minimum population of 25,000 (based on the 1940 Census of Population). The "New York-Northeastern New Jersey"

designation is treated as the one exception to this rule. Because of the wide use given Federal area-type data, locally-popular designations such as "Twin cities," "Quad cities," etc., were not adopted.

Individual industry (4-digit) statistics have been tabulated for the 53 standard metropolitan areas having 40,000 or more manufacturing employees in 1947 (table 5 of the State reports). In addition, industry group (3-digit) statistics have also been compiled for "principal" industrial counties, defined as those counties with 20,000 or more manufacturing employees (table 6 of the State reports). In general, the disclosure rule makes it impossible to show significant industry statistics for geographic areas with fewer employees. In contrast with earlier census years, no industry statistics are presented for incorporated cities.

17. Content of the General Sections of the Census Form

On the whole, the 1947 report forms did not differ greatly from those used in 1939. Two inquiries, distribution of sales and power equipment, were dropped entirely and one, highway motor vehicles in use, was added. In general, changes in the form of particular inquiries have not been such as to invalidate comparison with other censuses. For the most part, such changes represent attempts at clarification rather than changes in objectives; consequently historical series published in this and other Census of Manufactures reports may be considered to be reasonably comparable. Where qualifications are considered necessary they have been stated either in the special text for each industry or in the footnotes to the tables.

Most of the general sections of the form were pretested in cooperation with the States of Massachusetts and Pennsylvania, the Bureau of Labor Statistics, and some 10,000 individual manufacturers on their mailing lists; in a few instances additional questions proposed by other Government agencies were dropped because the tests indicated that most manufacturers maintained no records on these matters.

18. Manufacturing Employees—Classifications Used

"All employees" comprises all full-time and part-time persons on the pay rolls of reporting establishments who worked or received compensation for any part of the 12 pay periods covered in the census year, including persons on paid sick leave, paid holidays, and paid vacation. Other persons, such as members of the armed forces and pensioners carried on the active rolls but not working during the period were excluded. This total of manufacturing employment is

divided in a threefold standard functional classification as follows:

(a) Production and Related Workers, closely comparable to "Wage earners" in the 1939 census classification, comprises working foremen and all nonsupervisory workers (including leadmen and trainees) engaged in fabricating, handling, packing, warehousing, shipping, maintenance, repair, janitorial and watchman services, product development, auxiliary production for plant's own use (e. g., power plant), record-keeping, and other services closely associated with these production operations.

(b) Force-Account Construction Workers, comparable to "Construction employees" in the 1939 census classification, includes all employees on the pay roll engaged in construction of major additions or alterations to the plant, who are utilized as a separate work force. Workers engaged in regular maintenance and repair operations are not included here but are classified as production workers.

(c) Administrative, Sales, Technical, and Office Personnel, comprises in terms of the 1939 classification (1) salaried officers of the corporation; (2) distribution employees; (3) managers, superintendents, other supervisory employees above the working foreman level, and professional and technical employees; (4) clerks, stenographers, bookkeepers, and other clerical employees; and (5) the few employees previously included under "all other." This class, like the two preceding, does not include employees at the central office or distributing branches of multiunit companies.

19. Employment for the October 15 Pay-Roll Period

Manufacturers were requested to report employment and pay rolls in some detail for the October 15 pay-roll period, in order to provide for a single pay period: (1) a breakdown of employment by sex; (2) a further breakdown of Administrative, Sales, etc., Personnel into (a) Clerical and Routine Office Workers, and (b) Executive, Sales, Professional, Technical, and Other Personnel; and (3) some measurement of the average pay of clerical and routine office workers as compared with that of production workers (cf. Appendix B, Item 8). In the course of editing the forms, however, it was discovered that a high proportion of manufacturers, including many large establishments, were reporting all their employees other than production and force-account workers in the line provided for routine office workers and that another large percentage of those establishments which did report these two types of employees separately were including the salaries of their administrative and executive personnel in the box provided only for routine office workers. Since it was impossible to incur the additional costs and the loss of time involved in corresponding with many thousands of manufacturers on this question, the employment data for the two types of employees were combined and no further attempt was made to tabulate the wage data for clerical and routine office workers for the October pay period.

20. Monthly and Average Employment

In addition to requesting detailed statistics for the October pay period, the standard forms also requested total and production-worker employment for the pay-roll period ended nearest the 15th of each month of 1947. So far as total employment is concerned, this represented a departure from previous censuses. Beginning with the Census of 1889, average employment was calculated by the Census Bureau by adding the number of nonwage earner employees reported for a "normal" pay period, usually in October, to an average wage earner figure which was derived from 12 monthly figures. The 1947 census averages for total employees are for the first time based on 12 separate monthly figures and constitute more nearly representative annual averages.

From the 12 reported monthly figures an average employment figure was calculated for both total employees and production workers, and entered in the basic machine tabulation card (Appendix B) most widely used in both industry and area tabulations and in the industry-area cross-tabulations. Total employment was also tabulated by months for the United States by 4-digit industry and for the States by 2-digit industry. No data on employment by months were tabulated for metropolitan areas or industrial counties. Information on production-worker employment by months is not shown in any of the census volumes.

21. Wages and Salaries for the Entire Year

Total wages and salaries for the year 1947 were collected for each of the three functional classes. These payments were defined as the gross earnings of employees, including commissions, dismissal pay, nonproduction bonuses, vacation and sick leave pay, and compensation in kind, and prior to such deductions as employees' Social Security contributions, withholding taxes, group insurance, union dues, and savings bonds. This definition of wages and salaries is substantially the same as in 1939 and is in conformity with that used by other Government agencies.

Production-worker wages and total salaries and wages were both included on the basic machine tabulation card. The annual wages of force-account construction workers are included in total salaries and wages, but not in production-worker wages. Construction-worker wages were punched on another card, that containing the October pay-roll data, but in view of the fact that the tabulation of the latter had been abandoned it was decided not to tabulate annual wages of construction workers. These wages are a small fraction of total salaries and wages in manufacturing, as most construction is performed on a contract basis, but there is some loss in being unable

to isolate them since they are properly a cost chargeable to capital additions rather than to current production.

22. Production Workers' Man-Hours

As defined for census purposes, a man-hour is one hour of work by one person regardless of whether on regular time or overtime. This unit-of-work measure provides the most comprehensive measure of labor input available since it takes into account both number of production workers and hours of work.

This census marks the first time production workers' man-hour statistics were collected for all industries, although similar data have been reported by some industries for each census year since 1933, beginning with 32 industries for that year and reaching 171 for 1939. The earlier statistics were collected on a monthly basis. For this census, however, man-hours were requested by quarter (either 13 weeks or 3 months) because a study of manufacturing records showed that many manufacturers could more easily report these data by quarters than by months.

Man-hours were generally well reported except in the case of very small establishments which have difficulty in distinguishing between production and other types of workers, and more generally in the apparel trades where it is customary to pay workers on a piece rather than an hourly basis. As indicated in Section 14 above, man-hours data were not requested of small establishments in the sawmill and some of the printing and publishing industries. Man-hours were estimated on the basis of reported production workers and their wages in the case of many small establishments. None of these factors, however, seriously qualify the published man-hour figures except for establishments with fewer than 10 employees.

Total man-hours for the year were punched on the basic "A" card, but the card containing quarterly man-hours was not included in the census tabulations.

23. Cost of Materials Consumed

The form called for the net costs, after discounts and allowances (paid or payable) for (a) materials, parts, containers, and supplies; (b) fuel; and (c) purchased electric energy actually consumed during the entire year. Manufacturers were asked to include costs of materials or fuels whether they were purchased by the individual establishment, transferred to it from other establishments of the same company, or withdrawn from inventory during the year; whether or not they were processed by the establishment or by others for its account. Manufacturers were asked to exclude materials sold in the same form as purchased and materials not owned by the establishment although processed by it. On the standard

form, separate entries were made for each of the items (a), (b), and (c) above, as well as for cost of contract work, and all items were added to arrive at a total cost of materials, etc., to be deducted from value of shipments or estimated value of production to obtain value added by manufacture. The cost of fuel does not cover that used as material in manufacturing processes—for example, coal in the production of coke—which is included with other materials.

While the cost of fuel and electric energy was on the whole well reported, nearly one-third of all reports as originally received at the Bureau contained no entry for cost of Materials, Parts, Containers, and Supplies. Subsequent correspondence usually yielded a prompt and satisfactory reply, and it is believed that the original failures to report this item were due in part to the fact that the form (cf. Appendix B) did not give sufficient prominence to this item rather than to any particular difficulty in reporting materials. It was, however, impractical to engage in correspondence in all cases in which this item was not reported originally, and it was, therefore, decided to estimate for many of the smaller nonreporting establishments. For most industries this could be done reasonably well, since the establishment had reported the cost of its principal materials in another section of the form.

The volume of estimating done on this inquiry is not believed to have appreciably affected the industry totals for either cost of materials or the derived figure of value added by manufacture. However, the relationship of value added to wages for the two lowest size classes (table 4 of the Industry reports and Chapter III of the Summary Volume) are somewhat suspect not only because of the relatively large degree of estimating for cost of materials in these size groups, but more important because of the proportionately large labor contribution of the proprietor or partners in establishments of this size.

24. Specific Materials Consumed

In addition to the total cost of materials which all manufacturers were required to report, figures on the quantities and, in most cases, the corresponding value of 61 specified materials, such as steel and aluminum castings, crude petroleum, and rubber by type and class were collected from establishments in every industry that consumed appreciable amounts of these materials. Since American industry consumes an enormous variety of materials, the number of materials on which information was requested had to be strictly limited. The inclusion of a particular material for general coverage was therefore based primarily on the following considerations: The importance of the material as measured by the total value

of United States consumption or production; the percentage of total consumption accounted for by factory consumption and the availability of nonfactory consumption data from other sources; the number of establishments to be canvassed in order to assure adequate coverage; the availability of consumption information from manufacturers' records; and, in certain cases, such less tangible factors as the strategic importance of the material. In addition to those materials for which consumption information was collected from all important consuming industries, another group of 75 materials was covered on a more limited basis. The inclusion of these materials was generally based on factors peculiar to each industry, e.g., a large proportion of these materials were included on particular forms because the industry's production was of a heterogeneous character and materials consumption was believed to give a better measure of physical output than production statistics.

Consumption of materials is usually shown in the report for the consuming industry. In addition, for the 61 materials consumed in a number of industries, consumption by all industries and, in most cases, by States are also shown in Chapter IX of the Summary Volume. The data on materials consumed, shown in table 7 of the Industry Volume, for gray-iron castings, steel castings, aluminum castings, and copper and copper-base alloy castings include only those castings purchased from other companies or obtained from other plants of the same company. Castings produced in the same establishment and further fabricated into a finished product or part are not included in the figures shown for these four types of castings. The consumption of castings produced in the same establishment are, however, shown in the Summary Volume in Chapter IX, table 12.

25. Products

As indicated in Section 13 above, most manufacturers were asked to report their shipments and, in many cases, their production of a specified list of products, both primary and secondary, known to be produced by a significant number of establishments in their industry. The list of products was prepared for each industry after intensive study of the 1939 reports, and review and approval by a number of Inter-Agency Committees set up within the Federal Government. In developing the product sections of the 1947 report forms, the Bureau benefited from the advice of trade association officials in nearly all industries. In addition, preliminary drafts of the form were mailed to selected manufacturers in every industry, and, where feasible, the form was revised in accordance with their suggestions.

In all, about 6,500 individual product items were specified on the various forms. The term "products,"

as used in the Census of Manufactures, may have a broader or narrower content than in common usage. For example, automotive gasoline was reported as a single item. On the other hand, cotton broad-woven goods were distributed into nearly 200 individual "products" according to type of weave, width of fabric, and other specifications. For some items, e.g., bearings, it would have been desirable to obtain product information in much greater detail than that actually requested, but the extent to which the production of individual types and sizes is concentrated in one or two individual companies would have made it impossible to publish detailed data. Thus the 6,500 individual products included on the forms merely represent the number of items for which it was considered practical to publish census information.

Of the 6,500 items included on the forms, data were actually published for approximately 6,100. The balance were eliminated because their publication would involve disclosure of the activities of individual companies or because it turned out that a number of important producers could not report products in the detail requested; in all such cases the product data were combined with that for a similar item or included in an "all other" category. In this respect 1947 experience compares favorably with that for 1939 when of approximately the same number of items included, only about 4,000 could be shown. The principal reason for this difference seems to have been that in 1947 a large number of products were eliminated from the forms because they were of very limited economic importance; in general, a product was not included if its 1939 production was valued at less than \$2 million. In 1939 the loss of product detail owing to disclosure or poor reporting was particularly heavy in products of this magnitude. On the other hand, product items which were reported in large volume by a large number of establishments in 1939 were split up in 1947 into a number of products, where feasible.

In designing the 1947 product inquiries more weight was given to current industry practice and requirements than to comparability with 1939. In consequence, at the individual product level 1939 data are available for only about 1,500 product items. In many instances, however, comparable 1939 value and sometimes quantity data are available for the sum of two or more 1947 product items; on this basis, 1939 data are shown for about 2,500 of the 1947 products. Comparable 1939 data are more often available for basic materials such as steel and textiles than for finished manufactures such as machinery or apparel.

26. Classes of Products

In the 1947 census the 6,500 individual product items were grouped into slightly more than 1,000

classes of products. Except for the conditions that the number of product classes within an industry should not exceed 10 and that every individual product should be assigned to a single product class, the classes were selected to secure the most homogeneous grouping of products within each industry in which they were primary. Of the 453 industries used in this census, 242 had only one class of products and only 33 had six or more. In many instances, of course, some products had to be left in a residual class, e. g., "other food preparations, n.e.c."

The purposes to be served by the use of product classes were twofold. They were useful in permitting more detailed breakdowns such as that between primary and secondary production (table 5 of the Industry reports) where the production of individual products would frequently be so concentrated as to make such breakdowns impossible under the disclosure rules. Secondly, for certain types of analysis, e.g., for studying the relation between output and employment or wages, the industry classification is frequently too broad to yield satisfactory data. To overcome this difficulty, every plant reporting on a standard form was coded according to the degree to which it specialized in the production of a single class of products primary to the industry. By this device it is possible to sort out and tabulate general, product, and materials consumption statistics for homogeneous groups of establishments within an industry. This procedure is, of course, useful mainly in those industries producing a large number of products. For such industries individual products could not be used as a basis for coding since an establishment would rarely specialize to any extent in the production of a single product item. Census data by class of product specialization were not tabulated for publication in the volumes, but all important cards have been so coded, for a variety of future tabulations.

27. Value of Products Shipped

For 1947, the data were collected for practically all industries on the quantity and value of products shipped or on receipts for contract work or other services. In addition, many of the industry forms also requested data on production when it seemed likely that shipments would differ significantly from production either because of changes in finished inventories or because some commodities reported, instead of being shipped, were used for further manufacture in the producing plant. The amounts under the heading of value of products shipped, both for each industry in total (tables 1-3) and for individual products or classes of products (tables 5 and 6), are the received or receivable net selling values, f.o.b. plant, after discounts and allowances, and excluding freight charges and excise taxes. This is the first Census of

Manufactures in which excise taxes were specifically eliminated from product values. For tobacco and other industries where these taxes are important, such taxes are covered separately. In shipments, manufacturers were asked to include, along with receipts for contract work, all items made by or for each establishment from materials owned by it, whether sold, transferred to other plants of the same company, or shipped on consignment. They were also asked to exclude shipments of products which were produced by the establishment from materials owned by others, resold in the same condition as purchased, or returned to it without sale.

The general use of shipments as the basis for valuing the output of manufacturing industries differs from the practice for all censuses except that for 1929. This change was made in order to facilitate direct reporting from records of sales, shipments, or billings. Value of shipments for 1947 may, however, be directly compared with value of products for earlier years. In the first place, it is likely that in previous censuses many manufacturers valued their output in terms of shipments even though value of production was requested. Secondly, the changes in the quantity of finished goods inventories for most industries were of minor importance and there was, therefore, little difference between production and shipments in either 1947 or 1939.

28. Transfer Values

The values to be assigned to products transferred from one establishment to another of a multiunit establishment always constitute a difficult problem where value figures are collected on an establishment basis. The manner in which the problem was handled in the 1947 census is best indicated by the following excerpt from the instructions forwarded to multiunit companies:

"In order to provide accurate information for individual industries, States, and local areas, it is necessary that each reporting unit of a multiple-unit organization report as though it were operated as an independent manufacturing establishment. For example, where a single company operates a textile mill and also manufactures apparel, the transfer of fabrics from one establishment to the other should be reported at approximately commercial value and not at the cost of production. This requires that a company operating two or more plants assign to each plant and to the individual products a reasonable proportion of the profits and overhead costs. The method found by each company to be most convenient will ordinarily be acceptable to the Census Bureau. It is recognized that estimates will often be involved.

"If Part VII of the form calls for 'interplant transfer' and 'shipments to others' separately, interplant transfers means transfers between manufacturing plants. The products reported at 'transfer values' by the shipping plant should be reported by the receiving plant at the same values, except for the addition of freight or other direct handling charges.

"Transfers to separate selling departments, sales, branches,

retail stores, export subsidiaries or other distribution channels owned by your company should be included in sales to 'others,' rather than in interplant transfers, and the value should be reported at approximately the net selling value f.o.b. plant.

"These instructions apply to all establishments for which separate reports are being submitted including those at the same location, as well as those at different locations. . . ."

The transfer problem is especially difficult in a few instances in which an integrated operation is for census purposes broken down into two or more industrial activities. For example, in the paper and pulp industries, pulp can be manufactured in the pulp mill and transferred in slush form to an adjacent paper mill at a cost (including overhead and profit) very much lower than that at which it can be manufactured in an independent pulp mill, dried, baled, shipped, and again converted to slush by a paper mill at another location. Consequently, the use of the price at which the relatively small quantity of pulp enters the market, for evaluating transferred pulp would result in assigning an unduly large part of the value added by manufacture for the combined operation to the pulp mill. In fact such values for transferred pulp would frequently have caused the paper mill to show a very substantial loss. The reporting manufacturer was therefore asked to prorate the value added in the combined operation and thus derive somewhat arbitrary value figures for "shipments" from the pulp mill and "cost of materials" for the paper mill. A very similar situation exists between the blast furnace and steel mills industries and a similar procedure was followed. In other industries where the same situation exists to some degree, some reports may have been tabulated in which an inappropriate "market price" was attached to a transferred item but as it was the practice to examine all reports of a multiunit company at the same time, it is not likely that there were many such instances.

In the more common situation in which a plant manufactures a part or component for the use of an affiliated plant which may be located at some distance from the parts plant, the cost of production (including overhead and profit), will not differ much from the market price and neither will differ greatly from the "book" value assigned to this part. In fact, plants of many large corporations are frequently operated very much like independent factories, and in some instances a plant is authorized to purchase materials in the open market if the market price is below that charged by an affiliated plant.

It is believed that shipments data obtained from manufacturers generally were valued f.o.b. plant, even where shipments from one or more factories were largely or exclusively to a central warehouse or to sales branches operated by the same company. To insure this, the Bureau conferred directly with

most large multiunit companies during the course of the census and these apparently experienced little difficulty in converting such shipments to an f.o.b. plant value, when it was not the usual practice to carry them on such a basis on the factory's books.

29. Duplication in Cost of Materials and Value of Products

The aggregate of the cost of materials and value of shipments figures for industry groups and for all manufacturing industries includes large amounts of duplication owing to the use of products of some industries as materials by others. With some important exceptions, such as the steel, refrigeration, and motor vehicle industries, this duplication is not significant within individual industries. It arises importantly, however, from the addition of industries representing successive stages in the production of a finished manufactured product. Examples are the addition of flour mills to bakeries in the Food Group and the addition of blast furnaces to steel mills in the Primary Metals Group of industries.

The manner in which this duplication arises and the proportions it may assume may be indicated by citing a few figures for the Paper and Paper Products Industry Group. Virtually all the pulp produced by pulp mills is consumed by paper mills and accounts for well over one-half of the latter's cost of materials. In turn, well over half of the paper and board shipped by paper mills is consumed by plants classified in the Paper and Board Products Industries and accounts for most of the materials cost of these industries. For the major group as a whole, about 40 percent of the total value of shipments represents shipments to other plants in the 2-digit group and over 60 percent of the total cost of materials for the industry group represents purchases or transfers from other plants in the group. Further duplication arises in the compiling of national totals because of the use of paper products by establishments in other major groups, e.g., most of the printing papers shipped from paper mills is consumed by printing and publishing establishments and a large proportion of the containers shipped by paperboard box mills is used in packaging products of a wide variety of manufacturing plants. Within the 2-digit group there was some increase in the amount of duplication between 1939 and 1947. A decision to require separate reports of all companies operating paper mills and paper products plants on an integrated basis, resulted in increasing the value of shipments and the cost of materials for the 2-digit group by nearly 10 percent and over 15 percent, respectively.

Similar measures are not available for most other industry groups but estimates of the over-all extent of this duplication indicate that the value of manu-

factured products exclusive of such duplication—the value of finished manufactures—tends to approximate two-thirds of the total value of products reported in the Census of Manufactures. Because of the unknown and varying amounts of duplication contained in cost of materials and value of products, these figures are not shown for groups of industries or States or local areas in this census and are also eliminated for 12 individual industries for which the proportion of duplication in the value of shipments was known to exceed 10 percent.

30. Value Added by Manufacture

Value added by manufacture is calculated by subtracting the cost of materials, supplies, and containers, fuel, purchased electric energy, and contract work from the total value of shipments. In that it approximates the value created in the process of manufacture, value added provides the most satisfactory measure of the relative economic importance of given industries available in the Census of Manufactures.

Value added by manufacture should not, however, be confused with the contribution of the manufacturing industry to the national income, as measured by the Office of Business Economics, Department of Commerce. Income produced in manufacturing is estimated at \$17.9 billion for 1939 and at \$61.7 billion for 1947, or about 70 and 83 percent, respectively, of the value added by manufacture for these two years. The main differences between income produced and value added is that the former excludes, in addition to cost of materials, such additional costs as depreciation, the labor costs involved in maintenance and repairs, State and local taxes (other than corporate income taxes), advertising, etc.; these deductions are partly offset by the inclusion of employer contributions to Social Security as a form of income and by the fact that the national income estimates are to a large extent prepared on a company rather than an establishment basis. In fact, many of the items that must be deducted from value added to arrive at income produced in manufacturing can only with great difficulty, if at all, be reported on an establishment basis.

Income produced in manufacturing increased nearly 250 percent between 1939 and 1947 as compared with an increase of approximately 200 percent in value added. This difference is due principally to the inclusion in value added of a number of important overhead costs which are fairly stable in the short run. As would be expected, the relative increase in income is greater in those industry groups and, presumably, in those areas which showed the largest percentage increase in value added over the period.

31. Method of Calculating Value Added by Manufacture for Selected Industries in 1947

As stated in Section 29 above, value added by manufacture is usually calculated for each establishment by subtracting cost of materials, etc., from value of shipments. For a limited number of industries, however, a different procedure was used for calculating value added by manufacture in the larger establishments (more than 50 employees). For most industries for which information was requested on the quantity of production as well as on the quantity and value of shipments of product items, value added for large plants was calculated by multiplying the quantity of each item produced by a unit value derived from the shipments data, adding these values to obtain a total value of production and subtracting therefrom the cost of materials. Consequently, for these industries value added by manufacture does not equal value of shipments less cost of materials.

32. Inventories

The value of beginning- and end-of-the-year inventories, respectively, was requested of all establishments except those in the Printing and Publishing and Allied Industries group and those reporting on short forms in all industries. As in the two preceding censuses, data were collected under two heads: (a) finished products and (b) materials, supplies, work in process, fuel, and other inventories.

Inventory data were generally well reported, particularly by larger establishments. Some manufacturers reported only a total figure on inventories and occasionally figures were given only for beginning-of-year or end-of-year inventories. Corrected data were ordinarily obtained for larger establishments, but for smaller establishments the inventories for the date not reported were assumed to be the same as those for the date reported, provided the establishment was operating on the former date. More frequently, the breakdown between finished goods and materials was not supplied. In these cases, the breakdown was estimated from the tabulated figures for reporting establishments in the same industry. In a few industries, usually with small inventories, the breakdown involved a considerable proportion of estimates. In these cases the detailed inventories figures are not shown in the Industry Volume, but they are included in the General Summary Volume, in order to construct national and group totals. Where no inventory figures were reported, inventories were estimated by applying the ratio of inventories to cost of materials for reporting establishments in the same industry to the cost of materials on nonreporting establishments. No estimates were prepared for establishments reporting on short forms. Estimates were

seldom resorted to in the case of large establishments, and in no instance in which they were expected to amount to a sizable proportion of an industry's annual production.

33. Expenditures for Plant and Equipment

Following the precedent established for 1939, data were collected on capital expenditures for plant and equipment by all establishments reporting on the standard forms. As for 1939, manufacturers were requested to report expenditures made during the census year for permanent additions and major alterations that were charged to the fixed-asset accounts of the individual establishments and were of the type for which depreciation accounts are ordinarily maintained. The figures do not include expenditures made by the owners of plants and equipment leased to reporting manufacturers. The breakdown requested for capital expenditures is similar to, but more detailed than, that requested for 1939.

Reporting on this question is believed to have been considerably better than in 1939. In 1947, establishments which made no capital expenditures during the year were asked to so state on the form. Correspondence was undertaken with all large and medium-sized establishments which neither supplied data nor indicated that they did not make any capital expenditures in 1947. Subsequent to tabulation, a special run of the cards for the State of Pennsylvania showed that establishments reporting capital expenditures in 1947 accounted for 92 percent of value added in that State, as compared with 85 percent in 1939. It should be noted, however, that 1947 was a year of heavy capital investment compared with 1939 and that this factor may explain much of this increase.

Expenditures for new plant and equipment amounted to \$6 billion in 1947 according to the census, as compared with an estimate of \$7.5 billion prepared jointly by the Office of Business Economics of the Department of Commerce and the Securities and Exchange Commission. Apart from reporting errors, of which little is known, it would seem that this discrepancy arises principally from two factors. The census did not attempt to cover capital expenditures by nonmanufacturing establishments of manufacturing companies. This factor is particularly important in the Petroleum industry, where company expenditures for developing new wells and for distribution facilities are normally much larger than their capital expenditures at refineries. Secondly, the census figures do not include capital expenditures at plants which were not in production at any time in 1947, whether or not such plants were owned by companies which did report in the census. Multiunit companies were requested to report their expenditures for manufacturing plants not in operation in

1947 and, therefore, not required to submit a census form, and reports aggregating some \$200 million in expenditures were received. However, a review of these reports raised some doubts as to coverage and these expenditures have not been tabulated by industry or geographic area.

34. Fuels and Electric Energy

Separate figures were collected in 1947 for quantity and cost of bituminous coal, anthracite, coke, fuel oil, and gas, and for cost of other fuels, consumed in manufacturing establishments for power and heat. In addition to quantity and cost of purchased electric energy, figures were obtained for quantity of electric energy generated, and quantity and value of electric energy sold. Check boxes were provided which yielded an approximate segregation of "Natural," "Manufactured," and "Mixed" gas, but prevented the segregation of gas by type for establishments which purchased more than one kind of gas.

The figures for cost of each type of fuel and for cost of purchased electric energy appear in table 3 for each industry in the Industry Volume. No separate figures on fuels are shown in the State volume, but the General Summary Volume contains a chapter showing totals for each of the fuel and electric energy items for which data were collected, summarized by industry and by State. Similar quantity figures were tabulated for 1909 and in several subsequent censuses, but cost figures for each type of fuel were tabulated previously for 1929 only. The introductory text to the Chapter on "Fuels and Electric Energy Consumed" in the General Summary Volume discusses in more detail the nature and qualifications of the fuel statistics.

35. Metalworking Operations

For 110 metalworking industries the 1947 forms included a special inquiry on the approximate number of production workers usually employed in selected metalworking operations. This information is useful in indicating the extent to which these operations, which for the most part define individual industries, are conducted by establishments classified in other industries in the metal-product area. When used in conjunction with the industry and product statistics for the industries primarily engaged in these operations, they are useful as an indication of the Nation's capacity for performing the more important types of metalworking operations.

This information was collected from establishments in every industry in which these operations were believed to be significant. Manufacturers were not requested to specify the number of production workers engaged in each operation; rather, they were merely asked to check that one of five size-classes

which most closely represented the usual number of production workers employed. Since the smaller establishments in a number of industries did not report on this inquiry, the number of establishments performing a particular operation in the lowest size-class may be incomplete for individual industries. However, the coverage for all other production-worker size classes is essentially complete.

Manufacturers were also requested to report the number of days each operation was performed in 1947. The responses indicated, however, that operations with more than 20 employees were almost uniformly maintained on a continuous basis with the exception of tool and die rooms and pattern shops. This did not hold true to the same extent for operations with less than 20 employees, but even there the operation was maintained on a continuous basis in the majority of cases.

The data on metalworking operations are included as table 8 of the appropriate industry reports. For comparative purposes, the data for each operation are also presented in industry order in Chapter X of the General Summary Volume. This chapter also shows comparable data by geographic divisions and States.

36. Highway-Type Motor Vehicles

Manufacturers reporting on standard forms were required to report the number of selected highway-type motor vehicles (other than passenger cars and busses) operated directly by each establishment on December 31, 1947, regardless of whether the vehicles in question were owned or leased by the establish-

ment. Vehicles operated by trucking concerns providing services to manufacturing establishments were not included.

This information is shown by rated capacity and by body type in table 3 of the Industry reports and by rated capacity by body type in table 10 of the State reports. In addition, table 1, Chapter VII, of the General Summary Volume shows for each industry the number of trucks by body type by rated capacity and table 3 shows the total number of trucks operated by establishments in selected employee size-classes in each industry. Some manufacturers reported the operation of trucks in impossible body-type capacity combination, e.g., light delivery trucks of a capacity exceeding 1½ tons, and vans of a capacity less than 1½ tons. These items were transferred from van to light delivery and vice versa.

37. Indexes of the Physical Volume of Production

The Bureau of the Census is constructing an index of the physical volume of manufacturing production for 1947 relative to 1939, primarily from the product and industry statistics published in Volume II, "Statistics by Industry" of the 1947 Census of Manufactures. In addition to the index for all manufacturing, separate indexes will be published for about half the industries (covering about 2/3 of the value added by manufacture) and for most of the major industry groups. This work was not completed at the time this volume went to press. It will be published in the form of a separate Bureau of the Census report at a later date.