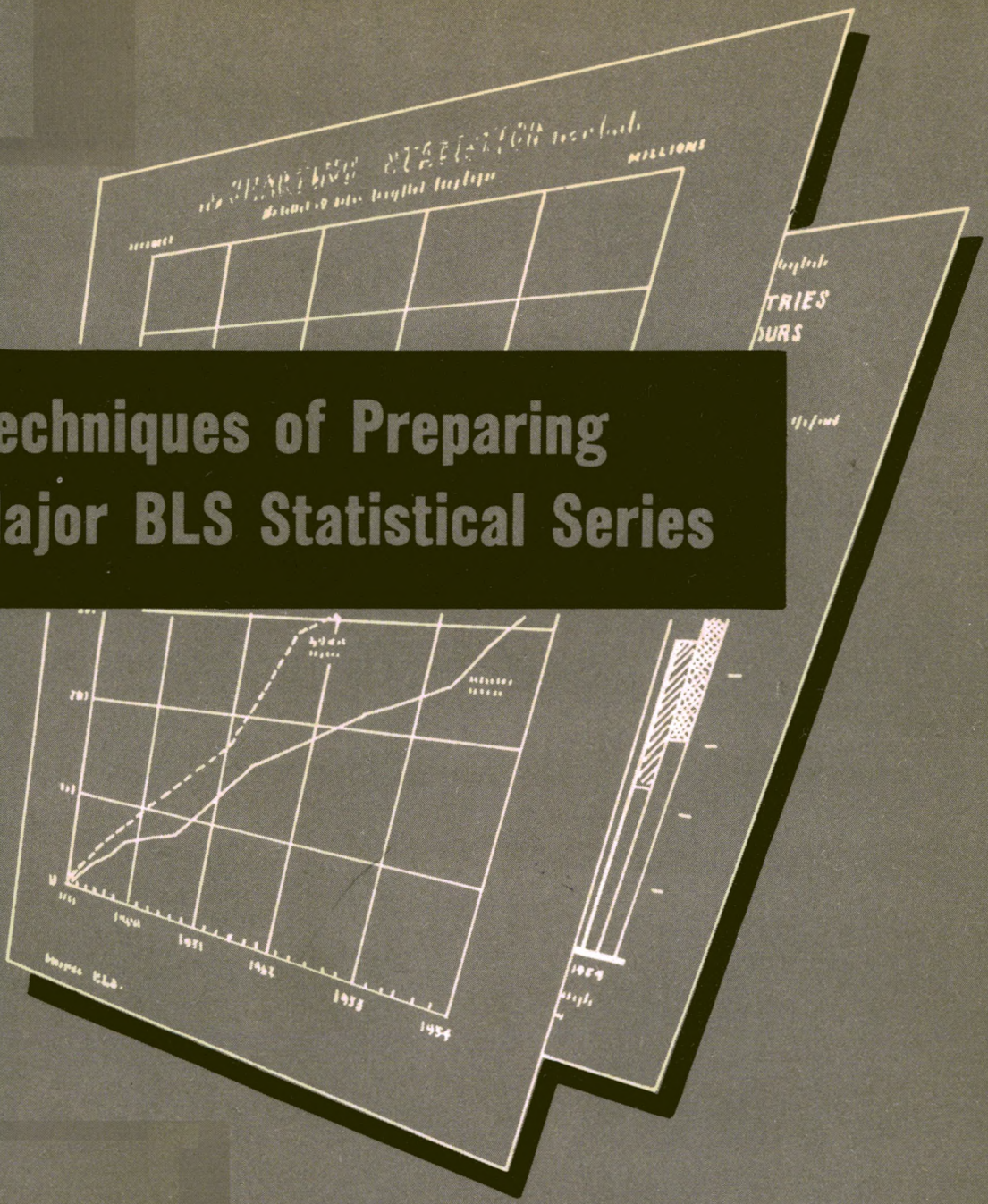
Techniques of Preparing Major BLS Statistical Series



Bulletin No. 1168

UNITED STATES DEPARTMENT OF LABOR
James P. Mitchell, Secretary
BUREAU OF LABOR STATISTICS
Ayrness Joy Wickens, Acting Commissioner

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DECEMBER 1954

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This bulletin was edited by Benjamin Lipstein of the Office of Statistical Standards under the direction of Samuel Weiss, Chief Statistician of the Bureau at the time when the bulletin was in preparation. The individual chapters were prepared by the Bureau's operating divisions.

Preface

Over the years, as the American economy has grown in size and complexity, there has been a parallel growth in the importance of economic statistics. Today, more than ever, the key decisions which affect public and private policies can be made only after careful study of basic economic facts and trends—and these, in many cases, can best be measured and summarized in statistical series. Some of these current series which have come to be accepted as "economic indicators" provide a broad gage of the level and trend of our economy.

This reliance on economic data, in business and labor circles as well as in Government, has placed a greater responsibility on the producers of statistics to describe the scope and nature of their product, to indicate the reliability (or limitations) of their data, and to explain the methods used in their preparation. The Bureau of Labor Statistics—as a major producer of current economic statistics—has long recognized this duty. The first version of this volume in 1950 was intended to fulfill part of this obligation.

But the conditions under which statistics are prepared, and the methods of compiling them, are constantly changing. In establishing its Office of Statistical Standards in 1950 the Bureau reaffirmed its policy of working continuously to improve the quality of its data and to increase their usefulness. The present volume is designed to meet the need for an up-to-date comprehensive description of the methods used in preparing the BLS statistical series.

The uses of BLS statistics are wide and varied. Their differing needs and uses mean that data ideally suited to one purpose may have limitations for another. Only the user, confronted with a specific problem, is able to judge whether the accuracy and reliability of statistics being used are adequate to meet the needs of his problem. The chapters on techniques used in the preparation of major BLS series give the users the information necessary for evaluating the fitness of the statistics for their own use.

In addition to outlining methodology and scope of major BLS statistical series, this volume also presents the background and uses; concepts and definitions used; sources; sampling and estimating methods; and the limitation of the series and available measures of their reliability. A selected bibliography is provided at the end of each chapter.

This bulletin supersedes an earlier edition, published in 1950 as Bulletin 993. The technical descriptions of major Bureau series in the earlier volume have been revised and expanded to reflect the most recent developments in our work. An introductory chapter has been added which describes the similarities and differences in methodology of these series.

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Chapter 1. Introduction*

The act creating the Bureau of Labor in 1884 specified its duties as follows:[1]

"To collect information upon the subject of labor, its relation to capital, the hours of labor, and the earnings of laboring men and women, and the means of promoting their material, social, intellectual, and moral prosperity": Subsequent legislation and Executive orders further elaborated the Bureau's areas of responsibility for the collection, compilation, and dissemination of economic data.[2]

The Bureau of Labor Statistics is one of the major fact finding agencies of the United States Government. From its inception, as the Bureau of Labor, it has been concerned with developing current economic statistics to fill the needs of a growing and more complex economy. One of the first regularly published series of the Bureau was the Wholesale Price Index. Other early areas of investigation related to wage rates and the differences in output between hand and machine labor. Shortly after the Bureau of Labor became the Bureau of Labor Statistics in the new Department of Labor, economic pressures of the First World War resulted in the development of the Consumer Price Index.[3] Over the ensuing years, series such as those for employment, earnings, housing starts, and changes in unit man-hour requirements have been added. Some of these series have come to be considered important economic indicators.

The Bureau is responsible for both current economic series and general economic studies.[4] In the preparation of its basic series, a great mass of related economic data are collected either in the process of researches in these areas or as byproducts of these activities. Periodically, special surveys and analyses are conducted to enhance the uses and maintain the currency of the techniques involved in the development of such fundamental statistics. A notable instance is the Consumer Expenditure Survey conducted in connection with the revision of the Consumer Price Index which resulted in the accumulation of a wealth of data regarding purchasing habits of American families. The Survey of Residential Builders which revealed the extent of owner and operative-built dwelling units was an outgrowth of the data used in estimating new housing starts.

Many of the underlying statistical processes involved in the preparation of BLS series are essentially the same although the scope of each series may differ. This introductory chapter describes some of the important steps in the development of these economic statistics; the areas of similarity and difference; and the common rules, definitions, and classification systems under which many of them are prepared.

*Prepared by Benjamin Lipstein of the Office of Statistical Standards.

[1] U. S. Stat. at Large No. 23 (p. 60).

[2] U. S. Stat. at Large, No. 25 (p. 182); No. 37 (p. 736); No. 46, chap. 873 (p. 1019).

[3] Originally called the Cost of Living Index.

[4] The many areas of economic investigation within the Bureau are divided into subject matter fields. The Division of Construction Statistics is concerned with new housing starts activity, construction expenditures and labor requirements and new housing characteristics. The Branch of Industrial Hazards ascertains work-injury frequency rates and estimates of the volume of disabling work injuries, and also develops material on accident causes. The Division of Manpower and Employment Statistics is concerned with a wide variety of problems such as manpower requirements, occupational outlook, levels of employment, hours, earnings, and labor turnover. The Wholesale and Consumer Price Indexes are prepared by the Division of Prices and Cost of Living. Matters relating to measurement of unit labor requirements are the responsibility of the Division of Productivity and Technological Development. The Division of Wages and Industrial Relations is concerned with occupational, industrial, community and geographic wage structures, current wage developments, work stoppages, and collective bargaining contracts.

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Elementary Unit of Inquiry

The business establishment has been found to be the most satisfactory source of data for most industrial statistics because it is the first level of business organization for which complete records—i. e., production, employment, purchases, sales, wages, inventories, etc.—are generally maintained. The establishment is the primary unit of organization in the business economy and is the first integrated level of combination of employees devoted to the production of a related group of products or services.

In investigations of employment, wage, hazard, and output per man-hour statistics conducted by the Bureau, the following standardized definition of the establishment is utilized:

"An establishment is generally defined as a single physical location where business is conducted or where services or industrial operations are performed; for example, a factory, mill, store, mine, or farm. Where a single physical location comprises two or more units which maintain separate payroll and inventory records and which are engaged in distinct or separate activities for which different industry classifications are provided in the Standard Industrial Classification, each such unit shall be treated as a separate establishment. An establishment is not necessarily identical with the business concern or firm which may consist of one or more establishments. It is also to be distinguished from organizational subunits, departments, or divisions within an establishment."[5]

In studying prices and the cost of living, the elementary unit of inquiry is also frequently the establishment. At the retail level, price quotations are obtained from retail outlets or service establishments; for wholesale prices, the elementary sampling unit is the producer, manufacturer or factory, or as close to that level as is feasible.[6] Consumer expenditure studies and rent data collection, of necessity, require focusing on the family and dwelling unit, respectively, as the elementary unit of inquiry.

The minor civil division is the elementary unit of inquiry for new housing starts since building permits are frequently issued at that level. For other surveys of new housing, such as housing characteristics, sales, or rental prices, the survey unit is a building permit or group of permits since that is the basis for the major part of the sampling frame. Subsequent followup of these permits may in turn lead to building contractors or homeowners.

Sampling Frame

One of the first steps in a statistical investigation is the definition of the universe of inquiry. This is followed by the development of a frame needed for sample selection.

In much of the Bureau's work, the universes of inquiry relate to the characteristics of establishments within a specific industrial segment of the economy. The various segments of the economy have been classified in terms of the Standard Industrial Classification (SIC) Manual and the Social Security Board (SSB) Industrial Classification code.[7] The Bureau uses the SIC system for manufacturing industries and for government and the SSB system for other nonmanufacturing industries. Specific studies are defined as including establishments falling within either a specified 4-, 3-, or 2-digit industry group, or within a standard grouping of these industrial classes. For new surveys, the sampling frames are lists of establishments obtained from employer reports to the Bureau of Employment Security under the Unemployment Insurance program. In going surveys, sample supplementation or modification is also frequently accomplished through reference to Unemployment Insurance lists. The completeness of these frames bears on the reliability of many of the estimates derived for these programs.

The sampling frame should not be confused with a benchmark which is a reasonably complete count of the characteristic being estimated at a specific date. Ideally, the characteristics being measured, e. g., total employment, should be the same in the benchmark and in the sampling frame for the same date. In practice, this is not always possible and is not always critical if the excluded establishments represent only a small proportion of the universe. The bias in sampling that results from excluding the smaller establishments is frequently less than the variance accompanying alternative probability designs.[8] Thus, for employment, the benchmark

[5] Standard Industrial Classification Manual, Bureau of the Budget, Vol. I, Manufacturing Industries, Nov. 1945 (p. 1).

[6] For some staple commodities such as wheat, prices are obtained from commodity exchanges.

[7] Op. cit., Federal Security Agency, Social Security Board, 1942.

[8] See Chap. 6, Measurement of Industrial Employment.

includes employment in all establishments (Unemployment Insurance reporters augmented by firms not covered by such programs) while the sampling frame, when derived from Unemployment Insurance listings only, frequently excludes establishments with less than eight employees.

In developing the sampling frame for pricing retail foods, the important distinctions are between chain and independent food stores, classified by type of operation such as combination grocery and meat store, grocery only or specialty store; in apparel, between department and specialty stores. At the wholesale level, it is important to identify establishments which are large volume sellers and price leaders, as well as the smaller producers which may be characterized by different price movements.

In the case of household or dwelling unit surveys it is uneconomic and unnecessary to list all households or dwelling units. Area or block sampling is used to achieve comparable results. This process involves a complete listing of blocks and segments within the sample area. A sample of blocks and segments is then selected; within these, all households or dwelling units are listed from which a sample of such units is then selected for actual enumeration. The delineation of the sampling frame is less difficult where the sampling units are blocks, segments, minor civil divisions, counties, groups of counties or urbanized areas, as in the case of the rent component of the Consumer Price Index and the housing starts survey.

Limitation of the Frame

Of necessity, any list of establishments compiled from historical reports on some industrial classification basis is out of date almost at its inception because of births and deaths of establishments or of changes in industrial classification resulting from shifts in the establishment's production. Therefore, in most Bureau programs, part of the industrial classification process entails a determination of the establishments within the scope of the industry being studied. In the employment statistics program, the industrial classification of manufacturing establishments is checked each year by a supplementary product questionnaire which requests information on the types of products produced and their relative importance in the establishment. Answers to this questionnaire permit appropriate revisions in the industrial classification of establishments. Nonmanufacturing establishments are classified once a year based on a description of activity given on the regular report form. In the case of wage, work injury, and output per man-hour surveys, the determination of in- and out-of-scope establishments is made during each survey.

In sampling from lists, as is the case with establishment sampling, delineation of the universe involves considerable difficulty. There is no definitive way of knowing when the entire population of establishments has been included in the list. Only after careful examination of supplementary lists can it be determined that the compiled list is reasonably complete. A limitation in the use of Unemployment Insurance listings is that the laws in some States exclude employers with fewer than eight employees. For wage studies, this limitation is not serious and the universe is defined to exclude firms with less than eight employees or, on occasion, some other size depending on the nature of the particular survey. Another problem in the use of lists arises out of the time lag in their preparation with the result that the universe of inquiry tends to under-represent new firms. New firms established subsequent to the reporting period in which the list is compiled are not included The effect of new firm formations on the establishment listing varies with the industry. Special attention is given therefore to industries characterized by rapid turnover and resultant high rates of business births and deaths—existing listings are supplemented by reference to trade publications, directories, associations, and unions.

Errors of the frame can also result from respondent error. Since an establishment's industrial classification is based upon its own report, the final statistics published for a particular industry contain not only sampling errors, but also errors in classification resulting from the respondent's incorrect reporting or incorrect industrial coding.[9]

Sampling Methods

Sample surveys rather than complete enumerations are the basic means which enable the Bureau to produce timely data. A number of different

[9] A test of the Validity of Collecting Wage Statistics by Mail Questionnaire, by Samuel E. Cohen and Benjamin Lipstein, Journal of the American Statistical Association, June 1954.

types of sampling and collection methods are used by the Bureau, stemming from the needs of programs and available resources. Probability sampling is used in the development of many important series, e. g., housing starts, wage rates, and selection of Consumer Price Index cities and retail food stores. In other instances, nonprobability, cutoff type samples have been developed primarily because of the efficiency of such sampling types in may segments of the business economy. This technique is discussed in the chapter on industrial employment.

The Bureau has found that complete enumeration is desirable in special instances. Most noteworthy is the permit segment of the national housing starts series which is based on a complete canvass of building permit officials. In this instance complete coverage is justified because: (1) the mail collection is very inexpensive; and (2) the variation in housing activity between cities is high. In the case of statistics of work stoppages which are called rare events[10] in statistical terminology, the Bureau attempts to obtain complete coverage of all work stoppages involving six or more employees because of the difficulties of estimating this statistic by sampling methods.

Where the sampling unit is the establishment and where the estimate relates to the number of employees, e. g., distribution of employees by wage rates, occupations, and output per man-hour, the design of the sample is usually of a uniform nature. The listing of establishments is grouped in two or more size strata, in terms of number of employees per establishment. If there are two strata, large and small, the large establishment stratum is usually given complete coverage and a sample is selected from the small establishment stratum. The definition of large establishments is frequently a function of the size of the requisite sample. For small samples, only a few establishments may be classified as large; for large samples many more establishments would be so classified. Such a design is usually optimum with respect to allocation. A sample design is optimum with respect to sampling efficiency when the sampling error is a minimum for a fixed cost or cost is minimized for a specified degree of accuracy.

[10] Statistically, a characteristic is a rare event when its relative occurence in the population is small.

In the employment, hours, and earnings, and turnover programs a variation of this design called cutoff sampling is used. The establishments are arrayed by size and all establishments above a specified size are included in the sample. The cutoff size varies among industries within States.

The establishment is a highly efficient unit of sampling for many of the Bureau's investigations and often the only possible one. The employment, productivity, wage, and hazard statistics programs are concerned with certain characteristics of groups of employees. The establishment represents a large clustering of employees and thus provides an inexpensive source of information for the basic elements of analysis. Characteristics such as employment, earnings, wages, and occupational distributions, and work injuries are easily obtained at the establishment level. Accuracy of response is an important additional advantage to the obvious cost advantage of sampling establishments rather than households or individuals. Information collected from establishments is generally obtained directly from accounting records. Further, the industrial classification of establishments is based on actual production records or close approximations. Employees generally have such limited knowledge of their own establishment that it could not be properly classified by industry type. Response errors, in the reporting of wage statistics and occupations, tend to be of much greater magnitude in household surveys than in establishment surveys.

Establishment sampling for retail pricing follows a pattern of allocation similar to that for the employment and wage programs. In price investigations, however, the measure of size of the establishment is the volume of sales rather than of employment. Thus, in food pricing for the Consumer Price Index, stores are stratified into chains (large) and independents (small). Differential rates of sampling for price quotations are used in these two strata.

Probability area sampling is used in selecting Consumer Price Index cities and in the housing starts series. These designs are of greater complexity, as a result of the special estimating techniques used. References to the technical aspects of these designs will be found in the chapters on the CPI and housing starts series.

Methods of Collection

The Bureau uses a variety of means for collecting data: namely, mail schedule, personal interview, telephone, and telegram. The mail schedule predominates as a means of collecting basic data because of the low cost per respondent, the general high rate of response obtained by the Bureau, and the accuracy of the returns.

A unique feature of the Bureau's mail collection program is the shuttle schedule, which has been used for many years in a number of monthly surveys. This type of collection form is used widely in the collection of data on employment and payrolls, turnover, and wholesale prices. Space is provided on the schedule for the entry of monthly data throughout the year. In the first month, e. g., January, a schedule is sent to the respondent, requesting submission of January data and return of the schedule to the Bureau. When the schedule is returned, the data are edited and recorded. The same schedule is returned to the firm for the February entries. In reporting February data, the respondent can refer to the January entries. This method of collection assures a higher level of consistency in reporting than might result from independent schedules. It becomes a simple matter for both the respondent and the Bureau to review the schedule for reasonableness. This advantage is of considerable importance for time series, since respondent variability from month-to-month is minimized. There is the further advantage that addressing of forms and entry of area, industry, and other codes need be done only once a year. Thus, costs of operation and possibility of coding errors are reduced.

The type of collection medium used in the Bureau depends for the most part on the complexity of the data. Surveys which are more complex are generally conducted by the direct interview technique. Examples of these are the Consumer Expenditure Survey, some types of direct unit man-hour studies, and certain wage investigations which require considerable detail from the respondent. In such surveys, rarely will a respondent be willing to devote the time required to complete the mail questionnaire, and frequently he may not have the specialized knowledge necessary to complete the survey schedule. Definitions and concepts employed in these surveys are complex, thus requiring execution of the schedules by trained investigators. In the case of the Consumer Expenditure Survey, an interview may exceed a full day. A single interview at a plant in a wage or unit man-hour study at times lasts a full day and may require a number of call backs. In these situations the investigator may question several company officials on a series of specific problems, but almost always directly consults the establishment's detailed accounting records.

Field interviewers are required in area sampling where lists of the basic units of enumeration are not available. For example, there is no single source to which the Bureau may direct an inquiry concerning new housing activity in nonpermit issuing areas. To obtain such data, a field enumerator must canvass the sample area and enumerate all new housing starts.

Factors relating to commodity quality in many important segments of the Consumer Price Index require the collection of price data by field enumerators. A fundamental operational principle of the index is "pricing by specification." Comparability of price quotations from month-to-month is maintained by rigid specifications for the commodities included in the index. The pricing of certain wearing apparel calls for highly trained commodity specialists whose function is the pricing of comparable items from month-to-month. Variations in thread count, stitching, and trim are very often the indirect factors in price changes—i. e., price change through quality variation. Food pricing involves essentially the same problem. Bureau agents must not only watch for quality variations but must also keep the Bureau informed of the disappearance and reappearance of commodities.

A program of quality control of field interviewers was recently inaugurated by the Bureau to insure an adequate level of quality of data collection. Under this program, acceptability of the interviewer is determined by the use of a sequential sampling plan. In this plan, a sample of each interviewer's work is revisited by supervisory personnel who determine the accuracy of the original interview, compliance with instructions and other predetermined criteria related to the specific program. An important feature of the program includes the setting of criteria for acceptable interviews in widely differing situations.

Standardization of Classifications and Definitions

The U. S. Bureau of the Budget's Standard Industrial Classification System is basic to this Bureau's industrial statistics program for manufacturing industries. As stated in the Foreword to the Standard Industrial Classification Manual, the code "is intended primarily as an aid in securing uniformity and comparability in the presentation of statistical data collected by various agencies of the United States Government, State agencies, trade associations, and private research agencies." [11] It serves this same purpose within the Bureau, fostering comparability of data collected in employment, wages, earnings, injuries, and other series.

The following general principles were used as guides in developing this classification system: [12]

(1) The classification should conform to the existing structure of American industry.

(2) The reporting units to be classified are establishments, rather than legal entities or companies.

(3) Each establishment is to be classified according to its major activity.

(4) To be recognized as an industry, each group of establishments must have significance from the standpoint of the number of establishments, number of wage earners, volume of business, employment and payroll fluctuations and other important economic features.

The Social Security Board's Industrial Classification Code serves the same function for nongovernment, nonmanufacturing statistics compiled by the Bureau. Under these standard systems, establishments can be classified on either a 2-, 3-, or 4-digit industry basis depending on the detail desired.[13]

Where related statistics cut across program lines or across Government bureaus, the Bureau of Labor Statistics cooperates to the maximum extent possible in the Bureau of the Budget's efforts to obtain adherence to standard definitions of terms to assure maximum comparability. The use of the definition of establishment described earlier (p. 2) is a case in point. Of outstanding importance is the use of the Bureau of the Budget's definition of "Production and Related Workers," so basic to the employment, wage, and productivity program,[14] and the "standard payroll period." [15]

Index Numbers

Index numbers are used widely by the Bureau in presenting various statistical series. Most prominent are the Consumer and Wholesale Price Indexes. Index numbers are also used in varying degrees in wage, employment, and productivity statistics. For operational reasons, the Laspeyres base year weighted index number is most generally used since, in many instances, data for weighting purposes are available for past years but not for the period in which the index is to be issued.

The problem of comparability over time is always present in the construction of index numbers. In price indexes, the quality of items may change or commodities may go off the market; in production indexes used in obtaining measures of output per man-hour, changes in the method of reporting production data create discontinuities; discontinuities are also created by quality as well as model changes. These technical difficulties are overcome within limits through the use of "link relatives." For example, in the time period "n," a commodity included in the index is no longer available on the market. A similar or related product is substituted and price information for this new product is obtained for time period "n" and also for the previous time period (n–1). The link relative consists of the price in period "n" divided by the price in period "n–1." This new relative is applied against the last available index (period "n–1") to project it into time period "n." In the case of price indexes, such discontinuities are rarely serious since many near substitutes are available for most commodities on the market.

[11] Standard Industrial Classification Manual, Bureau of the Budget, Vol I, Manufacturing Industries, November 1945.

[12] Ibid. (p. IV).

[13] An example of a 2-digit group is Major Group 20—Food and Kindred Products which is composed of a number of 3-digit groups one of which is Group No. 201—Meat Products which is in turn composed of a number of 4-digit industries one of which is Industry No. 2011—Meatpacking, wholesale.

[14] Standard Definitions of Types of Workers, Bureau of the Budget, November 7, 1944. Production and Related Workers are defined to include working foremen and all nonsupervisory workers (including leadmen and trainees) engaged in fabricating, processing, assembling, inspection, receiving, storage, handling, packing, warehousing, shipping, maintenance, repair, janitorial, watchman services, product development, auxiliary production for plant's own use (e. g., powerplant) and recordkeeping and other services closely associated with the above production operations. Excluded are supervisory employees (above the working foremen level) and their clerical staffs.

[15] Standard Specifications for Employment Reports, Bureau of the Budget, November 15, 1944. Forms designed to collect information from business establishments on the number of employees, payrolls, hours worked, or related items should provide for such collection as of payroll periods ending nearest the fifteenth of the month.

It is of interest to note that the projection of indexes by this method of relatives generally does not permit quality to affect the level of price indexes. However, over long periods of time the combined effect of new products, model changes, and, to some extent, quality variation affects the index. Therefore, in the strict sense, index numbers are comparable only over relatively short periods of time. The longer the time span, the less comparability in the series.

In order to assist the users of Government index numbers in making comparisons, the Bureau of the Budget recommended that all official Government index numbers be converted to a 1947–49 base, unless some other period is clearly more suitable. In compliance with this request most indexes prepared by the Bureau of Labor Statistics were placed on this base.

Voluntary Reporting and Confidentiality

The Bureau's functions as a statistical agency are prescribed by law. The collection of information from firms and individuals is the means by which the Bureau executes these functions. The Bureau has always relied upon the voluntary cooperation of respondents in the reporting of data. This is based on the belief that data provided on a voluntary basis are more reliable in the long run than those obtained under a mandatory authority. The system of voluntary reporting is intimately related to the Bureau's pledge of confidentiality of response. When firms and individuals provide the Bureau voluntarily with information concerning their operations, it is with the clear understanding that these data will be used only for statistical purposes and that no releases will be made which will disclose the identity of the individual firm or establishment. Collection schedules are available only to sworn employees of the Bureau of Labor Statistics. Over the years, respondents' confidence in the Bureau's policy of confidentiality has contributed to increased rates of response in surveys.

Chapter 2. Estimating National Housing Volume*

Background and Uses

The housing statistics series prepared by the United States Department of Labor's Bureau of Labor Statistics measures the number of new permanent nonfarm dwelling units started in the United States. The detailed series—by public-private ownership and type of structure—is available on a monthly basis beginning in 1939 and on an annual basis from 1920. Total estimates, without detail, are available from 1910–19.

The series is widely used by government and industry as an important economic indicator. It is a key tool in shaping national economic and housing policy and a guide in determining the scope and emphasis of Federal housing programs. Business and labor follow the trend and level of housing activity closely because of the important influence of residential building on the general economy and, specifically, on the numerous major markets affected by new housing production.

Methods of deriving new nonfarm housing estimates have varied considerably in different parts of the period for which the series are available. In 1921 the Bureau of Labor Statistics began to collect information from large cities on the number and valuation of buildings and dwelling units recorded on building permits. Although the number of reporting cities grew steadily, the Bureau itself did not make any comprehensive estimates from these reports for many years, but published simple summaries.

The earliest housing starts series covered the period from 1920 to 1936 and was prepared on an annual basis by David L. Wickens and Ray R. Foster in a study for the National Bureau of Economic Research.[1] These authors made extensive use of Census data for 1920 and 1930, and of data reported to the Bureau of Labor Statistics by numerous building-permit-issuing localities. Beginning in 1937, the Bureau of Labor Statistics carried forward the Wickens-Foster annual series, basing it upon building-permit information.[2] After data from the 1940 Census of Housing became available the 1930–39 estimates were revised by the Bureau of Labor Statistics.[3] From 1940 to date the Bureau has prepared regular monthly estimates.

For trend analysis purposes it was found desirable to have estimates prior to 1920. To answer this need the Bureau derived estimates for 1910–19 by the following method. Utilizing historical building-permit data compiled during special building-permit surveys conducted in the late 1930's, the estimates for 1920 were extrapolated backward according to the year-to-year trends in permit volume in available cities. The number of cities varied from 205 for 1920–21 to 132 in 1910. National totals only were derived for the decade.

In summary, then, the currently used housing starts series is composed of data derived by various methods during the following time segments: (1) 1910–19, estimates derived by the Bureau; (2) 1920–29, part of the period covered by the original Wickens-Foster estimates; (3) 1930–36, a BLS revision of the Wickens-Foster estimates; (4) 1937–39, a BLS revision of its earlier estimates; and (5) 1940 to date, regular monthly estimates derived by the Bureau.

Although the details of the methodology changed according to the available sources of data, the estimates between 1940 and 1953 were derived by essentially similar methods. For a description of the methodology used from 1947–53, see Estimating National Housing Volume, by Dorothy K. Newman, Bureau of Labor Statistics Bull. No. 993, chap. III (pp. 13–19). The present article outlines the revised estimating techniques installed early in 1954.

*Prepared by Marvin Wilkerson of the Division of Construction Statistics.

[1] For a detailed discussion of the methods used, see National Bureau of Economic Research Bulletin 65, dated September 15, 1937, and Chap. V of Residential Real Estate (1941) by David L. Wickens.

[2] See Building Construction, 1940, Bureau of Labor Statistics Bull. No. 693 (p. 17).

[3] Housing and the Increase in Population, by M. H. Naigles. Monthly Labor Review, April 1942 (pp. 869–880).

Concepts and Definitions

The unit of measurement of the volume of housing construction is the "dwelling unit." A dwelling unit is defined by the Bureau of Labor Statistics as a dwelling place containing permanent cooking facilities, i. e., the minimum built-in facilities essential to housekeeping. The dwelling unit count, therefore, reflects the number of families planned for in the construction of new housekeeping dwellings, and includes not only 1-family homes but units in 2-family structures and in 3-or-more-family apartment buildings.

Temporary units and units without housekeeping facilities and such dwellings as trailers, houseboats, sheds, and shacks are not included. Excluded also are the temporary dwellings built during the period of defense and World War II, the Federal temporary reuse units erected during the Veterans Emergency Housing Program of 1946–47, and temporary structures erected at large Federal industrial facilities and on military posts.

Accommodations in transient hotels, dormitories, and clubhouses are also excluded from the dwelling unit figures. These are usually nonhousekeeping quarters and the buildings containing them are defined as "nonhousekeeping residential." Units in apartment hotels are excluded, unless most of the space in the structure is devoted to housekeeping units. Since the Bureau's housing statistics are designed to reflect the extent of new house-building activity, and not necessarily all additions to the housing inventory, living quarters provided for superintendents in public buildings, warehouses, and factories are excluded also. Construction of such a residence is quite incidental to the nonresidential character of the building. On the other hand, the Bureau's housing estimates do include housekeeping units in buildings that also contain stores; for example, large apartment buildings with shops on the ground floor.

The series does not cover farm dwellings, although, as will be explained later, it is possible that a few farm homes are counted.

The volume of new permanent nonfarm dwelling units started should not be interpreted as being equivalent to the change in the inventory of existing housing, as, for example, the change in the dwelling unit count between decennial Censuses of Housing. Changes in the Census totals result from a number of factors, of which new housing construction is only one. Units provided by the remodeling of existing residential structures or the conversion of nonresidential buildings into residential housing are automatically excluded from the new housing series although counted in the Census.

The new permanent nonfarm dwelling units included in the Bureau of Labor Statistics series are now classified as metropolitan or nonmetropolitan; private or public; and 1-family, 2-family, 3- to 4-family; and 5-or-more-family structures. The former classification of urban or rural nonfarm location has been abandoned because of the problem of resolving differences between the geographic areas used for building permit systems and the urban areas as defined in the 1950 Census.[4] All units located within the 168 Standard Metropolitan Areas as defined by the Bureau of the Budget and used by the Bureau of the Census in the 1950 Census of Population and Housing are classified as metropolitan. Housing located outside these areas is classified as nonmetropolitan.

Dwelling units owned by Federal, State, or local governments are classified as public units; all others are considered private. Thus, ownership is the determining factor. Even though private units are financed by mortgages insured by the Federal Housing Administration or guaranteed by the Veterans Administration they are not publicly owned. Conversely, the fact that housing built by local housing authorities may be financed by bond issues sold to private groups does not mean that it is privately owned housing.

A one-family structure may be detached, semidetached or one of a continuous row. A semidetached one-family structure has a common wall with another structure which also contains a single dwelling unit. Each unit in both semidetached and row houses is counted as a separate structure, because each has a separate entrance and separate heating facilities and utility connections. Each can be sold independently of the other units in the group.

[4] The 1950 urban category includes not only incorporated places of 2,500 or more but a large number of unincorporated specially delineated localities, and the densely settled but unincorporated fringes adjacent to large cities. These unincorporated areas were defined on the basis of housing or population density and their boundaries in general are not political but follow such identifiable physical characteristics as streets, roads, railroads, streams, etc. On the other hand, building-permit systems usually cover entire political subdivisions: cities, villages, townships, counties, etc.; it is not possible to obtain reports which segregate the building activity by urban and nonurban areas within such subdivisions.

Two-family structures are those having 1 unit above the other or 2 units on the same floor with a common entrance or common heating facilities.

Multifamily structures contain three or more dwelling units and usually have centrally controlled heating and utilities and a common entrance. In some types of apartment buildings which have individual entrances for each apartment, the units are defined as being multifamily structures because of other common features which prevent separate sale and maintenance of the individual units.

Sources

The estimates of private nonfarm housing starts are derived from two basic sources: (1) monthly summaries of building permits issued by local building officials, and (2) field surveys in a sample of non-permit-issuing areas.

(1) Practically all large cities of the United States, a high proportion of smaller cities, and numerous unincorporated towns, townships, districts, and entire counties require that a building permit be taken out before construction can be started on any type of new building and before certain types of repairs and alterations are made. The permit requirement may arise out of zoning ordinances, a building code, or both. The purpose of the permit is to insure compliance with zoning restrictions and structural requirements related to safety, fire prevention, and health considerations. The applicant for a building permit is normally required to furnish certain information regarding the proposed construction; the detail required varies among localities.

A questionnaire form (BLS 404 or BLS 404B) is mailed by the Bureau [5] each month to the building-permit-issuing officers in approximately 7,000 places throughout the country. Almost 1,000 of this number were added during a recent intensive campaign to locate, and obtain reporting from, all places having permit systems. It is believed that virtually all permit-issuing places have now been identified. The expanded coverage includes localities containing about 80 percent of the nonfarm population, 93 percent of the metropolitan nonfarm population, and 95 percent of the total urban population, based on 1950 Census figures. It is estimated that about 85 percent of nonfarm housing is built in these permit places. Reports are received in any particular month from about 9 out of every 10 places to which forms are sent.

Information is requested on the questionnaire as to the number and value of the new dwelling units for which permits were issued, by type of structure, as well as similar information for nonresidential building and for additions and alterations. The front of the form BLS 404, containing the portion relating to housing, is reproduced on page 11. Forms are mailed about the twenty-fourth of each month. Returns are usually sufficient for preliminary estimates by the twelfth of the month and for final estimates by the eighteenth or twentieth. Editing and tabulation of the data for the final detailed estimates require approximately 2 weeks more.

(2) Not all areas of the country require building permits, of course. In order to obtain an estimate of the housing activity in such nonpermit areas, on-the-spot field surveys are conducted in the nonpermit parts of 53 sample areas. Each of the 53 areas is visited once each quarter, but at each visit the number of dwelling units started in each of the three previous months is obtained. Approximately one-third of the areas are surveyed each month. Thus one group is visited in January, April, July, and October; another in February, May, August, and November; and the last in March, June, September, and December.

Field investigators obtain leads on new homebuilding from local builders, utility companies, building-supply dealers, real estate agents, and a variety of other sources. The investigator then secures information on each house or project directly from the builder or owner regarding the date construction was begun, and the number and estimated cost of units in the project. Finally, the investigator canvasses his assigned territory to determine whether he has omitted any new homebuilding begun in the three previous months. The reports of the Bureau field agents are reviewed in the Bureau's five regional offices, and at periodic intervals, an on-the-spot check is made of the completeness and accuracy of field investigations.

The Bureau derives its estimate of total nonfarm housing starts by adding the number of

[5] Except in seven States—Iowa, Massachusetts, New Jersey, New York, North Carolina, Pennsylvania, and Texas—where the State Department of Labor or other cooperating agency sends the forms directly to building officials in their State. These agencies then forward the permit information to the Bureau of Labor Statistics in Washington for use in preparing summaries and national estimates.

B. L. S. 404
(Rev. 1-1-54)

U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON 25, D. C.

Form approved.
Budget Bureau No. 44-R049.14.

REPORT OF BUILDING PERMITS ISSUED and LOCAL PUBLIC CONSTRUCTION

If possible, please return one copy on or before the 4th of the month.

FOR BLS OFFICE USE ONLY							
KARDEX		EDIT		ADD		POST	
In.	Tab.	Made	Ver.	Made	Ver.	Mach.	Hand

Please report for month of—

If no building to report this month enter "X" here ⟶ ☐ and return this form

(If above mailing address is incorrect or zone number omitted, please indicate change)

PART I—PRIVATELY OWNED

ITEM NO.	CLASSIFICATION	NUMBER OF BUILDINGS	ESTIMATED COST (Omit cents)	NUMBER OF HOUSEKEEPING UNITS	CODE
	NEW HOUSEKEEPING UNITS				
	1. One-family units, detached. (Each structure is a separate 1-family house.)				01
	2. One-family units, semidetached and row. (Each structure contains two or more housekeeping units separated by ground-to-roof party walls.)				91
	3. Two-family buildings. (Each structure contains two housekeeping units *not* separated by ground-to-roof party wall, i. e., the units have a common attic, basement, heating plant, or other common feature.) Include structures containing 1 or 2 housekeeping units plus space for business or professional use.				02
	4. Apartment buildings. (Each structure contains 3 or more housekeeping units having a common basement, heating plant, stairs, or entrance.) Include structures containing 3 or more housekeeping units plus space for business or professional use; also, apartment hotels, in which most of the space is devoted to housekeeping units. **(a) Three- and four-family**				03
	(b) Five-or-more-family				04
	Leave blank ⟶				37

ITEM NO.	CLASSIFICATION	NUMBER OF HOUSEKEEPING UNITS			CODE
		Before conversion	After conversion	Net change	
	5. HOUSEKEEPING UNITS ADDED OR LOST BY CONVERSION. Enter the total number of housekeeping units in all converted buildings *before* and *after* conversion. Enter the difference between these numbers as Net Change. Include permit value under item 10 (*a*). If no conversion permits were issued, enter "none" under Net Change.				32

ITEM NO.	CLASSIFICATION	NUMBER OF BUILDINGS	NUMBER OF DWELLING UNITS	CODE
	6. HOUSEKEEPING UNITS LOST BY DEMOLITION.			29

ITEM NO.	CLASSIFICATION	NUMBER OF BUILDINGS	ESTIMATED COST (Omit cents)	CODE
	NEW NONHOUSEKEEPING RESIDENTIAL			
	7. Hotels. Exclude apartment hotels in which most of the space is for housekeeping units. See item 4.			06
	8. Tourist cabins, courts, motels and seasonal camps.			07
	9. Other nonhousekeeping residential buildings. Include club and association buildings *with* bedrooms, such as YMCA's, service clubs and fraternity houses.			08
	Leave blank ⟶			31

ITEM NO.	CLASSIFICATION	NUMBER OF PERMITS	ESTIMATED COST (Omit cents)	CODE
	ADDITIONS, ALTERATIONS, REPAIRS AND INSTALLATIONS			
	10. Additions and structural alterations.			25
	(*a*) To housekeeping buildings (homes and apartments)			
	(*b*) To other buildings			27
	11. Repairs and improvements (with no structural change).			33
	(*a*) To housekeeping buildings (homes and apartments)			
	(*b*) To other buildings			34
	Leave blank ⟶			28
	12. Installations, mechanical (for which separate permits were issued by your office). Elevators, plumbing and electrical equipment, oil burners, stokers, water heaters, etc.			35

16—60763-1 **(OVER)**

publicly owned units started to the estimate of private starts. For public housing the concept of month of start varies somewhat according to program and sponsorship. Federally owned projects on Government installations are considered to start in the month of contract award. Projects under State and local programs are reported by BLS regional offices to start during the month construction begins. Projects under the United States Housing Act of 1949 (reported by the Public Housing Administration) are considered to start the month the "proceed order" is given.

Sampling Plan

Early in 1954 the Bureau placed in operation the present sample of 53 nonpermit areas, replacing the previous 96 county sample. In selecting this new sample an intensive analysis was made of data on housing activity available for a large number of areas for which BLS had complete reports, either from building permits or from regular quarterly field surveys. This analysis indicated that a ratio type of estimate, based on the relationship between the volume of housing starts in the nonpermit parts of an area and the volume of units authorized in the permit parts, would be approximately 50 percent more efficient than an independent estimate of the nonpermit segment. It was found that the efficiency of the ratio estimate was improved by narrowing the strata limits based on the percent of nonfarm population in nonpermit-issuing places. (That is, each stratum should contain only areas having approximately the same proportion of population in nonpermit areas.) Additional stratification by metropolitan or nonmetropolitan location and by 4 broad geographic regions was decided upon, giving 8 primary strata.

The primary sampling unit, or "p. s. u.," which was chosen consisted of a "cluster" of counties rather than a single county as was previously used. Each of the 168 Standard Metropolitan Areas made up a p. s. u. (In the case of 7 areas, whose boundaries extend across the broad region lines, the areas were split into 2 p. s. u.'s, making a total of 175.) The nonmetropolitan clusters consisted of single counties or groups of two or more contiguous counties. The clusters conformed, in general, with those established by the Bureau of the Census, with the exception that some clusters were enlarged in order to eliminate p. s. u.'s with no permit-issuing places. Since a relatively large primary sampling unit was being used, it was found that it would be advantageous to subsample minor civil divisions within some of the sample areas rather than to cover each area completely.

Thirty-four metropolitan areas and 15 nonmetropolitan clusters were removed from consideration because they were completely, or virtually completely, covered by building permits. In addition, the central city or cities were deleted from 55 other metropolitan areas because it was found that the housing volume in nonpermit suburban places was more closely related to the volume in suburban permit places than to the volume in the larger central cities.

An optimum allocation of the sample areas to the metropolitan and nonmetropolitan classifications was made. That is, the sample areas were assigned to the two segments in such a way that the derived estimate would have the minimum possible variance for the expenditure of available funds.[6] Within the metropolitan and nonmetropolitan segments the number of sample areas was then allocated to each of the four broad geographic regions in proportion to the nonfarm population in each region. The actual sample in each of the eight primary strata was then selected in the following manner. The clusters in each stratum were arrayed in ascending order by percent of nonfarm population in nonpermit areas. Each array was then subdivided into approximately equal sized substrata, the number of which was equal to the number of sample areas assigned to that stratum. One sample cluster was then drawn from each subgroup using a table of random numbers, with probability proportional to size. The measure of size used was the total nonfarm population in each cluster. The final sample consists of 53 areas, 29 metropolitan and 24 nonmetropolitan, covering 131 counties.

As part of the optimum allocation, sample areas having less than 23 nonpermit minor civil divisions were given complete coverage. Areas with more minor civil divisions were subsampled, the subsampling rate varying from two-thirds in the smaller areas to one-fourth in the larger ones.

[6] For the development and solution of the cost function appropriate to this type of design—a stratified 2-stage, cluster sample—see Hansen, Hurwitz and Madow, Sample Survey Methods and Theory, vol. 1, chap. 7, sec. 9.

In each area in which subsampling was used the minor civil divisions were classified on the basis of growth rate, urban population, and other available data into two groups: those likely to have a high building volume and those with a probable lower volume. All of the first group were listed for survey and the remainder of the subsample selected from the second group by the following procedure. The group two places were located on a map and numbered in a serpentine fashion. Starting with a random number every nth place was selected. This method was used to insure adequate geographic dispersion of the subsample.

Estimating Procedures

Two estimates of housing volume are made for each month: the preliminary and the revised estimates. Essentially the same procedures are used for both except that the preliminary estimate is not made in as great detail and is based on less complete data.

The revised, or final, estimate of private housing starts is made separately for the permit and for the nonpermit segments. Places which were identified as being permit issuing as of January 1, 1954, were classified by geographic division and State; and within each State by metropolitan and nonmetropolitan location, by size of place, and, in some cases, by high or low housing activity. In addition, the places in some of the larger metropolitan areas were grouped by individual area, by size, and activity level. In making the monthly estimates of dwelling units authorized in permit places, the building permit data reported on the form BLS 404 are tabulated for each type of structure (i. e., 1-family, 2-family, etc.) by the detailed classification outlined above. Since not all places report every month it is necessary to prepare an estimate for these nonreporting places. This is done by applying the ratio between the total number of such places in the cell and the number reporting that month to the volume of housing reported for each type of place. Virtually all places of 25,000 population or over report regularly. The proportion of reporting places in a cell is usually 75 percent or over. Places having an unusually high volume or erratic fluctuations in volume are treated separately, and special efforts are made to obtain permit reports.

The reported and estimated data are added to give State totals, by type of structure, for the volume of housing authorized. Further cumulations can be made to give any desired combinations: geographic divisions, broad regions, metropolitan-nonmetropolitan locality, and national totals. These are estimates of dwelling units authorized by permits, not of units actually started. In order to translate building-permit volume into dwelling units started, two adjustments are made: one for permits which are never used and are allowed to lapse, and the other for lag between permit issuance and start of construction.

Factors for these adjustments are based on periodic field studies in sample localities in which the Bureau investigates (1) the elapsed time between issuance of a building permit and the start of construction, and (2) the extent to which permits issued are not used. The rate of lapsed permits has varied from over 7 percent in 1946, a year of severe labor and material shortages, to between 1 and 2 percent in recent years. Approximately 65 percent of dwelling units are started in the month of permit issuance and 95 percent by the end of the 2 following months. These percentages have remained fairly stable over the past few years. Each month's estimates of dwelling units authorized is adjusted for such delays and lapses; subtractions are made for abandoned permits and for the proportion to be started in later months; additions are made for units authorized in previous months but not started until the month of reference. The starts estimate for any month is thus a total of contributions from the permit volume of that and several previous months. Separate adjustments are made for metropolitan and nonmetropolitan areas within each of the four broad geographic regions.

Estimates for nonpermit areas of the country are derived from the results of the surveys in the 53 area sample by relating the activity in nonpermit places to that in permit places. This is done as follows: in those sample areas where a subsample of minor civil divisions was taken, an estimate is first made of the housing volume in all nonpermit parts of the area. A tabulation of the volume of dwelling units authorized in the permit places in the area is also made. Both the estimated nonpermit starts and the permit authorizations are then weighted by the reciprocal of the probability used in selecting the area. These

weighted quantities for all 53 areas are then combined and an overall ratio of nonpermit starts to permit authorization is obtained. This ratio is applied to the permit estimate for the entire permit universe to derive the estimated nonpermit units started. Independent estimates for each of the eight primary strata are derived by a similar procedure and are adjusted to the national total.

Because of the "cycle" method used as an economy measure in conducting field surveys, whereby only about one-third of the areas are surveyed each month, there is a time lag of over three months before all field results are available for a specified month. In order to make some information available more promptly the *preliminary estimate* is prepared about the 11–13th of the month following the month of reference and is available for publication a few days later. By the tenth of each month a substantial number of permit reports have been received, and a special effort is made to secure data from almost all of the more important localities. Data from these reports are tabulated according to a less detailed stratification than is used for the final estimate; a geographic rather than a State classification is used and no breakdown by type of structure is attempted. The percent of change in the number of dwelling units reported between the previous and the current month for identical cities is applied in each estimating cell to the previous month's estimate for all the cities represented by that cell. By this ratio procedure a preliminary estimate is obtained of the total number of dwelling units authorized in permit areas. The usual adjustments are then made to translate this into the number of units started in permit-issuing places.

Since no field survey returns are available in time for use in the preliminary estimate, it is necessary to estimate for this segment by other methods. Ratios of nonpermit to permit activity are obtained by using the most recent ratios derived from complete survey results, modified by appropriate seasonal considerations (i. e., activity tends to drop more sharply in nonpermit than in permit areas during winter months and to rise more sharply in spring months).

Publication. The preliminary estimates, along with a limited amount of historical data, are presented in a press release each month. More detailed summaries, showing estimates by type of structure, metropolitan or nonmetropolitan location, public or private ownership, etc., are published monthly in two Bureau publications—Construction and the Monthly Labor Review—and in detailed tables prepared for less general distribution.

Limitations

Statistics on the number of dwelling units started do not measure the number *completed* in any given month. Dwelling units are usually not ready for occupancy until several months after the start of construction. Nor, as was explained earlier, can total starts be considered as equivalent to the increase in the housing inventory.

Conceptually, the series excludes all farm housing but it is not possible to adhere strictly to this distinction in practice. In survey areas the field agents are instructed to report only nonfarm housing, based on the primary source of income of the intended occupant. However, some permit officers which cover extensive farm areas, such as county and township systems, do issue permits for farm houses. This relatively small segment cannot be isolated and is included with the nonfarm housing volume. It tends to be minimized by the fact that some States specifically exempt farm construction from permit requirements, and by the concentration of county and township systems in rapidly growing metropolitan areas.

Reliability

Approximately 85 percent of the nonfarm estimate is derived from building permits. This segment consists largely of reported data and contains little estimate. It is subject to some nonsampling errors due to incorrect reporting by building officials and possible omission of some construction. Extensive work with local permit data by the Bureau has, however, failed to uncover any serious reporting inaccuracies and a limited number of permit adequacy checks have indicated that only a negligible percentage of new dwelling units is started in permit areas without a permit being taken out. The Bureau maintains a continuing program to help reporting officials submit accurate and consistent reports.

The sampling error in the nonpermit segment is estimated to be between 5 and 7 percent depending on the month involved. However, since this segment comprises only about 15 percent of the total private starts estimate, the overall effect due to this sampling error would be about 1 percent. In probability terms this means that the chances are about 19 out of 20 that a total nonfarm housing count, including a complete enumeration of the nonpermit segment, would not differ from the estimate by more than plus or minus 2 percent (twice the sampling error).

Study of the revisions that have occurred between the preliminary and the final estimates shows that they are primarily caused by the difference between the estimate for nonpermit places based on field survey data and the projected figure used for the preliminary estimate. The adjustments in the total estimate have seldom exceeded 6 percent and for most months they have been less than 4 percent.

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Chapter 3. Estimating Expenditures for New Construction*

Background and Uses

The estimates of expenditures for new construction prepared jointly by the Bureau of Labor Statistics and the Business and Defense Services Administration of the U. S. Department of Commerce are widely used by private business analysts and government economists as measures of construction activity. They are also important components in more comprehensive series, such as the National Income and Gross National Product series, which reflect the state of the general economy.

The expenditures estimates are frequently referred to as a "public policy" construction series because of their wide use by government bodies in studies relating to full employment, public works, Federal-aid, and similar legislation. The data are also used by private research organizations, industrial firms, and the like, for broad market analysis and production control. A lesser known use has been as a basis for estimating trends in the volume and distribution of the total work force on new construction—a difficult area for measurement—by the application of factors expressing the value of work placed per man-month on various types of construction.[1]

The uses of the expenditures estimates are distinct from those of the contract-award or building-permit data. The latter indicate the value of construction scheduled for early start, and are therefore useful in forecasting construction activity. The expenditures estimates, on the other hand, indicate current activity and are therefore particularly suitable for use in making comparison with related concurrent data, such as those for employment and consumption of material. Moreover, for some kinds of historical analysis, the expenditures type of construction data is frequently easier to use because of its inherent smoothness of trend as compared with an award series, in which the entire cost of a project is necessarily included in a single time period.

These estimates represent the monetary value of the construction work performed within the continental United States during the periods covered. This monetary value is equivalent to the cost of the materials put in place or otherwise consumed, the wages of the workers who placed the materials, and appropriate charges to the work for equipment depreciation and other overhead costs and for profit on the construction operation.

Annual estimates are available beginning with 1915; monthly figures, from January 1939.[2] This series is an extension of yearly estimates developed in the late 1930's in the Bureau of Foreign and Domestic Commerce of the U. S. Department of Commerce and presented in Construction Activity in the United States, 1915–37, Domestic Commerce Series—No. 99 (out of print). For some years after the publication of the original series, several agencies prepared a number of independent, and often conflicting, projections of the series. In 1945, the Bureau of the Budget, through its Division of Statistical Standards, assigned the preparation of an official Government estimate to the Bureau of Labor Statistics and the Bureau of Foreign and Domestic Commerce[3] jointly, and delineated the responsi-

*Prepared jointly by Roland V. Murray of the Bureau's Division of Construction Statistics and Bruce M. Fowler of the Building Materials and Construction Division of the Business and Defense Services Administration, U. S. Department of Commerce.

[1] See Chap. 4, Labor Required for New Construction, in this bulletin (pp. 30-32).

[2] Preliminary monthly estimates of construction expenditures, with an interpretative text, are released to the press jointly by the two agencies responsible for them about a week after the end of the month of reference. These first estimates are subject to revision in each of the 2 succeeding months as additional information becomes available. The figures appear later, in somewhat expanded form, in separate monthly publications of the two agencies: Construction and the Monthly Labor Review of the Department of Labor, and Construction and Building Materials and the Survey of Current Business of the Department of Commerce. Complete historical series, with statements of sources, methods, coverage, etc. are available in annual publications of the two agencies: New Construction: Expenditures and Labor Requirements of the Department of Labor and the Statistical Supplement to the monthly construction publication of the Department of Commerce.

[3] Owing to organizational changes affecting the Building Materials and Construction Division of the Department of Commerce, the responsibilities of the former BFDC in the preparation of the figures rested with the National Production Authority during its existence from 1950 to 1953, and now rests with the BDSA.

bilities of each agency in the preparation of the statistics.

Responsibility for estimating private housekeeping residential construction and all public construction was given to the Bureau of Labor Statistics; and for estimating all other private construction, primarily private nonresidential building, farm construction, and privately owned public-utilities construction, to the Bureau of Foreign and Domestic Commerce. Individual responsibilities are for the work directly involved in developing sources and processing the data. The two agencies take joint responsibility for the overall validity of the estimates, and the work of each agency in the preparation of the series is at all times subject to the review of the other.

Concepts and Scope

In these estimates, "new construction" includes the engineering, design, and production of all fixed works and structures, whether by contract or "force-account," [4] and whether under conventional or work relief programs. Major additions and alterations are covered, but maintenance and minor repair work are excluded.[5] The estimates cover buildings; other structures, such as dams, levees, and bridges; and nonstructural works such as airfields, highways, canals, and navigation channels. They include the installed value of equipment generally considered an integral part of a structure and commonly included in the contract price, such as plumbing and heating equipment and elevators. They exclude separable equipment, such as production machinery, power-generating equipment, and furnishings. Excluded also are the value of raw land but not the costs of land improvements.

Several types of activity which have some of the characteristics of construction are excluded because they are primarily industrial or agricultural operations. Chief of these are: (1) oil and natural gas well drilling; (2) mining operations (except for the construction of mine buildings above ground); (3) shipbuilding; and (4) farm work which is an integral part of farm operations, such as terracing and individual irrigation ditches.

Following general revision of the estimates in 1950, the entire series purports to represent the total value of new construction, as previously defined, within continental United States.[6]

The following tabulation lists the types of new construction for which expenditures estimates are regularly published. Somewhat greater detail is available on an annual than on a monthly basis.

Type of construction	*Period for which available* Annually	Monthly
Total new construction	x	x
Private construction	x	x
Residential building (nonfarm)	x	x
New dwelling units	x	x
Additions and alterations	x	x
Nonhousekeeping	x	x
Nonresidential building (nonfarm)	x	x
Industrial	x	x
Commercial	x	x
Warehouse, office, and loft buildings	x	x
Stores, restaurants, and garages	x	x
Other nonresidential building	x	x
Religious	x	x
Educational	x	x
Social and recreational	x	x
Hospital and institutional	x	x
Miscellaneous	x	x
Farm construction	x	x
Operators' dwellings	x	------
Service buildings	x	------
Public utilities	x	x
Railroad	x	x
Telephone and telegraph	x	x
Telephone	x	------
Telegraph	x	------
Other public utilities	x	x
Local transit	x	------
Petroleum pipe line	x	------
Electric light and power	x	------
Gas	x	------
Manufactured	x	------
Natural	x	------
All other private	x	x
Sewer and water	x	------
All other	x	------
Public construction	x	x
Residential building	x	x
Nonresidential building	x	x
Industrial	x	x
Educational	x	x

[4] Force-account work is done, not through a contractor, but directly by a business or Government agency using a separate work force to perform nonmaintenance construction on the agency's own properties.

[5] The Business and Defense Services Administration prepares annual estimates of total construction activity by combining the new construction activity estimates with separate estimates of maintenance and repair. This series is available by years from 1915.

[6] A previous technical note, published in the Monthly Labor Review in February 1950, and reprinted in Bureau of Labor Statistics Bull. No. 993, Techniques of Preparing Major BLS Statistical Series, discussed the coverage and methodology applicable to the series at that time.

Type of construction	Period for which available: Annually	Monthly
Public construction—Continued		
Nonresidential building—Continued		
Hospital and institutional	x	x
All other nonresidential	x	x
Public administration	x	------
Social and recreational	x	------
Miscellaneous	x	------
Military facilities	x	x
Highway	x	x
State	x	------
County	x	------
Municipal	x	------
Federal	x	------
Sewer and water	x	x
Sewage disposal	x	------
Water supply	x	------
Miscellaneous public service enterprises	x	x
Conservation and development	x	x
Bureau of Reclamation	x	------
Army Engineers	x	------
Tennessee Valley Authority	x	------
Other	x	------
All other public	x	x

Sources and General Estimating Methods

Ideally, construction expenditures information would be based upon monthly reports from each construction project providing a cost accounting figure combining the wages of the workers on the project, the cost of the materials which they placed, and appropriate charges for overhead and profit. Although such figures exist for many projects, the cost of collecting merely an adequate sample would greatly exceed the Federal resources currently made available for these estimates. Therefore, the estimates are derived from data collected from a wide variety of secondary sources and from primary source material originally intended to serve other purposes.

Few of these sources are static. In fact, the outstanding characteristic of the list of such sources is its constant change in content. This results from: the continual search for more complete, accurate, and timely information than previously available; the undertaking and completion of public works programs; and the changes in operating and reporting requirements of Federal construction and regulatory agencies. It is therefore emphasized that the specific sources and methods described in the following section were those in use in the spring of 1954. No attempt has been made to discuss significant improvements in techniques which were in the planning stage at that time.

Three general methods are used in developing the estimates from the various source materials. In order of preferred methodology, they consist of: (1) summarizing physical observations of construction underway (or the cost records which reflect such observations); (2) summarizing fiscal statements or reports on additions to plant; and (3) converting data on work started to estimates of work put in place.

(1) The summaries made from actual observations of progress on individual construction projects are based primarily on the operating reports of the Federal agencies supervising the construction of public works, such as military airfields, veterans' hospitals, flood control dams, and the like. In designing such reports, the operating agency and the Division of Statistical Standards of the Bureau of the Budget consider the Bureau of Labor Statistics' needs for expenditures data.

Many non-Federal public construction agencies make similar reports, but the systematic collection and use of them is not considered feasible by the Bureau at present. Except in the case of the New York City Housing Authority, such progress reports are therefore used only with respect to Federal construction for which they are a readily available and accurate source of information. They usually reflect the observation, or in some cases the actual measurement, by a Federal engineer of the status of a construction job at uniform intervals (primarily to determine the payments due to the contractor for work accomplished during the interval). Tabulations of data for all of the individual jobs in a program for which progress reports are available are made in some cases by the construction agency and in others by the Bureau of Labor Statistics.

(2) The summaries of fiscal data are based on the accounting records of private companies such as privately owned public utilities, and of public agencies which are required, in the public interest, to maintain financial records. The figures reflect disbursements for construction, and are adjusted roughly whenever possible for deferred charges, such as for large purchases of materials to be used in a later period. In a few instances, special summary tabulations must be

prepared from detailed records. These are made in some instances by the trade association involved and in others by the two Government agencies responsible for the statistics. Generally, however, suitable basic data are in published form. For example, some are summarized by trade associations for presentation to the public in yearbooks or other periodical reports, and certain data are summarized by Government regulatory agencies for publication in their annual reports.

A special case is the table on appropriations and expenditures for civil public works in the annual Budget of the United States, made available at the time of the President's annual budget message to Congress. It consists of a tabulation of checks issued against construction appropriations. After adjustment to eliminate operation, maintenance, equipment procurement, and other nonconstruction items, these data form the basis of the estimates for construction by a few Federal agencies from which monthly data are not obtained at present.

(3) Conversion of work started to estimates of work put in place is the most important of the three methods of deriving construction expenditures estimates, from the standpoint of the dollar volume of the expenditures categories for which it is used. The value of work started each month is spread over a period of time according to predetermined patterns. Each pattern is a series of percentages which represent the probable proportion of the total cost of construction which will be performed in each month of the known or estimated duration of a particular project or group of projects. On a given type of construction, therefore, the expenditures for any month are the sum of the estimated expenditures during that month on all projects estimated as under way, according to the length of the expenditures pattern.

Obviously, the use of these three different methods of estimating expenditures raises problems of comparability, both as to timing and content. Timing is a problem only in month-to-month comparisons. Over longer periods, the three methods should give similar results. Comparability in coverage is a more difficult problem. Therefore, all source material is carefully examined and adjustments are made in it, or in the expenditures estimated from it, to insure that the results conform with the general concepts previously outlined.

The first and third of these three general estimating methods yield monthly results directly. The second, fiscal data, are usually available only on an annual basis. Therefore, the monthly figures are obtained by projecting the levels established for the previous year, month by month, on the basis of the known movements of a related series. At the year's end, an adjustment is made to the new benchmark. This correction of level is only one of several types of revision which may be introduced during a comprehensive annual re-examination of all components of the estimates. These revisions frequently affect individual series over periods longer than a year.

The table on the following page shows, for each class of construction, the type and agency source of the basis for the estimates. These basic data are adjusted in varying degrees by the agencies responsible for the construction expenditures series.

Specific Estimating Procedures—Type of Construction

Private Construction. The estimating procedures for the private construction segment are as follows:

Residential building (nonfarm). For new dwelling units, the monthly reports to the Bureau of Labor Statistics on the value of residential building authorized by local building permits are adjusted to reflect the construction cost of new permanent nonfarm dwelling units started [7] in all permit-issuing places. Inflating factors are applied to compensate for the understatement of cost inherent in permit valuation. These are revised periodically on the basis of information obtained from field surveys in which the permit valuation and the construction cost reported by builders and contractors are compared for a large sample of projects.

Construction cost of units started in nonpermit-issuing places is based on monthly field studies. Estimated construction costs are secured from builders and contractors for a large number of dwelling units in sample counties throughout the country. From these an average construction cost for all units started in nonpermit-issuing areas is derived.

[7] See Chap. 2, Estimating National Housing Volume, in this bulletin (pp. 8–15).

Sources used in estimating expenditures for new construction, by ownership, type of construction, and source of public funds

Ownership and type of construction	Source of public funds	Basis of expenditures estimate [1]	
		Type of basic data [2]	Source of data (organization responsible for collection)
PRIVATE			
Residential building (nonfarm):			
New dwelling units		National housing starts	Bureau of Labor Statistics, U. S. Department of Labor
Additions and alterations		Building permits	Do.
Nonhousekeeping		Contract awards	Business and Defense Services Administration,[3] U. S. Department of Commerce.
Nonresidential building (nonfarm): all types		do	Do.
Farm construction: all types		Expenditures surveys [4]	Agricultural Marketing Service, U. S. Department of Agriculture.
Public utilities:			
Railroads		Fiscal records	Interstate Commerce Commission.
		do	Association of American Railroads.
Telephone and telegraph		do	American Telephone and Telegraph Co.
		do	Western Union Telegraph Co.
Other public utilities:			
Local transit		do	American Transit Association.
Petroleum pipeline		do	Interstate Commerce Commission.
Electric light and power		do	Federal Power Commission.
Gas		do	American Gas Association.
All other private		Contract awards	Business and Defense Services Administration.[3]
PUBLIC			
Residential building	Non-Federal	Progress reports	New York City Housing Authority.
		Housing starts	Bureau of Labor Statistics.
		Contract awards	Business and Defense Services Administration.[3]
Nonresidential building:			
Industrial	Federal	Progress reports	Atomic Energy Commission.
			Department of Defense:
		do	Army—Office of Chief of Engineers.
		Progress reports *	Navy—Bureau of Yards and Docks.
		do *	Air Force—Air Materiel Command.
Educational	do	do *	Housing and Home Finance Agency.
		do *	General Services Administration.
	Non-Federal	Contract awards	Business and Defense Services Administration.[3]
		Progress reports *	Housing and Home Finance Agency.
Hospital and institutional	Federal	Progress reports	Veterans Administration.
		Progress reports *	General Services Administration.
		do *	Public Health Service, Department of Health, Education, and Welfare.
	Non-Federal	Contract awards	Business and Defense Services Administration.[3]
		Progress reports *	Public Health Service.
Other nonresidential building	Federal	do *	General Services Administration.
		Fiscal records	Federal agency supervising construction and the Bureau of the Budget.
		Contract awards	Federal agency awarding contract.
	Non-Federal	do	Business and Defense Services Administration.[3]
Military facilities	Federal		Department of Defense:
		Progress reports	Army:
		Contract awards *	Office of Chief of Engineers.
		Progress reports *	National Guard Bureau.
		do *	Navy—Bureau of Yards and Docks.
		Contract awards *	Air Force—Air Materiel Command.
			U. S. Coast Guard.
Highways	Federal	Progress reports	Bureau of Public Roads, U. S. Department of Commerce
		Financial records	Do.
	Non-Federal	Progress reports	Do.
		Financial records	Do.
		Contract awards	Do.
Sewer and water	Federal	Progress reports *	Housing and Home Finance Agency.
		do *	Public Health Service.
	Non-Federal	Contract awards	Business and Defense Services Administration.[3]
		Progress reports *	Housing and Home Finance Agency.
		do *	Public Health Service.
Miscellaneous public service enterprises	Federal	do *	Civil Aeronautics Administration, U. S. Department o Commerce.
	Non-Federal	Contract awards	Business and Defense Services Administration.[3]
		Progress reports *	Civil Aeronautics Administration.
Conservation and development	Federal	Progress reports	Office of Chief of Engineers.
		do	U. S. Bureau of Reclamation, U. S. Department of Interior.
		Fiscal records	Tennessee Valley Authority.
		do	Federal agency supervising construction and the Bureau of the Budget.
All other public	Federal	do	Bureau of the Budget.
	Non-Federal	Contract awards	Business and Defense Services Administration.[3]

[1] For the methods of incorporating the various types of data into the overall expenditures estimates, see the following section, "Specific Estimating Procedures."

[2] Data are in the form of summations by the collecting agency, except where the asterisk indicates tabulation by BLS.

*See footnote 2 above.

[3] The Building Materials and Construction Division of BDSA, which uses as a source F. W. Dodge Corporation and other contract awards data.

[4] Nonperiodic sample surveys of farm construction expenditures. In nonsurvey years, benchmarks are moved in accordance with related economic data.

The permit and nonpermit segments are then combined to give a total estimated construction cost of the dwelling units started in the given period. A further adjustment is then applied to this construction cost to cover architect and engineering fees, and that part of site development costs which are not accounted for elsewhere (expenditures for streets, sewers, sidewalks, curbs, and gutters which are built by municipalities are included under public construction).

An expenditure pattern is then applied to this adjusted cost figure to estimate the amount of work put in place in the months following start of construction. This pattern is derived from: (1) special studies of construction time to obtain a distribution of completions in the month of start, in the following month, and so on; and (2) studies of the progress on actual jobs to develop typical patterns for jobs of 2 months' duration, 3 months' duration, and so on. The final expenditure pattern is an average of these patterns for different lengths of construction time weighted by the proportion of the units started which are completed in these various lengths of time.

Residential additions and alterations are also derived from building-permit data. Estimates of activity in permit-issuing places are adjusted to cover all nonfarm areas, using the ratio of activity in permit- to nonpermit-issuing places derived for new housekeeping construction. A further substantial adjustment, based on experience, is made to allow for understatement of true construction cost and for work that is done without permits in permit-issuing places. The resulting estimate of the value of work started is distributed by means of an expenditure pattern to estimate the value of work put in place in the months following start of construction. Because of the character of the source of the basic data, these estimates relate primarily to those types of residential additions and alterations which require building permits, i. e., mostly those involving structural change. They do not include a sizable volume of minor repairs, improvements, and maintenance work which is outside the coverage of the expenditures series.

Nonhousekeeping residential construction expenditures cover hotels, dormitories, and tourist courts, and are estimated in the same manner as described below for private nonresidential building.

Nonresidential buildings (nonfarm) are covered in separate estimates made for each of the following types of new private nonresidential buildings: (1) industrial; (2) warehouse, office, and loft buildings; (3) stores, restaurants, and garages; (4) religious; (5) educational; (6) social and recreational; (7) hospital and institutional; and (8) miscellaneous.

Estimates of expenditures for each of these categories are derived by distributing the value of construction started each month over the period during which the work is presumed to be done. The data on the value of work to be started are based primarily on the statistics of contracts awarded in the 37 eastern States compiled by the F. W. Dodge Corporation.[8] However, the following adjustments are required in the Dodge data in order to arrive at estimates of the value of work actually started throughout the country:

(1) Cancellations: A contract for construction may be canceled later or indefinitely postponed. In the Dodge reports, adjustments for cancellations and corrections are made in data for the month in which cancellations or corrections are ascertained, rather than in data for the month in which the original entry was made. Where such cancellations or corrections would significantly affect measurements of the trend of construction activity, it is necessary to carry them back into data for the month in which the contract awards were reported.

(2) Undercoverage in 37 eastern States: An adjustment is made to allow for projects not included in the Dodge reports. The omissions are chiefly smaller projects and force-account work. The adjustment, of necessity, involves considerable judgment because there has never been a complete enumeration or controlled sampling of such projects. It is based upon analyses of the techniques employed by Dodge in the collection and processing of contract-award information and upon comparison with fragmentary data developed from other sources, such as construction trade journals.

(3) Expansion to cover 11 western States: Since the Dodge reports cover only the 37 eastern

[8] The Dodge data are prepared monthly by the firm's Statistical and Research Division, as a byproduct of its daily news reporting service. Reports are obtained by a staff of individuals who interview owners, architects, engineers, contractors, financial institutions, real estate brokers, and others able to supply reliable information on the awarding of construction contracts.

States, they do not reflect contracts awarded in the 11 States in the Rocky Mountain and Pacific Coast regions. Building-permit data are available, however, for practically all urban areas in the United States. The percentages of the United States totals indicated in these building-permit data as being in the western States are used as raising ratios to expand the 37 State totals to estimated United States totals for each type of private nonresidential building. Because building permits cover only a part of all private nonresidential construction work started, with the coverage varying considerably among the various types of construction and from one period of time to another, the results are checked and augmented whenever possible through the use of reports on construction contract awards which appear in a number of construction trade periodicals.

(4) Duplication of data on public utility buildings: Offices, warehouses, and other buildings constructed by public utilities are included in the total value of construction reported by the various utilities and are also included in Dodge reports for nonresidential buildings. To eliminate this duplication, estimates for buildings constructed by public utilities are subtracted from total values of warehouse, office and loft buildings in the private nonresidential building segment. Thus, an office building constructed by an electric power company is classified, not under nonresidential building, but under utility construction.

(5) Translation of contract awards to work started: The Dodge collection procedures produce reports of contract awards due for early start. The awards reported for a given month are therefore used as construction starts in the following month.

Estimates thus obtained of the total value of new work started are converted to estimates of the value of work put in place each month by the application of typical progress patterns. From past surveys of actual construction projects, several activity patterns have been developed showing for each type of building the probable percentage of total cost which will be placed each month, taking into account the average size of project and the season in which work is begun. These patterns, which tend to become obsolete with technological changes in the industry, are revised periodically as funds for this work are made available.

For *farm construction*, annual estimates of total expenditures on farm buildings and a breakdown of the total as between expenditures on operators' dwellings and expenditures on other farm structures are prepared by the Agricultural Marketing Service of the Department of Agriculture.[9] They are based chiefly on data from sample surveys of construction expenditures of farm operators in 1934–37, 1939, 1946, and 1949. Estimates for other years are made by interpolation and extrapolation, based in part on inference from data on farm electric lighting systems, silos, domestic water systems, etc., reported in the annual Census of Manufacture and Sale of Farm Machinery and Equipment. The bulk of the dollar amounts involved, however, for other than benchmark years represents approximations based on changes in indices of farm construction costs and in such indicators as estimated consumption of lumber on farms, sales of building materials in rural areas, and nonfarm residential construction. The separation of estimated expenditures for maintenance and repairs from new construction expenditures is based upon relationships indicated in some of the source material. Current monthly estimates of new farm construction are prepared by the Department of Commerce by projecting annual estimates for the preceding year on the basis of the trend of farm income and applying a seasonal pattern to the annual totals.

For *public utilities construction*, estimates of expenditures are made basically from financial data showing outlays for construction. Since financial reports usually are made up sometime after the close of a year, it is necessary to extrapolate from other data during the current year in order to provide preliminary monthly estimates; these are subject to adjustment when complete financial data become available. Sources of financial statistics and bases used for extrapolation in preparing estimates of construction by various major classes of privately owned public utilities are described below:

(1) *Railroads.* Final estimates are based on an annual summary of construction expenditures prepared by the Interstate Commerce Commission from reports to that agency by all Class I railroads. Construction expenditures by Class I railroads are

[9] As described in Agricultural Estimating and Reporting Services of the U. S. Department of Agriculture, Miscellaneous Publication No. 703, 1949.

adjusted upward to allow for construction by all classes of railroads. Provisional data compiled monthly by the Interstate Commerce Commission are used for extrapolation to prepare preliminary monthly estimates. These preliminary estimates are first adjusted shortly after the close of the year when the annual report of the Bureau of Railway Economics of the Association of American Railroads becomes available. They are subject to further adjustment to correspond with the official figures of the Interstate Commerce Commission which are issued subsequently.

(2) *Local transit.* The Transit Fact Book, annual publication of the American Transit Association, provides the basic source for estimates of capital and maintenance expenditures of transit companies in the United States. Monthly extrapolations are based on the trend shown by other public utilities.

(3) *Petroleum pipelines.* Annual reports by oil companies covering their capital expenditures filed with the Interstate Commerce Commission form the primary basis for final estimates. These reports must be adjusted to eliminate purchases of existing lines and to allow for expenditures of companies not required to file reports with the Interstate Commerce Commission. Monthly extrapolations are made on the basis of the trend shown by Dodge contract-award data and by quarterly data of the Securities and Exchange Commission.

(4) *Electric light and power.* Annual reports to the Federal Power Commission by Class A and B electric utilities are used to prepare final estimates. These reports are adjusted to exclude purchases of existing facilities and to allow for construction by small companies not required to file reports. Monthly extrapolations are based on the trend shown by Dodge contract-award data and by quarterly reports of the Securities and Exchange Commission on capital expenditures of utility companies.

(5) *Gas.* Annual data published by the American Gas Association are the basis for final estimates. They cover both manufactured and natural gas facilities and they include gas transmission lines as well as local distribution lines. The A. G. A. data are adjusted to eliminate manufacturing and pumping machinery and equipment purchases. Monthly estimates are made by extrapolations based on the trend of Dodge contract awards and on quarterly data compiled by the Securities and Exchange Commission on capital expenditures of utilities.

(6) *Telephone and telegraph.* Monthly estimates of new construction expenditures by the entire telephone industry in the United States are used as prepared by the American Telephone and Telegraph Company. The A.T.&T. summarizes reports from member companies of the Bell System and includes an estimate of construction by independent companies. No futher adjustments are necessary.

Monthly statements of construction expenditures by the Western Union Telegraph Company are used as received from the company.

For *all other private construction,* expenditures are estimated from the same sources, and in the same general manner, as described for private nonresidential building.

Public construction. Estimates of expenditures for public construction are obtained by combining separate estimates for two components: Federal construction and all other public construction (i. e., State, county, and municipal). Monthly information currently available on Federal construction is generally more satisfactory than information on State and local public construction; the Bureau of Labor Statistics prepares a separate report of monthly Federal expenditures. The following section describes, for each category of public construction, the methods of estimating first the Federal, and then the non-Federal component, on the basis of the source of the construction funds.[10]

Residential building by the Federal Government, except the temporary housing currently nearing completion under the Defense Housing Program (P. L. 139), has recently been confined to military

[10] The main division in construction expenditures is between private and public projects. It is based on the ownership of the facilities under construction. Within the public category, however, two types of division between Federal and other public construction is possible, because of the grants of funds under Federal-aid programs. One is on the basis of ownership; the other, which is that used in this description of methods, is on the source of the construction funds. To illustrate, the Federal-Aid Highway Program provides Federal funds for State-owned highway construction. Therefore, State expenditures for highway construction presented under an ownership classification exceed those for the same construction under a source-of-funds classification by the amount of the Federal grants.

The foregoing applies only to Federal grants. Federal loans for construction, such as those by the Rural Electrification Administration for the extension of power facilities, are considered to be the funds of the agency receiving them (i. e., the owner of the facilities) and therefore do not give rise to different results under the two classification systems.

installations, and to such other Federal property as construction camps and project control areas. Expenditures for such construction are included in the "Military facilities" or "Conservation and development" categories listed on page 18. All data currently reported in the public residential classification, therefore, can be considered to represent outlays by non-Federal public agencies. It should be noted that the actual construction expenditures for public housing built by local housing authorities under the Federal low-rent program (U. S. Housing Act of 1949) are from funds raised locally. Federal participation in this program is limited to aid in planning and to annual grants for operation, as required, to assure low rentals.

By far the most important of the local housing agencies has been the New York City Housing Authority from which construction expenditures data are collected monthly. These data are a reconciliation of estimates by the contractor and by NYCHA engineers of the amount of work placed, and are prepared primarily to determine monthly payments to the contractors. For the smaller programs in other places, estimates are made by applying typical residential construction patterns to data collected by appropriate Bureau of Labor Statistics regional offices on the cost and estimated start and duration of the projects. Estimates for the relatively small amounts of nonhousekeeping public residential construction, principally college dormitories, are based on a distribution of contract-award data.

Nonresidential building data are derived for each type of construction as follows:

(1) *Industrial.* Federally owned and financed industrial plants were of minor importance before World War II. During and since that period, construction of such facilities has fluctuated widely, tied closely to international events. At the present time, the major portion of the annual expenditures are for the construction of facilities for the Atomic Energy Commission. The remainder are for plants built by the military establishment. In all cases, expenditures estimates are based on monthly construction progress reports made available to the Bureau of Labor Statistics by the administering agencies. The only routine adjustment of the reported data is an inflation for architectural and administrative costs in the reports by the Atomic Energy Commission and Bureau of Yards and Docks. However, the reported monthly figures occasionally show distortions because previous errors in appraising progress are usually reflected in the data for the current month. The report for any given month may therefore require adjustment to present a trend consistent with seasonal and other factors. To maintain correct levels, totals of the expenditures as reported and as used are reconciled at quarterly intervals.

The relatively small amounts of non-Federal public industrial construction are included in miscellaneous nonresidential building by the method described below for non-Federal nonresidential building.

(2) *Educational.* The Federal component of this category consists of: (a) construction under the Federal School Construction Program; [11] and (b) construction of an occasional specially authorized educational project. (Military training buildings are included under military facilities.) Construction of the specially authorized projects is usually under the supervision of the Public Buildings Service, and copies of progress reports to that agency are supplied to BLS for tabulation. The Federal School Construction Program is, however, a grant-in-aid program, and as such presents special estimating problems. Construction expenditures for the program as a whole, and for the Federal contribution, are summarized by BLS from individual project progress reports prepared at the site by HHFA engineers and forwarded to that agency's Washington office. The Federal contribution is combined with the outlays on the PBS projects to obtain the Federal component of the total public educational construction expenditures.

As with most non-Federal public construction which is not federally aided, the expenditures for locally financed educational facilities are estimated, in general, by distributing the dollar value of contracts awarded over a number of months according to a typical pattern developed from experience records for actual construction projects. The contract-award series used is that compiled by the Business and Defense Services Administration of the U. S. Department of Commerce for

[11] The program authorized by Public Law 815, 81st Congress, to provide assistance to local educational agencies for construction of schools in areas affected by Federal activities. The program is administered by the Office of Education, which uses the services and facilities of the Housing and Home Finance Agency to carry out its responsibilities.

State and local public construction, using information collected by the F. W. Dodge Corporation in the 37 eastern States.[12] To obtain data for the noncovered western States and to supplement Dodge coverage in the eastern States, the BDSA utilizes information from other construction news sources, both private and public. The Bureau of Labor Statistics adjusts the expenditures estimates derived from the distribution of contracts awarded to compensate for undercoverage, to reflect normal seasonality and to eliminate the duplication present when some of the contracts represent work under a Federal-aid program, for which the expenditures are obtained from progress reports.

These expenditures estimates for school construction financed without Federal aid are combined with the estimates of State and local funds contributed to the Federal School Construction Program to obtain the non-Federal component of the total public educational construction expenditures.

(3) *Hospital and institutional.* The Federal component of this category reflects two major programs of hospital construction—the Veterans Administration Program and the National Hospital Program [13]—and occasional individual projects such as the Washington, D. C., Hospital Center. Construction of the individual projects is generally under the supervision of the Public Buildings Service, and copies of project progress reports to that agency are supplied to the Bureau of Labor Statistics for tabulation. Estimates for the construction of veterans hospital facilities are also based on project progress reports, but in this case tabulation is by the Veterans Administration.

The National Hospital Program is a Federal-aid activity, and expenditures under it are estimated from progress reports collected by the State agencies supervising the program and submitted to the Hospital Facilities Division of the Public Health Service, which makes them available to BLS for tabulation. The method of integrating these expenditures with those for independently financed State and local construction (obtained by a distribution of the BDSA contract-award data) and with those for direct Federal construction is similar to that described for educational construction.

(4) *All other nonresidential.* Separate expenditures estimates are prepared for each type of building in this category: Social and recreational, public administration, penal and corrective, and miscellaneous. The Federal expenditures for these types of construction are relatively small, and are frequently included in other major categories (recreational buildings for military personnel, for example, are reported under military facilities). It has therefore been found practicable to present Federal expenditures for all other nonresidential building in only two subcategories: public administration and miscellaneous. The former covers construction by Public Buildings Service and frequently by the Architect of the Capitol for the provision of office facilities. The latter includes principally construction of civilian storage and research facilities by a considerable number of Federal agencies, some of which engage only occasionally in construction activities. For those agencies which supervise sizable and continuing programs, such as Public Buildings Service and the National Advisory Committee for Aeronautics, procedures have been established for obtaining progress reports or statements of payments to contractors. For the other agencies, estimates are based on annual expenditures data from the Budget of the United States, and on contract-award information reported by the agency to the Bureau of Labor Statistics.

Estimates of expenditures for State and local other nonresidential building are obtained by a distribution of the BDSA contract award summaries, with the usual adjustments to compensate for undercoverage and to reflect normal seasonality.

For *military facilities*, the expenditures reported represent the volume of all new construction, regardless of type, at Federal military installations, and of new construction financed wholly or in part with Federal funds on State-owned military sites. The relatively small amount of military construction financed exclusively by the States (armories, rifle ranges, and the like) are included with other public construction categories according to type of construction.

The data for military facilities construction administered by the Office of the Chief of Engineers, Department of the Army, and by the Bureau

[12] See footnote 8.

[13] The construction program authorized by the Hospital Survey and Construction Act of 1946, Public Law 725, 79th Congress.

of Yards and Docks, Department of the Navy, are based on monthly progress reports. These reports reflect the observation or the actual measurement by service engineers of the volume of work accomplished during the month. Data for Army construction are obtained from a Corps of Engineers monthly publication presenting a listing tabulation of progress by individual project. Data for Navy construction are tabulated by BLS from copies of monthly reports prepared in the field offices of the Bureau of Yards and Docks showing progress on individual contracts. The figures for Navy projects require an inflation for architectural and administrative costs, and those for both agencies occasionally require adjustment, within the limits of the reported quarterly totals, to correct distorted monthly trends, as described for public industrial construction.

Relatively minor amounts of construction are incorporated in the military facilities category for work performed under the direct jurisdiction of the Department of the Air Force and the National Guard Bureau. Direct Air Force construction consists of works of a highly specialized nature and a program of jobs termed "Major repairs and minor (new) construction." The data for these are obtained annually, based on financial records. Monthly figures are obtained by dividing the annual figures by twelve and adjusting for seasonality. National Guard estimates are obtained by distributing monthly contract-award data.

Highway construction expenditures estimates are the sum of five components—expenditures on the Federal-Aid Highway Program,[14] on State highways (including toll facilities) independent of the Federal-aid program, on county roads, on municipal streets, and on roads on Federal lands. Satisfactory monthly data are currently available for only one of these components—the Federal-aid program, which accounts for roughly one-third of total highway work. For this program, estimates of the value of work actually placed each month are available, based on observations by engineers of the Bureau of Public Roads, U. S. Department of Commerce. The latter agency tabulates these data for internal use, primarily to determine the "earnings" of States under the program, and supplies pertinent aggregates for the expenditures estimates, showing Federal grants separately. These grants are added to the expenditures for highway construction on Federal lands, derived in the same manner as described below for State and local work, to obtain total Federal expenditures for highway construction.

The estimates for components of highway construction not federally aided are derived from the Bureau of Public Roads annual summaries of expenditures for highway construction according to Government jurisdiction. These are based primarily on special financial reports submitted to the BPR by the State highway departments.

These annual totals are distributed by month on the basis of the reported monthly progress on Federal-aid work by use of ratios of the reported expenditures to the corresponding moving-average values.

Current monthly estimates for these non-Federal-aid components are in effect extrapolations of the previous year's figures. Current levels are established by: (1) a forecast prepared by BPR from reports of anticipated expenditures by State highway departments; and (2) BPR tabulations of contracts awarded by State highway departments. Trends are based on reported progress of the work on Federal-aid jobs.

The *sewer and water* expenditures estimates are confined to projects which are non-Federal in nature. The small amount of sewer and water construction at Federal installations is included with other major types of construction. The Federal component of this category therefore consists only of the Federal funds provided for grants-in-aid to local projects under the provisions of the "Defense Housing and Communities Facilities and Services Act of 1951." [15] Expenditures under this program are determined from individual project progress reports collected in the field and made available for summary to BLS by HHFA and PHS, the two agencies administering the program. Expenditures for the projects financed without Federal aid are obtained from a distribution of the BDSA contract-award summaries, and the method of integrating the two sets of data is the same as previously described for educational.

[14] The construction program undertaken under the terms of the various Federal-aid highway acts which provide Federal funds to assist the States in road construction.

[15] Public Law 139, 82d Congress.

Miscellaneous public service enterprises expenditures estimates cover outlays for such works as publicly owned electric power facilities, transit systems, wharves, and civilian airfields. Direct Federal construction in these categories is relatively small, is usually confined to Federal installations such as military bases, and is therefore included in other major categories, e. g., the erection of a power line at a Federal dam construction camp is included under conservation and development. In recent years, however, most civilian airport construction has been undertaken with Federal financial aid, under the provisions of the Federal Airport Act of 1946. Progress of construction under each Federal grant is reported monthly by regional offices to the central office of the Civil Aeronautics Administration which supervises the program, and these reports are made available to the Bureau of Labor Statistics for transcription and tabulation.

All other construction in this category is wholly locally financed, and expenditures are estimated from a distribution of contract-award summaries supplied by the Business and Defense Services Administration.

Conservation and development expenditures, as reported currently, represent the volume of all new construction, regardless of type, at the sites of Federal projects for the conservation, development, or control of the Nation's natural resources. The small amount of expenditures by non-Federal public agencies for construction for these purposes is represented chiefly in all other public.

Three agencies are principally responsible for Federal work in this category: The Civil Works Division of the Office of the Chief of Engineers, the Bureau of Reclamation, and the Tennessee Valley Authority.[16] From each of these agencies, summaries on a project basis are received each month covering expenditures accruing during the previous month. These accruals reflect primarily the value of work actually put in place as determined by site observations by Government engineers.

From most of the agencies doing relatively small amounts of conservation work, such as the Soil Conservation Service and the International Boundary and Water Commission, United States and Mexico, monthly data are not at present solicited. For these agencies, annual expenditures data (actual for past periods, and estimated for future) are obtained from the Budget of the United States, and distributed by months on the basis of the trends shown by the major agencies.

All other public construction not elsewhere classified covers such projects as parks, athletic fields, memorials, and the like. The small amount of Federal outlay in this category is estimated monthly from the annual figures presented in the Budget of the United States. Non-Federal expenditures are obtained by a distribution of BDSA contract-award figures.

Limitations

As the preceding sections have shown, the methods by which these estimates are compiled result in measures in terms of dollars of a purchasing power current during the period of reference. The figures therefore cannot be used as indicators of the physical volume of construction placed without extensive adjustments for differences in price levels and wage rates, technological changes, and other relevant factors.[17]

The degree of error in the estimates of expenditures cannot be measured statistically and, because of the uneven quality of the basic source data, the accuracy of the figures varies considerably between types. Thus, for example, the estimates for farm construction are much less reliable than those for public utilities. Moreover, the degree of accuracy attained in the estimates has varied with the resources available for searching and processing appropriate secondary data, and for conducting pertinent original surveys. To a greater extent, probably, than in many statistical series, crude construction expenditure estimates may be obtained very inexpensively, whereas the preparation of highly accurate and detailed estimates is quite costly. In general, the larger the coverage

[16] Expenditures for TVA have been retained in the conservation and development category, even though for several years the construction activities of this agency have been directed toward the provision of steam electric, rather than hydroelectric, generating capacity.

[17] The Business and Defense Services Administration estimates change in the physical volume of construction placed by expressing current estimates in 1947–49 prices. This is done by deflating the estimate for each class of construction by an appropriate construction cost index. This series is available by years from 1915 and by months from January 1939. (Two other series are derived from the basic expenditures estimates. One presents seasonally adjusted new construction activity, monthly beginning in January 1939, and the other a distribution of new construction activity by States, annually beginning in 1939, and quarterly beginning in 1947.)

of the expenditures the more reliable are the figures. For instance, annual estimates are better than monthly, and the total for any period is more nearly accurate than the data for any of the individual types of work. Relatively small month-to-month changes should be used with caution because most monthly data are based on normal construction patterns, and not on actual observed progress (p. 19). In particular, sweeping conclusions should not be drawn from preliminary monthly figures, in which, because of the timing of the preliminary estimates, a substantial element of judgment in forecasting is involved. The year-to-year changes in the estimates for total and major types of construction are correct as to direction and are substantially correct in extent.

The figures by type of construction are not adapted for use in making exceedingly fine comparisons, primarily because of some unavoidable inconsistencies in classification. For example, regardless of type of work (whether building construction, road work, etc.), all construction by privately owned public utilities is included under public utilities, all military construction (except industrial) by the Department of Defense is represented in military facilities, and all construction by the civil units of the Army Engineers, the Bureau of Reclamation, and other Federal conservation agencies is included in conservation and development.

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Chapter 4. Labor Required for New Construction*

Background and Uses

The statistical series currently termed "Labor Required for New Construction" was initiated during the early 1930's as a means of measuring the volume of employment created by new construction activity at construction sites. Until the mid-forties these figures were accepted as actually measuring construction employment and were, accordingly, termed "Estimated Construction Employment." With the development and improvement of the "Contract Construction Employment" series (chap. 6—Measurement of Industrial Employment), it became necessary to change the the name of the former series to "Labor Required for New Construction" in order to eliminate confusion between the two related, but fundamentally different, sets of data. The contract construction series is an estimate of the number of full- and part-time employees who actually worked during, or received pay for, the payroll period ending nearest the fifteenth of the reporting month. It covers all site and off-site wage and salaried employees of private establishments whose major activity is construction, but excludes self-employed construction workers, working proprietors, and force-account employees of nonconstruction firms and public agencies that perform their own construction work. The series on labor requirements is an estimate of the number of full-time workers required to put in place the dollar volume of new construction under way during a given period of time. It covers all workers, both site and off-site, of construction firms, as well as self-employed construction workers, working proprietors, and force-account employees engaged in new construction.

The labor requirements estimates lend themselves to two basic uses. They approximate the total number of employees engaged in new construction activity, by type of construction, and by skill and occupation of workers, a statistic not available from any other source. The estimates, therefore, provide a measure of the volume and trend of employment created by new construction activity, a very important segment of the overall employment picture. Of perhaps equal value is the fact that the basic data used in preparing the regular estimates can be used to estimate the employment that would be required by a particular expenditure for new construction, or that would be generated by a proposed construction project or program. Thus, they are useful in analyzing the manpower feasibility of defense or emergency construction, or the employment-creating potential of proposed public works programs.

Concepts and Scope

An indirect approach in measuring the needs of on-site construction employment seemed desirable because of conditions peculiar to the construction industry. Some of these conditions are: (1) the instability of employment at any one construction site; (2) the sensitivity of employment to weather conditions; and (3) the difficulty of directly measuring the volume of force-account employment.

The labor requirements series is designed to measure the number of full-time workers required to put in place the dollar volume of new construction under way during a given period of time. The estimates project worker requirements at the site of new construction, and in yards, shops, and offices where worker time is chargeable to new construction operations. Consequently, the projections cover, in addition to employees of establishments primarily engaged in new construction, self-employed persons, working proprietors, and employees of nonconstruction establishments who are engaged in new construction work. The coverage is identical, therefore, to the coverage of the series (chap. 3—Estimating Expenditures for New Construction) which measures the volume of new construction in monetary terms. Data

*Prepared by Edward M. Gordon of the Division of Construction Statistics.

are regularly prepared on a quarterly basis; quarterly estimates are available starting with 1939. In addition to these regular quarterly estimates of labor requirements for all new construction activity, periodic estimates are prepared for specific construction projects and programs, either proposed or actually under way.

Estimating Procedures

The estimating techniques make use of the "expenditure" estimates for new construction and "value of work put in place" factors; the direct use of either a questionnaire or a sampling procedure is not involved. Essentially, the technique consists of: (1) developing, from special surveys and studies, a dollar value of work put in place per man-month (or man-year) for each major type of construction for some given base period; (2) adjusting, during the interim periods between special studies, these "value of work put in place" factors for changes in labor costs and material prices that have occurred since the base period, by the use of "construction cost" indexes; and (3) dividing the estimated expenditures (chap. 3—Estimating Expenditures for New Construction) by these factors to derive the estimated number of man-months (man-years) of full-time employment required to effectuate the given amount of work.

The most complicated and time-consuming operation involved in this technique is the development of the "value of work put in place" factors from special studies and surveys of completed projects. Representative completed projects of the various types of construction are selected for these special surveys. Several different types of data are utilized in making these special studies: (1) summary reports of the number of man-hours worked and of the amount of earnings on specific projects of given value; (2) summary reports of the number of man-hours worked on specific construction programs involving various kinds and values of projects; and (3) copies of contractors' and subcontractors' weekly payrolls.

The most satisfactory sources of data for the development of these "value of work put in place" factors are actual copies of contractors' and subcontractors' weekly payrolls. An analysis of such payrolls provides "value of work put in place" factors, timing patterns showing man-hour requirements by period of operation (week or month), and distribution of workers by skills and occupations. For the projects selected for study, copies are obtained of payrolls of all contractors and subcontractors engaged on the project. Man-hours worked are then summarized by week of operation and for each occupation involved during each week of operation. Data for similar projects (type and value) are then summarized to obtain "overall" or average factors and patterns. These special studies are conducted periodically as funds are made available.

During the periods between the time that special studies are made, "value of work put in place" factors are revised quarterly to adjust for changes in labor costs and material prices that have occurred. Currently, "construction cost" indexes, which reflect the changes in construction costs, are used to make these adjustments. Inasmuch as the Bureau of Labor Statistics does not prepare a "construction cost" index, indexes prepared by certain private firms and associations are used. Among the indexes currently being used are the E. H. Boeckh and Associates index for residential construction, the Engineering News-Record index for certain types of nonresidential construction, and the Associated General Contractors index for certain types of heavy construction.

Limitations

The series is limited in that the estimates represent the number of full-time workers required to perform a given volume of work without adjustments for certain variables (labor turnover, weather conditions, changes in productivity, overtime work, etc.) rather than a count of names actually appearing on payrolls at a given time; and are therefore minimum estimates of employment. The accuracy of the estimates themselves, depends largely upon the accuracy of the "value of work put in place" factors and the "expenditure" series estimates. Therefore, the limitations inherent in the "expenditures" estimates apply as well to the labor requirements estimates.

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Chapter 5. Work-Injury and Accident-Cause Statistics*

Background

The Bureau's first report relating to work injuries—a study of European workmen's compensation procedures—was issued in 1893. This was followed by a series of special reports on workmen's compensation problems and of the hazards associated with particular industrial operations. In 1910 a continuing series of annual injury-rate compilations for the iron and steel industry was inaugurated. In 1925 the injury-rate series was expanded to include 24 industries; by 1952 it covered more than 200 manufacturing and nonmanufacturing industry classifications.

The Bureau's work-injury and accident statistics program is designed as a service to the occupational safety movement. It creates and maintains interest in accident prevention by providing national indicators of the magnitude of the injury problem; by providing measures indicating the relative level of injury occurrence in various segments of industry and indicating the progress achieved in the prevention of injuries from year to year; and for a limited number of selected industries provides the basic data on accident causes necessary for effective planning of accident-prevention programs. Through cooperative arrangements with certain States similar data are made available in State detail for direct use in State and privately sponsored safety programs.

Currently, the national work-injury and accident-cause statistics fall into four groups. The groups and their uses are as follows:

(1) Annual estimates of the total volume of disabling work injuries in each major industrial classification, and of the total economic loss, in terms of unproductive man-days, resulting from these injuries. These estimates are available for each year starting with 1936. They are a primary stimulant in creating and maintaining general acceptance of the need for continuing accident-prevention activity.

(2) Annual work-injury frequency rates and injury-severity measures for a wide variety of manufacturing and nonmanufacturing industry classifications. These data are continuous for all manufacturing and for most industry classifications from 1926.

The annual injury rates constitute the basic measures of work-injury occurrence in the United States. They permit direct comparison of the incidence of injuries and of the resulting losses in different industries, in different States, and in different categories of plant size; and in year-to-year comparisons they indicate the basic trends in injury occurrence. They indicate the industries and areas in which accident prevention needs to be intensified and measure the success or failure of existing State or industrywide safety programs. Most important, they provide a norm or basis of comparison against which management can evaluate the injury experience of individual establishments.

(3) Current monthly, quarterly, and monthly cumulative work-injury frequency rates for the primary manufacturing industry classifications. This series was started in 1943.

These rates provide measures of seasonal variations in injury occurrence; give early indications of changes in the trend of injury incidence; and support the end-of-the-year estimates of the total volume of work injuries in manufacturing. Their greatest importance in the safety movement, however, is that they maintain interest in injury records in the period between the basic annual surveys and provide current norms for comparison with the current experience of individual establishments.

(4) Detailed studies of the injury experience and of the causes of accidents in selected industries, occupations, or activities during specified periods of time. Two of these studies are made each year.

The detailed injury-rate distributions developed in these studies serve to identify particular oper-

*Prepared by Frank S. McElroy of the Branch of Industrial Hazards.

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ations within the industry which are most productive of injuries. By so designating the problem areas they assist the safety engineer in effectively allocating his time and provide him with convincing arguments in his efforts to sell safety to workers in those operations.

By combining the experience of many establishments, the accident-cause analyses reveal hazard patterns which might never become evident in the experience of an individual safety engineer or of a single establishment. The studies do not indicate how to prevent accidents in an engineering sense. They do, however, provide the safety engineer with clues as to the conditions and actions which require his attention because of their propensity to lead to accidents. They support his appeals for management and worker cooperation in eliminating particular hazards by providing evidence that similar conditions have produced accidents. They support the recommendations of safety inspectors and direct their attention to hazards which otherwise might be overlooked. By detailing the hazards of specific types of equipment, they establish the need for safety-code provisions applying to those hazards and stimulate engineering design to eliminate such accident potentials at the point of manufacture.

Standardization. Efforts to standardize the methods of compiling work-injury statistics were initiated by the Bureau of Labor Statistics in 1911. In 1914, the Bureau called a formal conference of labor and workmen's compensation officials and others interested in this subject. The work of this conference was carried forward in later years by the International Association of Industrial Accident Boards and Commissions, culminating in the publication of the first standardized procedures in 1920.[1] In 1926, a sectional committee of the American Engineering Standards Committee, later the American Standards Association, undertook a revision of these procedures. This work led to the publication in 1937 of the first American Standard Method of Compiling Industrial Injury Rates. This standard was revised in 1954 and is continuously under review by a sectional committee of the American Standards Association. A second standard, the American Recommended Practice for Compiling Industrial Accident Causes, developed under the American Standards Association procedures, was published in 1941. These two standards constitute the basis for the concepts utilized in the compilation of all injury and accident statistics by the Bureau of Labor Statistics.

[1] Standardization of Industrial Accident Statistics, Bureau of Labor Statistics, 1920 (Bull. 276).

Concepts and Scope

Injury-Frequency Rates. Injury-frequency rates are the primary measures of the incidence of work injuries. They indicate the relative level of injury occurrence prevailing in different establishments, operations, or industries during a specified period of time, and provide a means of determining trends in injury occurrence or of progress in accident prevention.

The standard *injury-frequency* rate is defined as the average number of disabling work injuries for each million employee-hours worked. The lack of comparability inherent in simple injury totals, arising from variations in employment and operating time, is thus overcome by expressing the injuries in terms of a standard unit of exposure.

A *disabling injury* is defined as any injury incurred in the course of and arising out of employment, which (1) results in death or in any degree of permanent physical impairment, or (2) renders the injured person unable to perform any regularly established job, which is open and available to him, during the entire time interval corresponding to the hours of his regular shift on any one or more days after the day of injury (including Sundays, holidays, and days on which the plant is shut down). Under this definition, the reportability of an injury for injury-statistics purposes is in no way related to the eligibility of the injured person for workmen's compensation payments. In case of doubt as to whether or not an injured person is able to work, the attending physician's decision is final.

Injury-Severity Measures. The severity of a temporary injury is measured by the number of days during which the injured person is unable to work. For death and permanent impairment cases, the American Standard provides a table of economic time charges. These time charges, based upon an average working-life expectancy of 20 years for the entire working population, represent the average percentage of working ability lost as the

result of specified impairments, expressed in terms of unproductive days. For example, death, representing the complete loss of all future production by the injured person, is assigned a time charge of 6,000 man-days (i. e., 20 years of 300 days each). The complete loss or loss of use of an arm is estimated as resulting in an average reduction of 75 percent in working efficiency. By applying this percentage to the 20-year working life expectancy, the time charge for this type of injury is established as 4,500 man-days.

The *standard injury-severity rate* is commonly used as a comparison measure indicating the relative level of economic loss resulting from work injuries. It weights each disabling injury with its established time charge or days of disability, and expresses the aggregate in terms of the average number of days charged for each million employee-hours worked.

The *average severity* is computed by adding the actual days lost for all temporary disabilities and the time charges for all deaths and permanent impairments and dividing the total by the number of disabling injuries. This measure constitutes the basis for direct evaluation of the severity of injuries in different industries, establishments, or operations.

The formulas for these injury measures are:

$$\text{Frequency rate} = \frac{\text{Number of disabling injuries x 1,000,000}}{\text{Total number of employee-hours worked}}$$

$$\text{Severity rate} = \frac{\text{Total of days lost or charged x 1,000,000}}{\text{Total number of employee-hours worked}}$$

$$\text{Average severity} = \frac{\text{Total number of days lost or charged}}{\text{Number of disabling injuries}}$$

Accident Causes. Accident-cause statistics are designed to assist the accident preventionist by identifying the events and circumstances which most commonly lead to the occurrence of injuries. They identify the most significant hazards and indicate the specific accident-prevention activities which most need to be emphasized.

The standard procedure for compiling accident-cause statistics requires an analysis of the circumstances involved in the occurrence of each accident in order to determine five essential sets of facts relating to the occurrence, grouped as follows: the accident type; the agency of accident; the unsafe mechanical or physical condition; the unsafe act; and the unsafe personal factor. A wide variety of subclassifications within each major category provides for a large number of analytical cross classifications. The major categories of the analysis remain the same in all studies, but the detail must be modified in each study to reflect the peculiar operations and hazards characteristic of the industry, occupation, or operation under study.

Coverage. The Bureau's annual estimates of work-injury volume cover all persons gainfully employed, including self-employed persons, but excluding those in domestic service, in the continental United States.

The annual injury-rate surveys cover all manufacturing industy classifications except petroleum refining, smelting and refining of nonferrous metals, cement and lime manufacturing, and coke production. The excepted industries are covered in similar surveys conducted by the Bureau of Mines, Department of the Interior; data for these industries are supplied to the Bureau of Labor Statistics for inclusion in published reports providing complete coverage for manufacturing. The manufacturing data are presented in detail for approximately 160 industry classifications.

Annual injury-rate data are compiled for some segments of nonmanufacturing activity. Agriculture, mining, domestic service, interstate and marine transportation, and Federal Government operations are not covered in the Bureau of Labor Statistics' surveys. Data on mining injuries, provided by the Bureau of Mines, are included in the annual report. Injury rates for railroads are published by the Interstate Commerce Commission and rates for Federal Government operations are published by the Bureau of Employees' Compensation. No rates for the other excluded activities are available.

The quarterly injury-frequency rate surveys cover most manufacturing activities. Petroleum refining, cement and lime manufacturing, coke production, and nonferrous smelting and refining are omitted, since they are included in the Bureau of Mines' surveys.

The detailed injury and accident-cause studies are each restricted to a single industry, occupation, or operation. These are onetime studies usually based upon the experience of a single year. Selection of the area to be studied is based on: (a) a past record of high injury incidence; and (b) the existence of a particular need for detailed

data to support the development of an organized accident-prevention program or for the development of safety codes or safe practice recommendations.

All of the surveys cover the continental United States. The industry classifications used are those in the Standard Industrial Classification Manual. The injury reporting requirements and injury-rate computations conform to the definitions and procedures specified in the American Standard Method of Compiling Industrial Injury Rates except that the Bureau of Labor Statistics' procedure, because of reporting limitations, does not include the use of percentage evaluations for permanent-partial loss of use, as is permitted in the Standard.

Survey Methods and Estimating Procedures

Annual Estimates. The annual estimates of work-injury volume and of the resulting manpower losses are prepared in cooperation with the National Safety Council. They represent the combined judgment of the technical staffs of the two organizations based upon a pooling of all data available to either group.

In the absence of a centralized system of reporting work injuries in the United States, the accumulation of national totals must be based upon the assembly of many bits of data drawn from a wide variety of sources. These basic data frequently overlap or omit entirely certain segments of employment. Additional problems are introduced by a lack of uniformity in the reporting and compilation procedures of the organizations from which the basic data are drawn.

The State workmen's compensation agencies and certain Federal agencies constitute the primary sources of the data on which the estimates are based. In the Federal service, work-injury data for particular segments of the economy are regularly compiled by the Bureau of Labor Statistics, the Bureau of Mines, the Interstate Commerce Commission, the Office of Vital Statistics, and the Bureau of Employees' Compensation. The Department of Agriculture and the Coast Guard provide intermittent data for operations under their jurisdiction. The Interstate Commerce Commission, the Coast Guard, and the Bureau of Employees' Compensation have compulsory reporting requirements and obtain practically complete reporting in accordance with their respective regulations. The other Federal agencies operate on a voluntary reporting basis yielding only sample coverage. Reporting requirements of the State compensation agencies vary widely, but reporting is compulsory and reasonably complete within the respective regulations.

Data drawn from the National Safety Council surveys and from surveys conducted by various trade associations, such as the American Petroleum Institute and the Portland Cement Association supplement the data from the public agencies and fill in some of the gaps in the public data.

The estimating procedure requires reconciliation of the various available data with standard reporting definitions, evaluation of the coverage in each segment of the economy, and direct expansion of the adjusted data to the total estimated employment in each area of industrial activity.

The estimates constitute an overall evaluation of the magnitude of the occupational injury problem in the United States. They indicate the aggregate social and economic losses resulting from work injuries and emphasize the national interest in advancing accident-prevention activities.

The estimates for mining and quarrying, manufacturing, and rail transportation are based upon very comprehensive data and are considered as having a high degree of accuracy. The estimates for construction, public utilities, miscellaneous transportation, trade, and for finance, service, government, and miscellaneous industries are based upon less comprehensive data, but are considered reasonably accurate. The estimates for agriculture are based upon fragmentary data and may reflect a comparatively high degree of error. Tests have indicated that underreporting is prevalent in respect to agricultural injuries. The estimating error, therefore, is probably that of underestimating rather than of overestimating.

Annual Injury Rates. These are based on surveys conducted by mail on a sampling basis. (See BLS Form 1418, p. 37.) Reporting is entirely voluntary and all reports are confidential. In a few States (Connecticut, New York, and Pennsylvania in 1954) the data are collected in cooperation with the State Labor Departments, which conduct sim-

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Budget Bureau No. 44-R002.7.
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U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON 25, D. C.

WORK INJURIES

(Please complete this report whether or not there were any disabling injuries)

(Please change mailing address if incorrect—Include postal zone)

EXPOSURE DATA (See instructions on other side)
(Please complete this section even though there were no disabling injuries)

1. Average number of employees in 1953:
   (Enter average for year; include all classes of employees) _____

2. Total hours worked by all employees during entire year, 1953 _____

3. Number of weeks this establishment operated during 1953 _____

CLASSIFICATION DATA (See instructions on other side)

4. Principal type of activity of this establishment (i. e., manufacturing, wholesale, retail, construction, public utility, etc.):

5. Enter in order of importance the principal products manufactured, lines of trade, specific service, or other activities during 1953.

	Percent of total annual sales value or receipts
(a)	
(b)	
(c)	
(d)	
(e)	

6. If manufacturing, please indicate:
   (a) Principal materials used (e. g., rough castings, machined parts, assembled parts; raw cotton, cotton yarn, or cotton fabrics, etc.)
   (b) General types of operations performed (e. g., foundry, machine shop, assembly; spinning, weaving, sewing, etc.)

Filled out by _____

Position _____ Date _____

INJURY SUMMARY, 1953

(Do not list any injury on more than one line. If no injuries, enter "0" on line 33. See instructions on other side.)

Type of disability	Code	Number of cases
7. Deaths	10	
8. **Permanent-total impairments** (Permanently unable to work at any job; include amputations or complete loss of use of both arms, legs, hands, feet, eyes, or any combination of these major body members. Describe on separate sheet.)	20	
Permanent-partial impairments (Include only amputations, permanent loss of use, or permanent impairment of functions.)		
9. 1 arm	31	
10. 1 hand	32	
11. 1 leg	33	
12. 1 foot	34	
13. 1 thumb	35	
14. 1 finger	36	
15. 2 fingers (same hand)	37	
16. 3 fingers (same hand)	38	
17. 4 fingers (same hand)	39	
18. Thumb and 1 finger (same hand)	40	
19. Thumb and 2 fingers (same hand)	41	
20. Thumb and 3 fingers (same hand)	42	
21. Thumb and 4 fingers (same hand)	43	
22. 1 great toe	44	
23. 2 great toes	45	
24. Toe (not great toe)	46	
25. 1 eye (loss of sight)	47	
26. 1 ear (loss of hearing)	48	
27. Both ears (loss of hearing)	49	
28. Other (describe on separate sheet)	50	
29.	51	
30. Sum of items 9 to 29	x	

Temporary-total disabilities (All work injuries, not listed above, involving disability of 1 full calendar day or more after the day of injury. Also include hernias whether time was lost or not.)		Number of cases	Total calendar days of disability
31. Cases resulting in—			
(a) Disability of 1, 2, or 3 days	61		
(b) Disability of 4 or more days	62		
(c) Hernia	63		x x
(d) Disability of unknown duration (describe on separate sheet)	64		x x
32. Sum of items 31 (a), (b), (c), and (d)	65		x x

Grand total—All disabling injuries		Number of cases
33. Sum of items 7, 8, 30, and 32	x	
34. First-aid and medical cases: (If records of these cases are not readily available, enter "N. A.")	x	

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ilar surveys within their own jurisdictions. Data for the automobile industry are obtained through the Automobile Manufacturers' Association which cooperates in securing reports from its membership. Direct mail reporting to the Bureau of Labor Statistics is maintained for all other covered industries and for all other areas of the continental United States.

Participants in the survey are requested to supply the following information applying to the year of reference:

(1) Average employment and total manhours worked by all employees during the year.
(2) A summary of the principal products or services rendered by the establishment during the period.
(3) A summary of the disabling work injuries experienced by employees during the period in the following detail: (a) Death cases—aggregate number; (b) Permanent-total disabilities—the aggregate number; (c) Permanent-partial disabilities—distributed by part of body affected; (d) Temporary-total disabilities—distributed into categories "of 1 to 3 days of disability" and "of 4 or more days of disability"; (e) Time lost because of temporary-total disabilities—distributed into categories "resulting from disabilities of 1 to 3 days" and "resulting from disabilities of 4 or more days' duration."

The sampling procedure is designed to yield maximum employment coverage subject to adequate distribution by States and by establishment size for each industry classification. A permanent sample of approximately 25,000 annual reporters is maintained in the noncooperating States. In the tabulations, this is supplemented by reports received in the quarterly survey and through the cooperating States to yield a total of approximately 40,000 manufacturing and 30,000 nonmanufacturing establishments.

Report forms are mailed to each annual reporting establishment at the end of each year. Second requests are mailed about February 15, to all establishments which have not reported by that date. Acceptance of reports is terminated and tabulations started about June 30, and summary data are released about October 1.

All reports received are reviewed individually to verify the assigned industry classification and to detect reporting errors. Questionable reports are returned for explanation or correction.

After verification, all data are transferred to punch cards; standard time charges for death and permanent impairment cases are computed and punched into the cards by machine; and all data are summarized mechanically. In the final computations, rates for individual industry classifications are calculated as simple averages. The rates for industry groups and for all manufacturing, however, are weighted rates in which the experience of each industry is given a weight equivalent to its estimated total employment.

The summarized data are published in brief form as a mimeographed release and in the Monthly Labor Review. Full detail is presented in an annual bulletin. The published reports include work-injury data for mining, cement manufacturing, and petroleum refining compiled by the Bureau of Mines.

The Bureau's injury rates for manufacturing are based upon broad and well-distributed samples and are presented in relatively detailed homogeneous classifications. In some areas of nonmanufacturing, however, coverage limitations prevent the presentation of rates in the most significant detail and thereby impose some limitations upon the data as the basis for evaluation of an individual establishment's experience.

Quarterly Injury Rates. These are based on quarterly surveys which are also conducted by mail on a voluntary reporting basis. Coverage is limited to 15,000 manufacturing establishments and about 13,000 reports are received in time for each quarterly tabulation. In Maine and Michigan (also in Iowa starting in 1954), the reports are collected in cooperation with similar surveys of the State Labor Departments. In all other areas the Bureau contacts the reporting establishments directly.

Participants in the survey are supplied with questionnaires, at the end of each quarter, requesting the following information relating to each of the preceding 3 months:

(1) Average employment and total manhours worked.
(2) Principal products manufactured.

(3) A summary of the disabling injuries experienced by employees in the following detail:
(a) Number resulting in death; (b) Number resulting in permanent impairment; (c) Number resulting in temporary-total disability.

Sampling in this survey stresses maximum coverage in terms of employment and geographic distribution. The reporting group includes an overly high proportion of large establishments and the unadjusted rates show some downward bias. This bias is corrected by adjusting the computed rates to the levels determined in the more comprehensive and more adequately balanced annual survey. Preliminary adjustments are made on the basis of the previous year's annual survey and final adjustments are made after the annual data for the year of reference are compiled. These adjustments correct the level of the monthly and quarterly rates but preserve the month-to-month fluctuations and short-term trend indications.

Report forms are mailed to all cooperating firms at the end of each quarter. Second requests are sent to all establishments which do not report within 4 weeks and tabulations are closed approximately 7 weeks after the end of the quarter of reference. Summary data are released in mimeograph form about 11 weeks after the end of the quarter of reference. All reports received after the closing date for any quarter are punched and are included in a final end-of-year revised tabulation.

The quarterly surveys yield monthly, quarterly, and monthly cumulative injury-frequency rates for all manufacturing, and for 130 manufacturing industry classifications.

No injury-severity data are collected in the quarterly surveys since the final degree of disability for many injuries cannot be determined in the short period allowed for reporting after the end of the quarter. The processing of the quarterly reports and the computation of the average frequency rates follow the procedure outlined above for the annual injury-rate surveys. The quarterly injury rates are published in quarterly processed releases and are summarized in the Monthly Labor Review and in the annual bulletin.

Special Studies. In contrast to the regular surveys, which provide general measures of injury incidence for a wide range of industries, the special studies are designed to provide specific and detailed information for direct application in the accident-prevention programs of the industries or operations studied. These surveys are divided into two categories: (a) detailed injury-rate studies; and (b) accident-cause studies.

The detailed injury-rate studies are conducted by mail and the reports are processed in the same manner outlined for the regular surveys. The questionnaires cover the same items included in the annual survey form, but request a distribution of the figures by operating divisions of the reporting establishments. From these reports, injury-frequency and severity measures are computed for each type of operation commonly found in the industry, for establishments of various sizes, and for establishments in various geographic areas.

Because of the detail in which the data are presented, these surveys require a substantially larger coverage than is necessary to support the industry-wide averages of the regular surveys. Sampling procedures are employed, therefore, only when the industry under study is very large. In most instances reports are requested from all establishments in the selected industry. The response rate is normally about 60 percent.

In the accident-cause studies the data are collected by Bureau representatives in personal visits to the cooperating establishments. The data collected consist of detailed case records of individual accidents listing all available information relating to each occurrence. These data are obtained primarily from the original accident records of the establishment supplemented by personal discussion with informed persons and, frequently, by inspection of the accident site and observance of the operation in which the accident occurred. The objective is to determine for each case: (1) how, when, and where the accident occurred; (2) what unsafe conditions and/or unsafe acts contributed to the occurrence; and (3) what type of injury resulted.

These case records are analyzed individually following the American Recommended Procedure for Compiling Industrial Accident Causes and the data are mechanically tabulated in a wide range of intercorrelations. From these summaries it is possible to determine the specific hazards which most commonly produce accidents in the industry, to identify them in relation to particular items of

equipment or specific personal actions, and to indicate their relative potential for inflicting injury.

A summary of each special study is published in the Monthly Labor Review and a fully detailed report on each study is published as a Bureau bulletin.

Limitations of the Surveys

The Bureau's injury-rate surveys provide information on a broad national basis. Because of coverage limitations, however, the data cannot be presented in State or local breakdowns. Supplementary State details are available in a few States from similar surveys conducted by the State Labor Department.

From an accident-prevention standpoint, it is recognized that the most useful injury and accident information is that relating to particular processes and operations. Operating requirements, however, restrict the presentation of quarterly and annual injury-rate data to the standard industrial classifications. Reporting establishments are classified according to the value of their leading products or services rather than in terms of processes or operations.

Because of resource limitations only a small proportion of the nonrespondents in the mail surveys can be visited to determine the possible bias due to nonreporting. Although there is no "contest" incentive element involved in the Bureau's surveys, there is a possibility that establishments with unusually high injury rates may be reluctant to report their experience. In general, the response rate is lowest among the smaller establishments. Since small- and medium-size establishments commonly tend to have somewhat higher than average injury-frequency rates, the published averages are more likely to be minima than maxima without regard to sampling error.

The estimates of total work-injury volume are measures of the injury problem as of a given time. From period to period, however, they reflect changes in the volume of employment, shifts in industrial activity, and technological changes in industry as well as changes in the level of work safety. They are not, therefore, satisfactory measures of progress or retrogression in accident prevention, particularly in long-term comparisons.

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Chapter 6. Measurement of Industrial Employment*

Background

The first monthly studies of employment and payrolls by the Bureau of Labor Statistics began in October 1915 and covered four manufacturing industries. By November 1916, these surveys were expanded to cover 13 industries, and this number remained unchanged until 1922. The depression of 1921 directed attention to the importance of current employment statistics, and in 1922 Congress granted additional funds to provide for program expansion. In ensuing years, other manufacturing industries were added, and the program was extended to cover nonmanufacturing employment.

By 1937, the Bureau was able to release estimates of total employment in nonagricultural establishments, based on estimates of employment in various industry divisions. Many improvements and refinements have been introduced over the years, and the industries for which data are published have continued to increase in number.

The current employment statistics program is an integrated Federal-State project which provides industrial employment information on a national, State, and area basis. In accordance with authority granted in a Congressional act of July 7, 1930 (ch. 873, 46 Stat. 1019; 29 U. S. C. 2), and in order to minimize the reporting requirements for cooperating establishments, the Bureau of Labor Statistics entered into agreements with State agencies, which have resulted in the issuance of employment data for all States and most metropolitan areas.

Uses

Employment levels are generally accepted as the common denominator for measuring the economic well-being of the community. Investment and saving, capital expansion and decline, all are closely associated with the rise and fall of employment. Similarly, employment is a relatively simple symbol of economic activity which is readily understood.

Statistics on employment are used widely by business and banking firms, chambers of commerce, Federal and State government agencies, and private research organizations. Employment statistics trends measure changes in the economic structure of the country and indicate the general direction of industry developments. Knowledge of diversity of current economic conditions as indicated by employment data is especially helpful in framing economic policies.

Concepts and Scope

For most purposes, employment trends have the greatest value as economic indicators if data are available soon after the date of reference. A complete census of employment necessarily takes a great amount of time because of collection and tabulation problems, and the cost is too great for such surveys at frequent intervals. In order to measure employment monthly by industry on an area, State, and national basis with a minimum of cost and to produce reasonably current data, the Bureau prepares estimates based on an employment sample.

The basic unit in the BLS sample is the nonfarm establishment, from which payroll data are compiled on the number of employees who received pay for any part of a specified pay period. This method of collection has several advantages. Since establishment employment is readily available from payroll records, the data are easy to collect, and establishments can be classified into significant economic groups. Thus, estimates based on establishment reports yield not only a current measure of total nonagricultural employment, but also employment by industry divisions and groups.

The standard definition of establishment is used (chap. 1, p. 2). In brief, an establishment is defined as a single physical location, such as a

*Prepared in the Bureau's Division of Manpower and Employment Satistics.

factory, mine, or store where business is conducted, or a unit for which separate inventory and monthly payroll records are maintained. When a company has several plants or establishments, the BLS endeavors to obtain separate reports for each establishment, for purposes of industry and area classification, since each may be classified in a different industry and have a different area location. However, when a company has more than one establishment in a single industry and area, the separate establishments may be covered by a combined report.

Because a payroll count includes persons who received pay for any part of the pay period, the employment series are affected by turnover of personnel; the same person may appear on two separate establishment payrolls in the same period. Thus, the employment count is not a measure of the number of available full-time jobs, nor is it an unduplicated count of paid workers. The data do not refer to employment throughout the month nor to employment on any one day in the month.

Employment statistics published by BLS represent the total number of persons employed in nonagricultural establishments during a specified payroll period. Employment data for nongovernmental establishments refer to persons who worked during, or received pay for, any part of the pay period ending nearest the 15th of the month. Data for Federal Government establishments generally refer to persons who worked on, or received pay for, the last day of the month; for State and local government, persons who received pay for any part of the pay period ending on, or immediately prior to, the last day of the month.

Employed persons include those who are working full or part time on a permanent or temporary basis. Workers on an establishment payroll who are on paid sick leave, paid holiday or paid vacation, or who work during a part of a specified pay period and are unemployed or on strike during the other part of the period are considered employed. Persons on the payroll of more than one establishment during the pay period are counted each time reported. On the other hand, persons are not considered employed who are laid off or are on leave without pay, who are on strike for the entire pay period, or who are hired but do not report to work during the pay period. Since proprietors, the self-employed, and unpaid family workers do not have the status of "employees," they are not covered by BLS reports. Farm workers or domestic workers in households are not included in the data for nonagricultural establishments. Government employment statistics refer to civilian employees only.

Distinction must be made between two categories of workers shown in industry employment estimates. "All employees" include all persons whose employment meets the above definitions.

The standard definition of production workers is used (chap. 1, footnote 14, p. 6). As defined, "production workers" include those in the all-employees group who are engaged in the following activities: working foremen and all nonsupervisory workers (including leadmen and trainees) engaged in fabricating, processing, assembling, inspection, receiving, storage, handling, packing, warehousing, shipping, maintenance, repair, janitorial, watchman services, products development, auxiliary production for plant's own use (e. g., powerplant), and record-keeping and other services closely associated with the above production operations.

Universe. The employment estimates represent the total number of persons employed in nonagricultural establishments, by industry, in the continental United States. Complete counts of employment in these establishments are available from social insurance reports, except for noncovered industries where special sources must be used. These complete counts, in addition to representing the universe of employment being measured, serve as benchmarks for the estimates.

The establishments are classified into various industries, both in the benchmarks and in the sample, according to standard classification manuals described in the section on estimating procedure (p. 47).

Time Periods. The BLS policy of measuring employment generally for the pay period ending nearest the 15th of the month is standard for all Federal agencies. The primary purpose of the U. S. Bureau of the Budget in establishing this standard procedure was to establish a uniform reference period for Federal statistics, in order to facilitate comparisons among the various economic series, and to avoid burdening business establishments with requests for data relating to various periods throughout the month.

Sample data for preparing employment estimates are collected monthly. The estimates are published regularly each month in the Employment and Earnings report and in the Current Labor Statistics section of the Monthly Labor Review.

Survey Methods

For most industries, data for computing the trend of employment are collected by means of schedules mailed monthly to individual establishments. The returns are tabulated by industry.

Questionnaire. A single "shuttle" schedule is used for each reporting unit over a calendar year period. These schedules (BLS form 790 series) provide for the entry of identification and activity information (for use in industrial classification) and for employment data for each month of the year. For all industries, the total number of "all employees"—i. e., all full- and part-time employees on the payroll who received pay for the pay period ending nearest the 15th of the month—is requested each month. For mining and manufacturing establishments, the number of production and related workers included in the all-employee figure is requested. In the manufacturing division, the establishments report monthly data on the number of women included in the all-employee figure.

The technical characteristics of the shuttle schedule, used in this program since 1930, are particularly important in maintaining continuity. The design exhibits automatically the trend of reported data, and therefore the relationship of the current figure to the previous month's data. The form has numerous operational advantages with respect to both accuracy and economy; for example, identifying codes and the respondent's address are entered only once a year. Also, the schedules received each month, from which the data are transcribed, are returned to the reporting establishment for the next month's data.

Cooperating State agencies mail the forms to the reporting establishments and edit them when returned. The same establishment reports are used for preparing State, area, and national estimates, in order to eliminate duplicate reporting by sample establishments.

Data on payroll and hours of work, and on the number of nonsupervisory employees in industries other than mining and manufacturing, are also collected. These figures are used in computing average hours and earnings.

Sampling Procedure. Sampling is used by BLS for collecting data in most industries, since full coverage would be prohibitively costly and time-consuming. The sample design used is cutoff sampling, which includes all firms having employment over a certain size. The cutoff point is set to include enough reporting establishments in order to provide an appropriate standard of accuracy as well as to represent a substantial proportion of total employment in an industry. This proportion varies among industries, depending on the percent of total employment on the payrolls of large firms, usually determined from social-insurance tabulations. In industries in which it is not feasible to secure 100-percent response from firms above the cutoff point, the basic design is modified somewhat to include small establishments. Target specifications for accuracy and corresponding size of sample are prescribed in procedure manuals in accordance with principles just stated.

Employment and payroll schedules are collected monthly for approximately 155,000 cooperating establishments. (See table.)

Approximate size and coverage of monthly sample used in BLS employment and payroll statistics

Division or industry	Number of establishments in sample	Employees in sample	
		Number (thousands)	Percent of total industry employment
Mining	3,300	440	50
Contract construction	19,700	783	28
Manufacturing	44,100	11,207	68
Transportation and public utilities:			
Interstate railroads (ICC)	----	1,357	96
Other transportation and public utilities (BLS)	13,600	1,430	51
Wholesale and retail trade	60,300	1,889	19
Finance, insurance, and real estate	10,600	486	25
Service and miscellaneous:			
Hotels and lodging places	1,300	145	31
Personal services:			
Laundries and cleaning and dyeing plants	2,300	99	19
Government:			
Federal (Civil Service Commission)	----	2,368	100
State and local (Bureau of the Census quarterly)	----	2,760	67

Industry Class Supplement to Form BLS 790C

U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON 25, D. C.

Budget Bureau No. 44-R745.5.
Approval expires January 31, 1955.

PRODUCT STATEMENT
for CONFIDENTIAL REPORT ON
EMPLOYMENT, PAYROLL, AND HOURS
Cooperative Project

This report should cover the entire activity of the same establishment covered by your regular Employment, Payroll, and Hours report.

Please return this form as soon as possible in the attached envelope which requires no postage.

BLS Codes	State	Report No.	Tab.	Size	Proposed Ind.

Your Report on Employment, Payroll, and Hours will be classified by industry on the basis of the principal activity in which your establishment was engaged during the calendar year 1953. The information requested on this form is needed to ensure the proper classification. A list of special characteristics important in describing activities in selected industries is provided on the back of this form. PLEASE REVIEW THE LIST ON THE REVERSE SIDE AND READ THE INSTRUCTIONS BELOW BEFORE ENTERING THE INFORMATION REQUESTED IN COLUMNS (*a*), (*b*), AND (*c*).

INSTRUCTIONS FOR COMPLETING THIS FORM

Column (*a*). Enter on a separate line each of the principal products or activities of your establishment during the calendar year 1953 in order of importance in terms of sales value. Combine on line 4 all except the three most important products or manufacturing activities. To ensure proper classification, please describe products or activities as fully as possible—for example: *upholstered household furniture*, instead of "furniture"; *air brakes for trucks and busses*, instead of "air brakes"; *insulated cable made from purchased wire*, instead of "insulated cable" or "cable"; *seamless hosiery*, instead of "hosiery"; *men's and boys' underwear*, instead of "underwear"; *portable power-driven metalworking tools*, instead of "metalworking tools" or "tools"; *stamping automobile parts*, instead of "stamping" or "automobile parts"; etc. If your regular report also covers a *nonmanufacturing activity* at this location, enter that activity on line 5. Use "SPACE FOR COMMENTS," if necessary, to provide further description of products or activities of your establishment.

Column (*b*). Enter opposite *each* item in column (*a*) the approximate percent of *total* sales value (including receipts from nonmanufacturing activity, if any) represented by that product or activity. **Entries in column (*b*) should total 100%.**

Column (*c*). Enter for each item in column (*a*) the principal material used in making the product or performing the activity. NOTE.—For some industries such as textiles, apparel, wood-products, metal-fabricating, paper, leather, glass, etc., it is important to also indicate whether the material used was produced in the same establishment as the finished product. If a material listed in column (*c*) was produced in the same establishment as the product listed in column (*a*) please mention this in the "SPACE FOR COMMENTS."

PRINCIPAL PRODUCTS OR ACTIVITIES DURING 1953 Please list in order of importance based on 1953 sales value. Enter nonmanufacturing activity, if any, on line 5. (*a*)	FOR ITEMS IN COLUMN (*a*) PERCENT OF TOTAL SALES VALUE (including receipts from nonmanufacturing activities, if any) DURING 1953 (*b*)	PRINCIPAL MATERIAL USED IN 1953 (*c*)
1.	%	
2.	%	
3.	%	
4. All other manufacturing (Specify general type)	%	
5. Nonmanufacturing (Describe)	%	
	100%	

SPACE FOR COMMENTS. (Use this space for further explanation of information in any of the columns above, or, for describing any characteristics of your activity not apparent from the above, such as those indicated on the back of this form.)

(Person to be addressed if questions arise regarding this report) (Position)

16—67315-2

B. L. S. Codes					
State	Report No.	Tab.	Size	Ind.	

Form B. L. S. 790C

Before entering data please see explanations on other side

PRODUCT STATEMENT — DO NOT USE THIS SPACE

LOCATION OF ESTABLISHMENT(S) COVERED IN THIS REPORT
(Number of establishments) (City) (County) (State)

Year and Month	PERIOD REPORTED: PAY PERIOD — From— (Both dates inclusive)	Through	NUMBER OF DAYS on which majority of employees worked during the pay period shown in cols. 2 and 3. *Include paid holidays and vacations (nearest ½ day)*: During the entire period	During 7-day period ending nearest 15th of month	DO NOT USE: L/P	NE	ALL EMPLOYEES — NUMBER: Both sexes	Women only	PRODUCTION AND RELATED WORKERS: Number of Production Workers	Production-Worker Payroll (*omit cents*)	Production-Worker Man-Hours (*omit fractions*)	DO NOT USE: Expl. Code	COMMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1953 Dec.						1				$			
1954 Jan.						1							
Feb.						1							
Mar.						1							
Apr.						1							
May						1							
June						1							
July						1							
Aug.						1							
Sept.						1							
Oct.						1							
Nov.						1							
Dec.						1							

COMMENTS

Please enter in column 14 the main factors responsible for significant month-to-month changes in this report. Examples are:

More overtime — *Strike* — *Seasonal expansion*
Partial shut-down for repairs or inventory-taking
More higher paid workers — *Less piecework* — *Weather*
Premium pay for holiday work — *Less incentive pay*
Materials shortage — *Hiring due to new contracts*

If any general wage-rate changes (not individual changes for length of service, merit, or promotion) have occurred since last month's report, note the amount of increase or decrease (as +2%, −5¢), the effective date of the change, and the approximate number of production workers affected

(Person to be addressed if questions arise regarding this report)

(Position)

Estimating Procedure. In the employment series (as well as those on hours and earnings), reporting establishments are generally classified into significant economic groups on the basis of major product or activity as determined from annual sales or receipts data for the previous calendar year. The published BLS estimates are for industry groups and in some cases combinations of industries listed in the SIC and SSB manuals.[1]

To obtain employment estimates for the various industry classifications, the following three steps are necessary:

(1) A total employment figure (benchmark) for an industry, as of a specified period, is obtained from sources which provide a complete count of employment for the industry.

(2) For each industry, the ratio of employment in one month to that in the preceding month (i. e., the link relative) is computed for sample establishments which reported in both months.

(3) Beginning with the last month of the benchmark period, the estimate for each month is obtained by multiplying the estimate for the previous month by the link relative for the current month.

Application of the estimating procedure in preparing an industry series is illustrated by the following: Total employment for a given industry was 50,000 in July. According to the reporting sample, 60 establishments in that industry had 25,000 employees in July and 26,000 in August, a 4-percent increase. To derive the August estimate, the change for identical establishments reported in the July-August sample is applied to the July estimate:

$$50{,}000 \times \frac{26{,}000}{25{,}000} \text{ (or } 1.04) = 52{,}000$$

The procedure for estimating current employment, previously described, has come to be known as the benchmark and link-relative technique. It is an efficient one, taking advantage of a benchmark, which is a byproduct of other governmental functions, and of the high correlation between levels of employment in successive months for identical establishments. The latter, in turn, permits smaller samples when the link or ratio of data for successive months is used than would be necessary if the sample itself were inflated to a universe total.

In addition to estimates of total employment by industry, the Bureau publishes data on production-worker employment for mining and manufacturing industries. For this purpose, the sample ratio for the current month of production workers to total employment is used. The 60 sample firms, which had 26,000 employees in August, reported an August production-worker figure of 19,500 resulting in a ratio of $\frac{19{,}500}{26{,}000}$ or .750. Using this ratio, production-worker employment in August is estimated to be 39,000 (52,000 multiplied by .750= 39,000).

A similar ratio method is used for the quarterly estimate of the number of women employed in manufacturing industries.

Appropriate revisions, based on new benchmarks, are introduced into the employment series as required to correct for classification changes and for deviations resulting from the use of sample trends.

Experience with the employment statistics program has shown that, without benchmark adjustments, the employment data tend toward understatement which becomes larger from year to year. This error cannot be adjusted precisely on a current basis; however, average adjustment is made through the use of bias adjustment factors.

In general, the benchmark period is the first quarter of the year. The monthly employment estimates which had been published previously for that quarter are compared with the new benchmark data. The need for adjustment of the published employment information is determined from this comparison.

Since 1939, the basic sources of benchmark information for "all employees" are periodic tabulations of employment data, by industry, compiled by State agencies from reports of establishments covered under State unemployment insurance laws. Supplementary tabulations prepared by the U. S. Bureau of Old Age and Survivors Insurance are used for the group of establishments exempt from State unemployment insurance laws because of their small size. For industries not covered by either of the two programs, benchmarks are compiled from special establishment

[1] Industry classifications currently used are defined in the following documents: (1) for manufacturing industries—Standard Industrial Classification Manual, volume I, Manufacturing Industries, Bureau of the Budget, November 1945; (2) for government—Standard Industrial Classification Manual, volume II, Nonmanufacturing Industries, Bureau of the Budget, May 1949; (3) for other nonmanufacturing industries—Industrial Classification Code, Federal Security Agency, Social Security Board, 1942.

censuses: for example, for interstate railroads, from establishment data reported to the Interstate Commerce Commission; for State and local government, from data reported to the Bureau of the Census; for the Federal Government, from agency data compiled by the Civil Service Commission. Establishments are classified into the same industrial groupings for benchmark purposes as they are for monthly reporting.

Publication and Revisions

Each month, BLS publishes continuous national series on total employment in all nonagricultural establishments and in the eight major industry divisions: manufacturing; mining; contract construction; transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; service; and government. Both total and production-worker employment series are also presented for 21 major manufacturing groups and 131 subgroups. Within nonmanufacturing, total employment information is published for over 40 industry groups. Production-worker employment is also shown for industry components of the mining division. Earliest date of availability varies for the different series.

Series covering employment in manufacturing industries are also currently published for all States and most of the major metropolitan areas. Employment in nonagricultural establishments and in each of the major industry divisions is available for all States from 1939 to 1952, and is prepared currently for all but a few States and metropolitan areas. Expansion of the program, now under way, is designed to produce current series for all States and 114 metropolitan areas.

Cooperating State agencies prepare State and area estimates. Statistical standards, set forth in a BLS-State procedures manual and in related instructional memoranda, are followed in order to maintain reasonably comparable data among area, State, and national series. Because some States have more recent benchmarks than others, and because of the effects of differing industrial and geographic stratification, the sum of the State figures differs from the official United States totals prepared by the Bureau of Labor Statistics.

In addition to the benchmark adjustments, discussed in connection with the estimating procedure, current data are revised to take account of late reports. The Bureau issues a monthly press release during the month immediately following the month of reference. It contains preliminary information on total nonagricultural employment, by industry divisions and by major industry groups, based upon tabulations of data that have been received in time for the release. These data are subsequently revised and presented in the Employment and Earnings report and in the Monthly Labor Review.

The most recent benchmark adjustment was to first quarter 1953. The adjusted series for detailed industries were first published in the May 1954 Employment and Earnings report and the June 1954 Monthly Labor Review. Summary sheets showing historical data, by industry, have been prepared and are available upon request.

Differences Between BLS and Other Employment Statistics

The BLS total of "all employees" in nonagricultural establishments should not be compared with the Census Bureau's estimates of the number of persons employed in nonagricultural industries as given in the Monthly Report on the Labor Force. The BLS series excludes unpaid family workers, domestics, and proprietors and self-employed persons. The only conceptually valid comparison is with the MRLF total of wage or salary workers employed in nonagricultural industries, after exclusion of those engaged in domestic service. Despite similarity of definition, there are generally differences in monthly levels and in the magnitude and direction of monthly changes between the BLS nonfarm employment series and the comparable MRLF total. These differences stem, primarily, from the different approaches in methodology.

The MRLF data are based upon personal interviews each month with a scientifically selected sample of households. In accordance with such responses, the population 14 years of age and over is classified into those in and those not in the labor force. Those in the labor force are further classified into the employed and unemployed. Further classification is made with respect to agricultural and nonagricultural activities, class of worker, etc. The BLS approach involves industry-by-industry samples of establishments and unified reports covering employment, pay-

rolls, and man-hours. The BLS nonfarm employment total is therefore the aggregate of the estimates for the specific industries. The basic difference in the source of response probably accounts for most of the variations in the final data. For example, in the BLS series, persons who worked in more than one establishment during the reporting period would be counted more than once.

Employment estimates derived by the Bureau of the Census from its quinquennial census and annual sample surveys of manufacturing establishments also differ from BLS employment statistics. Among the important reasons for disagreement are differences in the industries covered, in the business units considered parts of an establishment, and in the industrial classification of establishments.

Limitations

The limitations of the classification structure also affect the employment data. Thus, it is not possible to provide detailed employment information for specific products. The requirement that establishments shall be classified according to major product or activity may result in the "concealment" or understatement of employment in other important activities with a simultaneous overstatement of employment in the major activity.

A comprehensive measure of the accuracy secured is provided by the statistic, "root mean square discrepancy" (RMSD). Periodically, the BLS estimate for each industry is compared with the total for the universe or benchmark. For each industry, the relative difference between the two is termed the discrepancy. Discrepancies for the various industries have a bell-shaped frequency distribution which approaches the familiar normal curve. The square root of the mean of the squares of the discrepancies is the RMSD. Thus, it is a measure somewhat similar to the relative standard sampling error. The RMSD is more inclusive, however, since it is the resultant not only of sampling error, but also of variations between benchmark and estimate in response, classification, and other procedural processes.

The most recent measurement of RMSD was computed for all manufacturing industries for March 1953, a date two years subsequent to the last previous adjustment to a new benchmark. This test produced a RMSD of 1.8 percent for 2-digit industries and 5.0 percent for 3-digit industries.

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Chapter 7. Hours and Earnings in Nonagricultural Industries*

Background and Uses

Monthly studies of employment and payrolls by the Bureau of Labor Statistics began in 1915 and covered four manufacturing industries. Subsequently, other manufacturing industries were added, and the program was extended to cover nonmanufacturing employment.

The collection of man-hour data needed for the preparation of estimates of hours and earnings made it possible in 1933 to publish average weekly hours and hourly earnings for 15 selected manufacturing industries. By December 1935, employment and payroll indexes were being published for 90 manufacturing industries, but hours and earnings series were available for only 20 of these industries, because many companies did not maintain adequate records of hours. As additional firms began to keep such records, the man-hour sample continued to increase. By 1940, almost all firms reporting employment and payrolls also reported man-hours.

The current employment statistics program is an integrated Federal-State project which provides employment, hours, and earnings information on a national, State, and area basis.[1] In accordance with statutory authority, and in order to minimize the reporting requirements for cooperating establishments, the BLS contracted with State agencies for the collection and publication of hours and earnings data for the 48 States and most metropolitan areas.

Hours and earnings information has various applications in economic analysis. These data are used by businessmen and merchants in analyzing markets, since they provide a comparison of trends in earnings, industry by industry and area by area. Banks, universities, and fact-finding organizations use hours and earnings data in compiling national and local business indexes. Such information is used also by government agencies as an important factor in the analysis of manpower utilization problems.

Organizations making studies of consumer income, expenditures, and purchasing power find average earnings data essential in their analyses, as do persons engaged in plant-location planning. The earnings series are often utilized also in wage negotiations. Many companies use earnings data for adjustment of labor costs in escalator clauses provided in sales contracts.

Concepts

The BLS hours and earnings series measure the trend and level of average weekly hours and hourly and weekly earnings in both manufacturing and nonmanufacturing industries.

The series are based on reports of gross payroll and corresponding paid man-hours for production or nonsupervisory workers only, an easily identifiable group for uniform reporting. Gross figures are usually available from regular payroll records.

The basic data-collection unit is an establishment, which is defined (standard definition of establishment in chap. 1, p. 2) as a single physical location, such as a factory, mine, or store, where business is conducted. If two or more distinct activities are conducted at the location and separate inventory and payroll records are maintained for each, the BLS requests separate reports for each activity. Because it is impractical and unnecessarily expensive to take a complete census every month, reports are collected from samples of establishments in the various industrial groupings.

Scope

For the hours and earnings series, BLS collects the following information:

(1) *The number of full- and part-time production workers or nonsupervisory employees* who worked during, or received pay for, any part of the pay period ending nearest the 15th of the month. For manufacturing, mining, laundries, and cleaning and dyeing plants, the data cover production and related workers only. Working foremen and all nonsupervisory workers are included if engaged

*Prepared in the Division of Manpower and Employment Statistics.

[1] See also Measurement of Industrial Employment, chap. 6, p. 42.

in such activities as fabricating, processing, inspection, handling, warehousing, maintenance, custodial services, product development, auxiliary production for plant's own use (e. g., powerplant), and record keeping and other services closely associated with the production operations. For most other industries, the data refer to nonsupervisory employees and working supervisors, in accordance with detailed definitions on the report form (BLS 790). (See standard definition of "production workers" in chap. 1, footnote 13, p. 6.)

(2) *Total gross payrolls* for the workers specified above, before such deductions as social-security and withholding taxes, bonds, union dues, and occupational supplies. The payroll figures also include pay for overtime, shift premiums, sick leave, holidays, vacations, and production bonuses. They exclude cash payments for vacations not taken, retroactive pay not earned during the period reported, value of payments in kind, employer contributions to welfare funds and insurance or pension plans, and bonuses, unless earned and paid regularly each pay period.

(3) *Total man-hours* for which pay is received by full- and part-time production or nonsupervisory workers including hours paid for holidays, sick leave, and vacations taken.

Universe. The hours and earnings series cover all manufacturing industries and selected groups of nonmanufacturing industries. Some of the industries for which estimates are not prepared are characterized by small establishments, thus making adequate sampling expensive, and for others the hours and earnings data cannot be collected on a basis comparable to that for covered industries.

Time Periods. The BLS policy of measuring employment, hours, and earnings for the week ending nearest the 15th of the month has been made standard by the U. S. Bureau of the Budget for all Federal agencies collecting employment data on an establishment basis. Use of this uniform reference period for Federal statistics facilitates comparisons among the various economic series and avoids burdening business establishments with requests for data relating to various periods throughout the month. Data are collected and estimates are published monthly.

Survey Methods

Data for computing average hours and earnings are collected by means of schedules mailed monthly to individual establishments. The reports are tabulated by industry. They are used for preparing State, area, and national estimates.

Questionnaire. The schedules used in collecting data for the respective industries are keyed to their special characteristics. A separate schedule (BLS Form 790) is sent for each reporting unit. It provides for the entry of identifying information and employment, hours, and payroll data for a pay period in each month of the year. Product or activity information is collected annually for use in industrial classification.

Most establishment reports cover a 1-week pay period. For those covering a longer period, the number of days worked by the majority of the employees during the entire pay period as well as during the week ending nearest the 15th are obtained, for use in converting payroll and man-hour data to a weekly basis. The schedule also provides for the entry of an explanation of any unusual changes in the data reported from month-to-month. When no explanation is provided, the schedule is returned to the reporter with a request for comments.

The BLS 790 schedules are "shuttle" forms, that is, data are transcribed from the forms submitted by reporting establishments each month and the same forms are returned for entry of the following month's data.

The shuttle schedule has been used continuously in the employment program since 1930. It is designed to facilitate reporting and analysis of the data, and to help maintain statistical continuity. The schedule also has numerous operational advantages, for example, accuracy and economy are obtained by entering identifying codes and the address of the respondent only once a year. The schedule design is reviewed annually to introduce improvements and to take account of changing economic conditions and industry characteristics.

Sampling Procedure. In the hours and earnings series BLS uses "cutoff" sampling, which provides for the inclusion of all firms having employment

over a specified size. The cutoff is set at a point which will cover enough reporting establishments to provide a defined standard of accuracy, as well as to represent a substantial proportion of total employment in an industry. This proportion varies among industries, depending on the percent of total employment on the payrolls of large establishments, a statistic usually determined from social-insurance tabulations. In industries in which it is not feasible to secure reports from all firms above the cutoff point, the basic design is modified somewhat to include smaller establishments.

Hours and earnings estimates are based on a slightly smaller sample than that for employment estimates, because some establishments which report employment do not furnish payroll and man-hour information. The following table shows the size of the employment sample for broad industry categories within which hours and earnings series are compiled.

Approximate size and coverage of monthly sample used in BLS employment and payroll statistics [1]

Division or industry	Number of establishments in sample	Employees in sample	
		Number (thousands)	Percent of total industry employment
Mining	3,300	440	50
Contract construction	19,700	783	28
Manufacturing	44,100	11,207	68
Transportation and public utilities:			
Class I railroads (ICC)		1,238	100
Local railways and buslines	410	97	71
Telephone	490	614	90
Telegraph	4,000	40	87
Gas and electric utilities	4,700	412	76
Wholesale and retail trade	60,300	1,889	19
Finance, insurance, and real estate	10,600	486	25
Service and miscellaneous:			
Hotels and lodging places	1,300	145	31
Personal services:			
Laundries and cleaning and dyeing plants	2,300	99	19

[1] Excludes industry groups for which no hours and earnings series are compiled.

Estimating Procedure. Reporting establishments are classified into significant economic groups on the basis of major product or activity as determined from annual sales or receipts data for the previous calendar year. Industry classifications currently used are defined in the SIC and SSB manuals;[2] in some cases the data relate to combinations of industries.

The BLS employment estimates are adjusted periodically in the light of complete employment counts or "benchmarks," but such adjustments are not made for the hours and earnings series. Although counts of payrolls and hours for many of the industries covered in the BLS program can be obtained from various sources, these totals cannot be used as benchmarks, because they vary with respect to coverage and definitions.

Benchmarks are less necessary for the hours and earnings series since these series are estimates of ratios of closely related factors—total payroll, total employment, and total man-hours are highly correlated with one another from plant to plant. Therefore, the ratio of one of these items to another is an efficient statistic which tends to have a low variance.

(1) *Hours and gross earnings.* To obtain average weekly hours for an individual industry, the sum of the man-hour totals reported by the plants classified in that industry is divided by the total number of production (or nonsupervisory) workers reported for the same establishments. Similarly, in computing average hourly earnings, the reported payroll total is divided by the reported man-hour total. These industry averages are derived from a sample of firms that have reported for both the month of reference and the preceding month.

Weekly hours and hourly earnings for major industrial groups and subgroups in manufacturing, for all manufacturing, and for major nonmanufacturing groups are weighted averages of the figures for individual industries. The average weekly hours for individual industries are multiplied by the estimates of total production-worker employment in the industry to derive aggregate man-hours. Payroll aggregates for individual industries are the product of the aggregate man-hours and the average hourly earnings. Payroll and man-hour aggregates for industry groups are obtained by summation of the component industries.

Average weekly hours for industry groups are obtained by dividing the man-hour aggregates by the corresponding production-worker employment estimates. Average hourly earnings for groups are computed by dividing the payroll aggregates by the man-hour aggregates. This

[2] (1) For manufacturing industries—Standard Industrial Classification Manual, Vol. I, Manufacturing Industries, Bureau of the Budget, November 1945; (2) for nonmanufacturing industries—Industrial Classification Code. Federal Security Agency, Social Security Board, 1942.

method is equivalent to weighting weekly hours and earnings by estimated universe employment and hourly earnings by estimated universe man-hours.

For both individual industries and major industry groups, average weekly earnings are computed by multiplying average hourly earnings by average weekly hours. Man-hour data are not collected for a few industries in the finance and service divisions; in these industries, average weekly earnings are obtained by dividing the sum of the reported payroll totals by the total number of nonsupervisory workers for the same establishments.

National estimates are prepared by BLS and State and area estimates by cooperating State agencies. Statistical standards are set forth in a BLS-State procedures manual and in related instructional memoranda, in order to maintain comparable data among national, State, and area series.

(2) *Net spendable average weekly earnings.*[3] When a majority of workers in lower income brackets were not subject to Federal income taxes, gross average weekly earnings were a satisfactory measure of trends in weekly earnings available for spending. After Federal income taxes began to affect spendable earnings of an appreciable number of workers, a method was developed for approximating net spendable earnings by deducting Federal income and social security taxes from gross earnings.

The amount of individual income tax liability depends on the number of dependents supported by a worker as well as on the level of his gross income. Net spendable earnings for workers in all manufacturing are published, therefore, for a worker with no dependents and a worker with three dependents.

Net spendable weekly earnings are also published in terms of 1947–49 dollars to give an approximate measure of changes in "real" net spendable weekly earnings or in purchasing power since that base period. This series is computed by dividing the spendable earnings average (in current dollars) by the BLS Consumer Price Index for the same month.

[3] See "Technical Note on the Calculation and Uses of the Net Spendable Earnings Series" (processed report, revised, 1953). It contains a table of formulas used in excluding Federal income and social security taxes from gross earnings, and an explanation of the derivation of the formulas.

(3) *Gross average weekly earnings in 1947–49 dollars.* Gross weekly earnings are also published in terms of 1947–49 dollars for all manufacturing, bituminous-coal mining, and laundries. The conversion is made in the same way as that for net spendable earnings.

(4) *Average hourly earnings excluding overtime.* As indicated previously, the basic payroll and man-hour data from which gross average hourly earnings are computed include both straight time and overtime. In order to estimate average hourly earnings excluding overtime for all manufacturing and for the durable and nondurable goods industry subdivisions, adjustment factors [4] are applied to gross average hourly earnings. These factors eliminate premium pay at the rate of time and a half for hours in excess of 40 per week. The factors are based on a special study of the relationship between gross average weekly hours and average weekly overtime hours.

The adjustment factors are applied separately to the gross average hourly earnings for each of the major manufacturing industry groups, and the adjusted figures are then weighted by the respective man-hour aggregates. These figures may differ somewhat from the results which would be obtained by direct application of the adjustment factors to gross average hourly earnings for all manufacturing and the durable and nondurable goods subdivisions.

Publication and Revisions

The BLS issues a monthly press release containing preliminary national estimates for the preceding month for all manufacturing, durable and nondurable goods industry subdivisions, and 21 major manufacturing industry groups. These estimates are based upon tabulations of data for less than the full sample; only reports received by a stipulated date are included in order to permit early release of the figures.

Revised data based on additional reports are published later in both the monthly Employment and Earnings report and the Monthly Labor Review. These publications also present average weekly hours, average hourly earnings, and average weekly earnings of production workers in about

[4] See "Eliminating Premium Overtime From Hourly Earnings in Manufacturing," Monthly Labor Review, May 1950 (p. 537).

300 manufacturing subgroups and separate manufacturing industries, as well as in about 50 nonmanufacturing groups and divisions. Gross weekly earnings in 1947–49 dollars, net spendable earnings, and hourly earnings exclusive of overtime are also published. Average hours and earnings in all manufacturing are published monthly for each State and most major metropolitan areas.[5] Current expansion of the program is designed to produce series for 114 metropolitan areas. National series for the two most recent months are subject to revision. For State and area data only the most recent month is subject to revision.

Limitations

The gross average hourly earnings series reflect actual earnings of workers including premium pay. They differ from wage rates, which are the amounts stipulated for a given unit of work or time. Nor do gross average hourly earnings represent total labor costs per man-hour for the employer, for they exclude retroactive payments and irregular bonuses, various welfare benefits, and earnings for those employees not covered under the production-worker and nonsupervisory-employee definitions.

The workweek information relates to average hours paid for, which differs from scheduled hours, because average weekly hours reflect the effects of such factors as absenteeism, labor turnover, part-time work, strikes, accidents, and machine breakdowns.

Gross average weekly earnings are not the amounts actually available to workers for spending. This is due, in part, to the fact that they do not reflect such deductions as those for income and social security taxes.

The computation of net spendable average weekly earnings is based upon gross average weekly earnings for all production workers without regard to marital status, family composition, and total family income. Neither the gross nor net spendable earnings data reflect actual differences in levels of earnings for workers of varying ages, occupations, and skills. Spendable earnings reflect deductions only for Federal income and social security taxes, and hence represent only a rough approximation of changes in disposable earnings for 2 types of workers—1 with no dependents and 1 with 3 dependents.

The "real" earnings data (those expressed in 1947–49 dollars) resulting from the adjustment of gross and net spendable average weekly earnings by the Bureau's Consumer Price Index indicate the changes in the purchasing power of money earnings as a result of changes in prices for consumer goods and services. These data cannot be used to measure changes in living standards as a whole, which are affected by such other factors as total family income, the extension and incidence of various social services and benefits, and the duration and extent of employment and unemployment.

To approximate straight time average hourly earnings, gross average hourly earnings are adjusted by eliminating only premium pay for overtime at the rate of time and a half for all hours in excess of 40 a week. Thus, no adjustment is made for other premium payment provisions such as holiday work, late shift work, and premium overtime rates other than time and a half.

[5] These data appear quarterly in the Monthly Labor Review (in the March, June, September, and December issues).

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Chapter 8. Measurement of Labor Turnover*

Background

Industry turnover rates are valuable for personnel and economic planning and analysis. Employers use these rates as a yardstick against which to measure the performance of their plants; they consider low turnover rates an indicator of efficient operations and good management-labor relations. The rates are particularly significant in a defense economy, as a consideration of turnover is essential for scheduling production and for planning the orderly recruitment and maintenance of an adequate manpower supply for critical industries.

The greatest single cause of movement in labor-turnover rates is industrial expansion and contraction. In prosperous times, quit rates and accession rates are high because of job availability; in periods of economic recession, high layoff rates are coupled with low quit and accession rates. Turnover rates are, therefore, valuable indicators of economic health.

Within the above framework, turnover is caused mainly by the job instability of certain groups of workers—young, unskilled, low-paid, temporary, and women. Hence, turnover is to a great extent related to age, sex, and the character of the job, with the work force of a factory generally consisting of a large segment of relatively stable employees and this relatively unstable segment.

The Bureau of Labor Statistics publishes, on a national basis, monthly series of labor-turnover rates for selected industries. These series show the rate at which employees move into and out of jobs in individual establishments. They are currently published for 20 major industry groups in manufacturing,[1] 91 individual manufacturing industries, and 8 nonmanufacturing industries in mining and communications.

The Bureau's series for manufacturing as a whole is a continuation of a series begun by the Metropolitan Life Insurance Co. in January 1926. Manufacturers then, as now, participated in the project in order to provide a measure of factory labor instability. The rates computed by the insurance company were median rates for all items except total separations, which were the sum of the component rates. The median was used because the sample was small and its composition unstable. Ratios of quits, discharges, and the other variables to the mean number on the payroll were computed for each manufacturer on a company, rather than establishment, basis. They were then arranged in order of magnitude and the median selected for each item.

By 1929, enough earlier data had been obtained from the participants to permit the extension of a monthly series back to January 1919. The published data showed rates of accessions, total separations, voluntary quits, discharges, and layoffs for total manufacturing.[2] On July 1, 1929, the Metropolitan Life Insurance Co. transferred the responsibility for the collection and compilation of labor-turnover rates to the Bureau of Labor Statistics. Approximately 350 large manufacturers, employing 700,000 workers, comprised the sample at that time.

Concepts and Scope

Labor-turnover rates are divided into two broad groups: Accessions or additions to employment, and separations or terminations of employment. Accession and separation rates are important for interpreting changes in the Bureau's employment series, since each monthly net change in an industry is the result of employment additions and separations.

Separations are reported as quits, discharges, layoffs, and military and miscellaneous separations. They are expressed in the BLS series as a rate per 100 employees, with separate rates for each of the component items computed for each published industry.

The primary difference between types of separations is whether action is initiated by the employee or employer, i. e., whether it is voluntary on the employee's part or involuntary. Voluntary

*Prepared by Jeanette G. Siegel of the Division of Manpower and Employment Statistics.

[1] The industry group—printing, publishing, and allied industries—is excluded from the turnover survey.

[2] For complete Metropolitan Life Insurance Co. series, see Labor Turnover in American Factories, in the July 1929 Monthly Labor Review (p. 62).

actions—quits—are initiated by the employee for an almost unlimited variety of reasons, generally financial, personal, or social (social reasons are lack of housing and transportation, poor community facilities, etc.). Involuntary actions may either be initiated by the employer or be beyond the control of both employer and employee; these actions may arise from economic causes such as business conditions, physiological reasons such as old age, and performance reasons such as incompetence. Discharges, layoffs, and miscellaneous separations are considered involuntary. Within the involuntary group of separations, the reason for the action determines the particular category in the Bureau's turnover rates.

Quits are terminations of employment initiated by employees. They may be due to job dissatisfaction, return to school, marriage, maternity, acceptance of other job, ill health, or voluntary retirement without a company pension. Unauthorized absences of more than 7 consecutive calendar days also are considered quits.

Discharges are terminations of employment initiated by management and occasioned by employees' incompetence, violation of rules, dishonesty, insubordination, laziness, habitual absenteeism, or inability to meet the organization's physical standards.

Layoffs are unpaid terminations of employment for more than 7 consecutive calendar days which are initiated by management without prejudice to the worker. They result from reasons such as lack of orders, materials shortages, conversion of plant to new product, or introduction of improved machinery or processes.

Military separations are terminations of employment for military duty lasting or expected to last more than 30 consecutive calendar days. From January 1942 through June 1944, the military separation rate was published separately. It has since been included in the miscellaneous separation rate.

Miscellaneous separations are terminations for reasons other than those itemized such as retirement on company pension, death, or permanent disability. Prior to 1940, miscellaneous separations were included with quits.

Persons on paid or unpaid authorized leaves of absence are not counted as separations until it is definitely determined that such persons will not return to work At that time, a separation is reported as one of the above types, depending on the circumstances.

Accessions are all permanent and temporary additions to the employment roll, whether of new or rehired employees.

New hires are permanent and temporary additions to the employment roll that have not been specifically recalled by the employer.

BLS turnover series are prepared on a national basis only. Both the turnover items reported and the employment base used to derive the rates apply to total employment, whether full or part time, permanent or temporary. Separate data for production workers are not reported. Transfers from one department or plant of a multiunit firm to another are not considered turnover. Monthly data on transfers, however, are collected because of their value as editing aids.

Universe. All manufacturing industries are represented in the labor-turnover universe, with the exception of the entire printing, publishing, and allied industries group and certain seasonal industries such as women's and misses' outerwear, canning and preserving, and fertilizer manufacturing. These industries are excluded because their seasonality or small-establishment character makes it difficult to sustain sample adequacy. Individual rates are not published for each covered industry, as some industry samples are too small to permit separate publication.

Approximately 1.5 million manufacturing employees, about 8 percent of total manufacturing employment, are outside the scope of the turnover survey. The only nonmanufacturing industries covered are metal mining, coal mining, and communications. (See table.)

Coverage of BLS labor turnover sample

Industry group	Number of establishments in sample	Employment	
		In reporting establishments	Percent of universe
Manufacturing	6,600	4,800,000	[1] 34
Durable goods	4,000	3,400,000	[1] 38
Nondurable goods	2,600	1,400,000	[1] 27
Metal mining	130	63,000	60
Coal mining:			
Anthracite	40	30,000	45
Bituminous	275	120,000	33
Communications:			
Telephone	[2]	582,000	89
Telegraph	[2]	28,000	60

[1] Percents for manufacturing relate to employment in industries within the scope of the survey.
[2] Data are not available.

Publication

Three series of turnover rates on a national basis are prepared by the Bureau of Labor Statistics: All employees, and men and women separately. For all employees, monthly rates for all variables (quits, discharges, etc.) are shown for each industry in the survey. For men and women, rates of accessions, total separations, and quits are published quarterly for the manufacturing industry groups and subdivisions.

Frequency and Medium of Publication. Preliminary turnover rates for total employment are published monthly in a BLS press release about a month after the reference month. Preliminary rates for detailed industries are published by the Bureau in the Employment and Earnings report and the Monthly Labor Review about 2 months after the month of reference.[3] Final rates are available in these publications a month after the preliminary rates.

Separate rates for men and women were published monthly from March 1944 through July 1947. At that time, the rates were discontinued until January 1950, when publication was resumed on a quarterly basis for the first month of each quarter.

The Bureau does not publish turnover rates for any time period longer than a month. For a yearly period, either average monthly rates for each variable, or annual rates, can be computed. The average monthly rate for a turnover item is, of course, the mean of the rates for the 12 months. An annual rate is the sum of the 12 monthly rates. Technically, a yearly rate should be this cumulated rate. For example, if monthly quit rates were not available, an annual quit rate would be derived by dividing average plant employment into the total number of workers who quit during the year. The result would be equivalent to that obtained by cumulating the 12 monthly rates. However, this cumulated rate is difficult to interpret; an annual quit rate amounting to 50 per 100 employees seems to imply that 50 percent of all the persons employed in January voluntarily left their jobs by the end of December. It may be that half of all the employees quit, but it is more likely that most of those who quit held largely the same jobs—that is, it was largely the same jobs which were vacated and refilled. As the Bureau does not have information on the number of employees who remained with the establishment during the entire year, annual rates cannot be properly interpreted. Over short periods of time, it is believed that the turnover items measured include little repetitive counting of employees who have left the same jobs, while over a period as long as a year there is considerable duplication. An average of the 12 monthly rates may provide a useful measure if a 1-month rate is not suitable for certain purposes, or if it is considered to be unusual or unduly influenced by seasonality.

[3] One preliminary series is published for each month. In the monthly publications, the preliminary rates for the current month are printed with the final estimates for the previous month.

Sources and Estimating Procedures

Questionnaire and Collection. A shuttle schedule is mailed to cooperating employers; that is, the same form is returned to the respondent each month for the entry of current data. The cumulated total of each turnover item for the calendar month is reported. Total employment, the base used to compute the rates, is reported for 1 week ending nearest the 15th of the month, except for the telephone and telegraph industries, for which employment at the end of the current month is reported.

The only turnover items requested for women are total accessions, total separations, and quits. The employment base is the number of women on the payroll during the week ending nearest the 15th of the month.

Industrial Classification. Since December 1949, manufacturing firms have been classified in accordance with the Standard Industrial Classification Manual (1945). From 1943 through 1949, the Social Security Board (1942) code structure was used.

Classification of nonmanufacturing reporters is based on the Social Security Board structure.

Method of Computation. Turnover rates are estimates of ratios. For individual industries, the rates are computed by dividing the amount of turnover items of each type, reported by the sample establishments, by the total number of employees reported by those establishments. The result is multiplied by 100. In an industry

B. L. S. 1219

U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON 25, D. C.

State	Report No.	Tab	Ind.

Budget Bureau No. 44-R290.14.
Approval expires January 31, 1955.

CONFIDENTIAL REPORT ON LABOR TURNOVER

Please enter the data requested and return the white copy in the enclosed envelope as soon as the information is available each month. The yellow copy is for your file.

Before entering data please see explanations on other side

(CHANGE MAILING ADDRESS IF INCORRECT—INCLUDE POSTAL ZONE NUMBER)

Information reported on this form is strictly confidential, will be seen only by sworn employees of the Bureau of Labor Statistics, and will not be revealed to any other person or agency nor published in such a manner that data relating to an individual company can be identified.

LOCATION OF ESTABLISHMENT COVERED IN THIS REPORT
(City) (County) (State)

I. ALL EMPLOYEES

Year and Month	Number of Employees who worked during or received pay for any part of the pay period (*preferably 1 week*) ending nearest the 15th of the month	Separations Except Transfers (during calendar month)						Accessions Except Transfers (during calendar month)		Transfers		Period Covered by Labor Turnover Items (preferably 1 calendar month)	
		Total (Columns 4 through 8)	Quits	Discharges	Lay-offs	Military separations	Miscellaneous separations	Total	New hires	To other establishments of firm	From other establishments of firm	From— (Both dates inclusive)	Through
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1953 Dec.													
1954 Jan.													
Feb.													
Mar.													
Apr.													
May													
June													
July													
Aug.													
Sept.													
Oct.													
Nov.													
Dec.													

II. WOMEN EMPLOYEES

Year and Month	Number of Women Employees included in column 2	Separations Except Transfers		Accessions Except Transfers Total	DO NOT USE
		Total	Quits only		
(15)	(16)	(17)	(18)	(19)	(20)
1953 Dec.					
1954 Jan.					
Feb.					
Mar.					
Apr.					
May					
June					
July					
Aug.					
Sept.					
Oct.					
Nov.					
Dec.					

III. COMMENTS

Please enter *Main Factors Responsible* for any significant month-to-month changes in Sections I and II. Examples are: *Seasonal expansion, partial shut-down for repairs or inventory-taking, lay-offs due to contract completion or cancellation, strike, fire.*

(21)

16—40879-9

(Person to be addressed if questions arise regarding this report) (Position)

sample, for example, 623 employees quit between January 1 and 31, while 30,062 employees worked or received pay during the week of January 11–17. The January quit rate for the industry is:

$$\frac{623}{30{,}062} \times 100 = 2.1$$

Turnover rates for industry groups are computed by weighting the rates for the component industries by the Bureau's universe employment estimates. Rates for the durable and nondurable goods subdivisions and for "all manufacturing" are weighted by employment in the major industry groups.

Turnover items for women are subtracted from total-employment turnover items to obtain turnover items for men. Separate men and women turnover rates for industry groups are obtained by weighting the rates in individual industries by the BLS quarterly employment estimates for men and women.

Continuity of Series. Comparable rates are available for "all manufacturing" from January 1930 [4] and for two coal-mining and two communication industries from 1943. Because of the adoption of the SIC code structure in December 1949, comparable rates for individual industries are available only from that date. However, December 1949 rates for many industries have been computed on both the SSB and SIC bases so that the effect of the classification revision may be measured.

Concurrent with the adoption of the SIC, industry-group rates were calculated by weighting the rates in the component industries by employment in those industries. Group rates had previously been computed directly from the group sample. Under both systems, the total-manufacturing and durable and nondurable rates were derived by weighting the industry-group rates by employment in those groups.

[4] Prior to this date, median rates were used. Substitution of the arithmetic average resulted in rates 25 to 100 percent higher than the median rates.

In 1943, the base of the turnover ratio was changed from production workers to total employment. Prior to October 1945, the employment base was the average of employment on the last day of the preceding month and the last day of the current month; this base was changed to employment during the midweek.[5] The effect on the rates resulting from this change was negligible.

Limitations

As the Bureau's turnover sample is comprised mainly of large firms, the rates are lower and more stable than they would be if small and medium size firms had greater representation. Large-firm rates are usually lower because of generally higher wage rates, better working conditions, more extensive and more liberal fringe benefits, greater advancement opportunities, better recruiting procedures, etc. In addition, as transfers from one department or plant of a multiestablishment concern to another are not considered turnover, all intracompany shifting is not reflected in the turnover items of large firms.

The use of turnover rates to interpret changes in the Bureau's monthly employment series is limited for the following reasons: (1) The labor-turnover series measure changes during the calendar month, while the employment series measure changes from midmonth to midmonth; (2) industry coverage is not identical, as the printing and publishing industry and some seasonal industries are excluded from turnover; (3) the rates tend to be understated because small firms are not as prominent in the turnover sample as in the employment sample; and (4) if a plant is affected by a work stoppage, the report for that plant is excluded from the turnover rates for the industry. If strikes are widespread and affect a substantial number of reporting firms in an industry, rates for that industry are omitted. The employment series reflect such stoppages.

[5] For the telephone and telegraph industries, the employment base is still the average of employment on the last day of the preceding and current month.

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Chapter 9. The Consumer Price Index*

Background and Uses

The Consumer Price Index [1] prepared by the Bureau of Labor Statistics is a statistical measure of changes in prices of the goods and services bought by families of city wage earners and clerical workers. The index was initiated during World War I, when prices rose rapidly, for use in wage negotiations, particularly in shipbuilding centers. Coverage was gradually extended to include industrial cities throughout the country and estimates of nationwide changes in consumer prices were published at intervals beginning in October 1919. Regular publication was begun in February 1921. Weights used in these early indexes were based on surveys of family expenditures conducted during the period from 1917 to 1919. In the fall of 1935 the Bureau introduced improved methods of calculating the index, and in 1940 completed revision of the weights to correspond with 1934–36 family expenditure patterns as determined by another extensive study of family consumption. During World War II, when many items were scarce and goods were rationed, the weights were adjusted to reflect these conditions; in 1950 the Bureau again adjusted weights to reflect the effect of postwar changes in spending patterns.[2] The most recent comprehensive revision of the index, begun in November 1949, was completed in January 1953, and weights representing 1951–52 spending patterns were introduced.

Since price change is one of the most important factors affecting the cost of living over short periods of time, the Bureau's index provides a satisfactory approximation of changes in the cost of living of urban wage-earner and clerical-worker families. Widespread acceptance of this use is shown by the inclusion in labor-management agreements of automatic wage adjustment clauses based on the Index, particularly after 1950. It has been estimated that, in early 1951, wages of several million employees were adjusted according to changes in the Consumer Price Index.[3] In addition, the index is used as a measure of changes in the purchasing power of the consumer's dollar, and as a guide in the formulation of broad economic and social policy.

In 1951, a Special Subcommittee of the Committee on Education and Labor of the House of Representatives held extensive hearings concerning the Consumer Price Index. One of the Committee's reasons for undertaking the investigation was that "any governmental statistic of such paramount importance as the Consumer Price Index should be understood by the public so that it will receive proper confidence and respect." [4] The Subcommittee heard more than 30 witnesses, including the Bureau officials responsible for the index and a large representative group of users from both labor and management. The Subcommittee also heard members of the Technical Advisory Committee of the American Statistical Association. Upon completion of its investigation, the Subcommittee reported its recommendations and comments,[5] concluding that the Consumer Price Index was generally adequate for the purposes for which it was intended.

*Prepared in the Division of Prices and Cost of Living.

[1] That title, Consumers' Price Index for Moderate Income Families in Large Cities, was adopted in 1945. Previously, this index had been precisely designated, Changes in the Cost of Goods and Services Purchased by Wage Earners and Lower-Salaried Clerical Workers in 1934–36. In popular usage, this title was later shortened to Cost-of-Living Index. The latter designation gave rise to some misunderstanding of the scope of the series, and therefore the current term, Consumer Price Index, was introduced.

[2] See: (a) Bureau of Labor Statistics Bull. No. 699, Changes in Cost of Living in Large Cities in the United States.

(b) Bureau of Labor Statistics Bull. No. 1039, Interim Adjustment of Consumers' Price Index.

(c) Bureau of Labor Statistics Bull. No. 966, Consumers' Prices in the United States, 1942–48.

(d) Report of the President's Committee on the Cost of Living, Office of Economic Stabilization, Washington, 1945.

(e) Consumers' Price Index—Hearings Before a Subcommittee of the Committee on Education and Labor, House of Representatives (82d Congress, 2d Session, House Document 404), Washington, 1952.

[3] See: "Wage Escalators and the Adjusted CPI," Monthly Labor Review, May 1951.

[4] Consumers' Price Index—Report of a Special Subcommittee of the Committee on Education and Labor. House of Representatives, 82/1, Subcommittee Report No. 2, Washington, 1951 (p. 1).

[5] Ibid., (pp. 31–39).

Index Measurement

The complete title of this index, popularly referred to as "The Consumer Price Index," is "Index of Change in Prices of Goods and Services Purchased by City Wage-Earner and Clerical-Worker Families."

The index is concerned with price changes involving retail prices of foods, clothing, housefurnishings, fuel, and other goods; fees paid to doctors and dentists; prices in barbershops and other service establishments; rents; rates charged for transportation, electricity, gas, and other utilities; etc. Prices are those charged to consumers, including sales and excise taxes.

The different goods and services priced for the index are representative of the goods and services bought by city wage-earner and clerical-worker families to use, replace, and add to their possessions, as determined in a comprehensive survey of family incomes and expenditures.[6] These families are defined as units of 2 or more persons who live in the 3,000 towns, cities, and suburbs of the United States, ranging in size from small cities of 2,500 population to the largest cities. The heads of these families are wage earners or salaried clerical workers, including craftsmen, factory workers, laborers, clerks, sales and service workers (except domestic service workers). Many of the families have two or more wage or salary workers; as a result, average family incomes are higher than average individual earnings. (Families with incomes after taxes of $10,000 or more are excluded.) The average size of the families included in the index was estimated to be about 3.3 persons, and their 1952 average family income after taxes was estimated at about $4,160. These families represent about 64 percent of all persons living in urban places and about 40 percent of the total United States population.

Price changes from some past reference date, in percentage terms, are averaged for the various goods and services. The resulting index number is the measure of price change from that past period (expressed as 100) to any later date. Through December 1952, the index was calculated using the average of the 5 years 1935–39 as a base. It was then changed to the base of 1947–49=100 to correspond to other indexes published by Government agencies, as recommended by the Office of Statistical Standards, Bureau of the Budget.[7] Index numbers as published from month to month compare prices at each date with the average level of prices in these 3 years.

Prices are obtained in 46 cities so selected that their populations are representative of the entire population of the 3,000 cities in the United States. Prices in all 46 cities are then combined into the National Index.

Separate indexes are calculated for the 20 largest of the 46 cities—monthly for the 5 largest, and quarterly for the 15 others.

The index measures the effect of price changes on the cost of the goods and services in the family "market basket." The contents of the "market basket"—that is, the quantities and qualities of goods and services that represent what families bought in 1951–52—is assumed to remain the same, so that the change in cost from month to month is the result of *changes in prices.* The index does not purport to measure the changes in spending of families that result from changes in their standards of living. It measures only the change in spending caused by changes in prices.

The "Index Market Basket"

The Bureau conducted a Nationwide Survey of Consumer Expenditures in 1950 to determine what goods and services urban wage-earner and clerical-worker families buy.[8] The representative sample of cities in this survey included all of the 12 largest urban areas with populations of more than 1,000,000 people, and a sample covering 85 of the large, medium-size, and small cities. This sample was selected to account for the characteristics of different city types which affect the way families spend their money.[9] The most important characteristics were size, climate, density of the population, and level of income in the community.

In each city the Bureau selected a representative sample of families from the entire population, including all family types and income classes. Interviewers visited and interviewed each family

[6] See: Monthly Labor Review, January 1951—Consumer Expenditure Study, 1950: Field Methods and Purposes.

[7] The indexes through December 1952 have been recalculated on the base 1947–49=100 to make them comparable with the indexes from January 1953 forward.

[8] See footnote 6.

[9] See Monthly Labor Review April 1951—Selection of Cities for Consumer Expenditure Survey, 1950.

and obtained a complete record of the kinds, qualities, and amounts of foods, clothing, furniture, and all other goods and services the family bought in 1950, together with the amount spent for each item. These records for all wage-earner and clerical-worker families of two or more persons were averaged together for each city, to form the basis for index weight determination.

The development of index weights from these survey results involved two major steps: (1) the averaging of variations in spending patterns reported by individual families, correcting the data for sampling and reporting errors and adjusting for unusually high purchases of automobiles, TV sets, and other consumer durable goods in 1950, and (2) the adjusting of survey data for price and income changes that had occurred after the survey year 1950.

The first step required the determination of stable relationships between average family income and average family expenditures on major categories of consumer goods and services, and also the development of relationships between expenditures on major commodity groups and expenditures for subgroups and items within these major groups. These relationships were discovered through a detailed analysis of the 1950 Consumer Expenditure Survey results which compared average expenditure patterns among the 91 cities included in the survey. This analysis defined the relationship between family average income and average expenditures for three major categories—food and alcoholic beverages, housing, and all other goods and services combined. Next, distributions of average expenditures on these major categories to successive groups and subgroups of items were determined; for example, the proportion of expenditures on all goods and services other than food and housing going to clothing, the proportion of clothing expenditures going to men's clothing, the proportion of men's clothing expenditures going to outerwear, and so on.

Finally, the distributions of expenditures to individual items included in the smallest subgroups of goods and services were based on average ratios of item to subgroup expenditures within groups of cities that showed approximately the same relationships. Adjustments for unusually high 1950 spending for automobiles and some other items were based on time series studies which estimated normal rates of growth in family expenditures on these items.

Thus, an average 1950 expenditure of wage-earner and clerical-worker families, adjusted for sampling and reporting errors, and the abnormal spending pattern following the Korean outbreak, was estimated for each item of expense; and these item expenditures were related to average 1950 family income.

The second step in creating weights for the revised index adjusted these average expenditures to the fiscal year 1951–52. This was accomplished by applying the stable income-expenditure relationships established for 1950 to estimated average family incomes for the 1951–52 period. This fiscal period was taken only because necessary information for the calendar year 1952 was not available at the time. Average 1951–52 incomes were estimated from regressions of 1950 average family income from the Consumer Expenditure Survey on average gross weekly earnings of production workers.

Since various local factors other than income affect the level of housing expenditures and relationships among component parts of total housing costs, no income-expenditure relationship could be established for this group. The ratio of homeowners to renters had not changed significantly between 1950 and the 1951–52 period. Therefore, the expenditure weights for housing required only the adjustment of the 1950 reported expenditures on rent, fuels, repair, and maintenance items, for price changes since 1950. For homeownership costs, estimation of expenditures for home purchase and interest payments and the rate of home purchase required to maintain the 1951–52 level of homeownership were developed from the 1950 survey and from census data.

The index "market basket" thus represents the customary buying pattern of city wage-earner and clerical-worker families in the period 1951–52. It includes television receivers and frozen foods that were not a part of family living patterns a few years ago, and it includes other important changes that have occurred in the amounts, kinds, and qualities of things people buy.

Prices Used in the Index Calculation

The sample of about 300 items, priced for the revised index, was selected to represent the

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average price movement of all goods and services bought by city wage-earner and clerical-worker families. It includes items that are relatively important in family spending, items that are representative of price change for large groups of related commodities, and items that have distinctive price movements of their own. In some cases, several qualities are priced to represent a single item.

During 1950 and 1951 the Bureau priced and studied the price changes of hundreds of items in order to expand and bring up to date the price information available in the Bureau's records. Items were then stratified within groups having similar characteristics with respect to physical description, use, and other price determining characteristics, into "price families" of items whose prices fluctuate similarly over reasonably long periods of time. Within each "price family" those items which were of outstanding importance in family spending were selected to represent price changes on all other items in the group. The number of items selected depended on the prevalence of items within a "price family" with high relative importance to total expenditures. Where only one item was selected, it was assigned the total expenditure weight of the group it represented; where two or more items were chosen, the total weight of unpriced items was assigned to them proportionate to their own importance in the group. Since price relationships change over time, the "price families" of items established for index item selection are reexamined periodically to determine whether price-change imputation patterns require adjustment.

Among the 300 items included in the sample are all the goods and services that are outstanding in family purchases, so that the priced items directly represent the greater part of total family expenditures. Intercity differences in the list of priced items were limited to commodity groups where differences in the kinds of goods purchased were highly significant, such as fuels and certain types of clothing, in order to standardize the pricing procedures as much as possible. Small differences in qualities of items offered for sale in the respective cities are reflected in city-to-city variations in the descriptive specifications used in obtaining current prices.

Prices of the 300 items are collected at regular intervals—some monthly, others less frequently—and the successive prices are compared to calculate price changes. It is important to be certain, however, that the calculation shows only price change and not changes which are due to other factors, such as quantity or quality differences. For example, the price of pork chops can vary considerably, depending upon how near the center of the loin they are cut. If center-cut pork chops are priced 1 month and end-cut the next, the price of pork chops might seem to have gone down. But in fact this would reflect a difference in quality, not a change in price. To prevent this, insofar as possible, the Bureau has prepared detailed specifications to describe the items that are priced for the index. These specifications are carefully written with the advice of manufacturers and retailers of the items. For example, the following is a specification for one of the men's shirts priced:

Style	Business, fused or similarly constructed collar, attached; barrel cuffs.
Fabric	Cotton broadcloth, white.
Yarn	Combed.
Thread count	136 x 60 or 128 x 68.
Finish	Residual shrinkage 1 percent or less.
Construction	Full cut; clean workmanship; 31 to 32 yards per dozen based on 36-inch fabric.
Size range	14 to 17 inch neckband.
Brand	Manufacturer's nationally advertised.

When the Bureau's agents price these shirts, they examine the merchandise in the stores to make sure that the prices they record meet this specification.

Sampling Methods

The Bureau collects prices for a representative sample of 46 cities selected from the 97 cities covered by the survey of family expenditures; the 46 cities include the 12 largest, 9 other large cities, 9 medium-size, and 16 small cities. In each city, the Bureau selected a list of stores and all other types of establishments where families of wage and salary workers buy goods and services. This list includes representative chain stores, independent stores, department and specialty stores. Prices reported by these stores are averaged together for each city to determine average price changes.

Samples of independent food stores were selected from listings of all outlets in each city, stratified by type of store in terms of foods sold (meat

markets, supermarkets, etc.), size of store as measured by annual sales volume, and geographic location within the city. All important chain-store systems are included in the sample for each city. Prices obtained from chain and independent stores are averaged separately and combined with weights based on sales volume data.

Samples of rental units are selected, by probability sampling procedures, from block listings of the total rental housing market in each city, stratified according to block density and location within the area.[10] For goods and services other than foods and rents, samples of outlets are selected to include stores and service establishments which are most frequently patronized by wage-earner and clerical-worker families, and which represent all important types of merchandising operations—department stores, family stores, specialty shops, etc. Because of cost limitations, only a very small sample of stores can be priced for any one item, and a representative probability sample including all types and sizes of establishments is impracticable. Therefore, only the most important establishments in each community where wage earners buy, representing the maximum number of retail sales, were selected. The importance of individual stores in family buying was established by asking families, who cooperated in the 1950 Survey of Consumer Expenditures, where they bought the goods and services for which they reported expenditures. Stores of different types which were mentioned most frequently were selected, after checking with local business associations.

For small cities, where mail-order buying is important, prices are obtained from catalogs and included in the calculation of price change for the city. For small cities also, an appropriate part of price changes for certain commodities that are bought "out-of-town," such as furniture, is represented by price changes in large cities. Thus, the movements of prices in small cities included in the national average are based on prices from outlets in the sample cities, from mail-order catalogs, and from outlets in larger marketing centers, weighted proportionately to the importance of such buying as reported in the Survey of Consumer Expenditures.

[10] For design of rent sample see Monthly Labor Review, January 1949—Rent Index—Methodology and Measurement.

Prices are collected in each city at intervals ranging from once every month to once every 4 months. Because food prices change frequently and because foods are a very important part of total family spending, food prices are collected in each city every month. A few other important items are also priced each month in each city; for example, cigarettes, fuels, and local transportation. Prices of other goods and services are collected every month in the five largest cities. In other large cities and in the medium-size cities, prices for items other than foods, fuels, and rents are obtained once every 3 months; and in the small cities they are collected once every 4 months. (See table 1 for the schedule of pricing in the 46 index cities.)

Food prices are collected about the middle of each month by local, part-time agents; these are often housewives, who meet United States Civil Service requirements for work of this kind and who are specially trained to follow standard pricing procedures and specifications. Commodities and services other than food are priced by the Bureau's full-time field agents, who are carefully chosen through the Civil Service system, and intensively trained.

Rent information is collected by mail every month from each city. Then, every 2 years, the Bureau's agents visit the homes of a large, representative sample of renting families to verify mail reports on rent and facilities such as heat, electricity, etc., included in rent payments. During the personal collection of rent information, the Bureau brings its sample of renters up to date to include those living in newly built dwellings.

In addition to rents, a few other prices are collected by mail. The Bureau uses mail questionnaires to obtain streetcar and bus fares, public utility rates, newspaper prices, prices of fuels and certain items which change in price only occasionally and do not require personal visits by Bureau agents. For a few items such as electric rates, postage, etc., price data are obtained from Government records.

The Index Formula

The index is based on the formula:

$$R_i = \frac{\Sigma q_a p_i}{\Sigma q_a p_o}$$

where the q_a's are the average annual quantities of each item used by families of wage earners and clerical workers in 1951–52, the base weight year; the p_o's are the average prices for these items in the base period (1947–49); and the p_t's the average prices in a current period.

In practice, the Bureau calculates the index on a variation of this formula as a weighted average of price relatives for each item: [11]

$$R_t = R_{t-1}\left[\frac{\Sigma q_a\, p_{t-1}\,\frac{p_t}{p_{t-1}}}{\Sigma q_a\, p_{t-1}}\right]$$

where the q_a's are the 1951–52 quantities; p_t's the average prices of the current period; p_{t-1}'s the average prices of the preceding period; and R_{t-1} is the index number for the preceding period on the 1947–49=100 base.

Thus the weights used in a current calculation of the index are "value weights" representing the cost of 1951–52 quantities at prices prevailing in the preceding period.

In the process of imputing the movement of priced items to groups of the unpriced items they represent in the index, value weights—1951–52 prices times quantities—were added together for the groups. The importance given to each item in the index therefore is equal to its own importance in family spending plus the importance of all the items it represents. Although the summation of value weights for groups of items in this manner makes it impossible to identify the quantity factors attached to each index item, it should be noted that despite the many respects in which the items within a group are related, they are of differing kinds and qualities and cannot be described in the same quantity units. Quantity weights therefore are only implicit in the index structure.

The tabulation below shows the 1952 relative importance of major groups of goods and services in the index and the approximate number of items priced:

Group	Relative importance	Number of items priced
All items	100.0	298
Food	30.1	90
Apparel	9.7	75
Housing	32.0	72
Rent	5.3	*1
Other shelter	11.9	14
Fuels, gas and electricity	3.2	10
Housefurnishings	6.6	35
Household operation	5.0	12
Transportation	11.0	18
Medical care	4.7	18
Personal care	2.1	13
Reading and recreation	5.4	8
Other goods and services	5.0	4

*32,000 dwelling units priced for rent information.

A detailed list of items and their relative importances, for December 1952, is given in table 2, on page 73.

Estimating and Calculating Procedure

Each time prices are collected in a city, they are averaged and compared with prices obtained during the preceding visit, and the percentage change in the average price of each item is calculated.

Price relatives are calculated for most commodities in the index by comparing the sum of prices for each specification from the same outlets in the current and preceding pricing period. For food, relatives are based on weighted averages of quotations for chain and independent stores. The chain store quotations are weighted according to the importance of sales in individual chain stores. Interim estimates of price change are made for all items not reported in the current period. For seasonal items or other items not reported in the preceding pricing period, a "long-time" relative is calculated by comparing current prices with the last reported prices. This makes possible a correction of interim estimates.

Retail prices used in the calculation of the index are for detailed specifications of goods and services, and include sales and excise taxes. When an article can no longer be priced, a substitution is made (1) of another article which is adequately described by the same specification, or (2) of an article serving the same purpose but described by a different specification. In the first type, the price of the original article in one period is compared directly with the price of the substitute

[11] When the specification of the priced commodity changes, the formula is not a precise representation. The relative $\left(\frac{P_i}{P_{i-1}}\right)$ would be $\left(\frac{P'_i}{P'_{i-1}}\right)$ where P'_i is the current price of the new item and P'_{i-1} is last month's price of the new item. The price change due to the specification substitution is excluded. Only the trend of price change would affect the index.

article in the next period, and any difference in price between the original and substitute article is shown as a price change in the index calculation. In the second type, prices of the original article in the preceding period and the current period are compared for the current relative, and prices of the substitute article in the current period and the succeeding period are compared for the following month's relative so that any differential in price which is due to differences in quality is not reflected in the movement of the index. This is known as a "linking" process.

In periods when prices are not collected in a city included in the index, price relatives for that city are estimated by reference to average changes observed in the five largest cities priced every month; for some items that change infrequently, the price is held constant over the period. When prices are again obtained for the city, estimating errors are corrected by using "long-time" price change from the previous to the current period—as is done for seasonal items.

Weighting of price relatives to calculate the average price change for groups of goods and services and for all items combined is carried out for each city separately. In combining the cities into the United States all city index, each city is given an importance or weight proportionate to the wage-earner and clerical-worker population it represents in the index [12] (table 1). Each of the 12 largest cities has a weight proportionate to its own population: the urban area of New York City, for example, represents four times as many wage-earner and clerical-worker families as the Detroit area. Therefore, the average price change in New York has four times as much weight in the United States index as an equal price change in Detroit. The 12 largest cities combined have about two-fifths of the weight. The other 9 large cities combined represent a class of cities having about one-fifth of the urban population, and therefore about one-fifth of the weight. Similarly, the 9 medium-size cities have about one-fifth, and the 16 small cities about one-fifth of the weight. The importance of cities in the index is now based on the Census figures for 1950. As new Census population figures become available, the Bureau will adjust the city weights accordingly.

[12] City areas are defined as the Census "urbanized area" which consists of the central city and the surrounding urbanized areas according to population density.

In the actual calculation of the index, population and expenditure weights are combined, so that index value weights are the product of three factors—base year quantities, population, and current prices. Aggregates for the United States index can therefore be calculated by a simple summation of value weights for the individual cities.

Limitations

(1) *Limitations of measurement.* The Consumer Price Index is not an exact measurement. It is subject to the many kinds of limitations that are always present in statistical calculations. The Bureau makes every effort, within the resources allotted to it, to keep the total effect of statistical errors to a minimum, and continually studies the nature of the errors, looking for ways to improve the index.

One kind of limitation arises from sampling procedures. Expenditures for items in the "market basket" are based on interviews with about 8,000 wage-earner and clerical-worker families; price changes are based on prices of about 300 items, collected in about 2,000 food stores and 4,000 other retail stores and establishments; rents are obtained from about 30,000 tenants. Prices are collected in 46 cities, some every month, some every 3 months, and some every 4 months. Thus, the index is based on samples of families, items, stores, and cities that are only a fraction of the total. There is even a "sample" of time, since information is collected only at certain periods.

The degree of error introduced into the index through sampling depends primarily on the amount of variation in price change that exists within groups of items and between stores and cities. To gain about the same degree of accuracy throughout the index, therefore, the number of price observations obtained for any item is conditioned by its price variability and its importance in the total index. For example, prices of fresh vegetables, which are important in the family food budget, change frequently and have different seasonal patterns in different cities; they differ considerably from item to item and from store to store. To measure the average change in prices of all vegetables satisfactorily, a large number of them must be priced in a fairly large number of stores each month in every city. On the other

TABLE 1.—*Cities in which prices are collected for the Consumer Price Index, their relative importance in the United States Index, and the months in which all items are priced* [1]

Cities (All urban places 2,500 and over: Total 1950 population 95,086,000; in wage and clerical families 60,706,000)	Relative population weight	Relative cost-population weights Dec. 1952	Pricing months for most commodities other than food, fuel, and rent											
			Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
All urban areas over 1,000,000														
(Total 1950 population 35,868,000; in wage and clerical families 23,417,000)		100.0												
*New York, N. Y.-Northeastern New Jersey	12.5	13.2	x	x	x	x	x	x	x	x	x	x	x	x
*Chicago, Ill	5.2	5.8	x	x	x	x	x	x	x	x	x	x	x	x
*Los Angeles, Calif	4.4	5.0	x	x	x	x	x	x	x	x	x	x	x	x
*Detroit, Mich	3.0	3.3	x	x	x	x	x	x	x	x	x	x	x	x
*Philadelphia, Pa.-Camden, N. J	2.8	3.0	x	x	x	x	x	x	x	x	x	x	x	x
*Boston, Mass	1.7	1.8	x			x			x			x		
*Pittsburgh, Pa	1.6	1.7	x			x			x			x		
*Cleveland, Ohio	1.6	1.8		x			x			x			x	
*Washington, D. C	1.4	1.6		x			x			x			x	
*Baltimore, Md	1.2	1.1			x			x			x			x
*St. Louis, Mo	1.5	1.5			x			x			x			x
*San Francisco, Calif	1.7	1.9			x			x			x			x
Total	38.6	41.7												
42 urban areas of 240,000–1,000,000														
(Total 1950 population 18,858,000; in wage and clerical families 12,808,000). Represented by:														
*Kansas City, Mo	2.3	2.4	x			x			x			x		
*Minneapolis-St. Paul, Minn	2.3	2.5	x			x			x			x		
*Portland, Oreg	2.4	2.4	x			x			x			x		
*Houston, Tex	2.4	2.4		x			x			x			x	
*Scranton, Pa	2.3	2.1		x			x			x			x	
*Seattle, Wash	2.3	2.7		x			x			x			x	
*Atlanta, Ga	2.4	2.1			x			x			x			x
*Cincinnati, Ohio	2.3	2.2			x			x			x			x
Youngstown, Ohio	2.3	2.4			x			x			x			x
Total	21.0	21.2												
216 cities and urban areas of 30,500–240,000														
(Total 1950 population 19,012,000; in wage and clerical families 12,165,000). Represented by:														
Canton, Ohio	2.1	2.0	x			x			x			x		
Charleston, W. Va	2.2	2.4	x			x			x			x		
Lynchburg, Va	2.4	2.2	x			x			x			x		
Evansville, Ind	2.4	2.0		x			x			x			x	
Huntington, W. Va.-Ashland, Ky	2.2	1.9		x			x			x			x	
Middletown, Conn	2.1	2.5		x			x			x			x	
Madison, Wis	2.1	2.3			x			x			x			x
Newark, Ohio	2.2	1.9			x			x			x			x
San Jose, Calif	2.4	2.4			x			x			x			x
Total	20.1	19.6												

2,527 cities under 30,500														
(Total 1950 population 21,348,000; in wage and clerical families 12,316,000). Represented by:														
Grand Forks, N. Dak	1.2	1.1	x				x				x			
Madill, Okla	1.4	1.0	x				x				x			
Pulaski, Va	1.2	1.0	x				x				x			
Ravenna, Ohio	1.3	1.2	x				x				x			
Camden, Ark	1.4	.9		x				x				x		
Garrett, Ind	1.3	1.3		x				x				x		
Rawlins, Wyo	1.2	1.2		x				x				x		
Shawnee, Okla	1.2	1.1		x				x				x		
Anna, Ill	1.2	1.0			x				x				x	
Glendale, Ariz	1.4	1.2			x				x				x	
Grand Island, Nebr	1.3	1.1			x				x				x	
Laconia, N. H	1.2	1.0			x				x				x	
Lodi, Calif	1.4	1.5				x				x				x
Middlesboro, Ky	1.2	.8				x				x				x
Sandpoint, Idaho	1.1	1.0				x				x				x
Shenandoah, Iowa	1.3	1.1				x				x				x
Total	20.3	17.5												

*Cities for which indexes are published.

[1] Food, rent, and certain other items are priced monthly in all cities.

hand, prices of men's nationally advertised brand shirts do not change often, and the same kind of shirt sells for the same price in almost all stores. These can be priced less frequently and in fewer stores, and still measure the price change satisfactorily.

Another kind of error may occur in the index because people who give information cannot always report exactly. In making surveys of consumer expenditures to determine the basic "market basket," the Bureau has found that families can estimate very well what they spend in a year for rent, or electricity, or automobile, but not all can remember all their expenses for men's shirts, or women's hose or other things that are bought frequently. Some report less than they actually bought, some more, so that these errors of recall tend to cancel out. The Bureau uses the most modern survey methods and highly trained interviewers to keep these reporting errors in the "market basket" to a minimum, and the survey results are compared with information obtained by other organizations whenever possible so that the figures can be adjusted if necessary.

The Bureau takes precautions to guard against errors in pricing which might affect the index most seriously. Price agents are well trained to recognize qualities of goods on the store shelves, and they take the selling prices as marked or as reported by the merchant. Sales prices and discounts are recorded, as well as premium prices and special charges. However, sales prices are included in the index calculation only if the goods offered on sale are in good condition, meet the Bureau's specifications, and the sale is of sufficient duration to allow most consumers to take advantage of the price reductions. Discounted prices are used if they apply generally to all customers; they are not used if offered to special types of buyers only, of if affected by the bargaining skills of the buyer.

The index, therefore, does not reflect all sales and discounts offered in retail stores, or the effect of savings the housewife may make in "shopping around." Nor does it reflect all special charges, such as tips and "under-the-counter" premium payments, that are not reported to the Bureau's price agent.

One of the principal sources of potential error in the index is in the estimation of price change for items which are important in family spending, but not included in the list of items priced. Also, failure to observe price changes in localities in which price trends differ from those in which prices are collected, introduces errors of estimation in the measurement of the national trend. In the past, the Bureau omitted from its pricing list some items which were difficult to price satisfactorily, and limited its price collections to large cities only. However, within the limits of funds available for price collection work, efforts were made to check on price trends in noncovered areas and to keep error of estimation low.

The revision of the Consumer Price Index, completed in January 1953, was the most comprehensive undertaken since the mid-thirties, and was designed to reduce still further the effects of errors. In addition to developing a new "market basket" for the index, the Bureau introduced many important improvements in pricing and calculation methods. For example, changes in costs of shelter to homeowners, including repairs and maintenance of homes, are now priced directly where formerly they were measured by changes in rents; the Bureau now prices meals in restaurants instead of assuming that restaurant prices move like prices of foods purchased in stores. Changes in prices of used cars are measured directly where formerly they were imputed from price trends of new automobiles. Although the pricing procedures used for these items are still imperfect, they represent an improvement over past practices. Many items of food and other goods and services were added to the pricing list to improve the accuracy of the index measurement. Small cities have been added to the index coverage to make it more representative of price changes that are experienced by all urban wage-earner and clerical-worker families, since price trends in large and small cities may differ under certain circumstances.

(2) *Limitations in use.* The Consumer Price Index is specifically designed to measure the average change in prices of goods and services bought by urban wage-earner and clerical-worker families. Consequently, the index must be applied carefully when used for other purposes. The index represents all wage-earner and clerical-worker families, but not necessarily any one family or small groups of families. There are limitations on the application of the index to very low or very high income groups, to elderly couples, to single workers, or to other groups whose level or manner of living and spending are different from the

average of all worker families. To the extent that these groups spend their income differently and are therefore differently affected by price changes, the index is not exactly applicable. On the other hand, when the index is applied to all city families or to the total urban population, the limitations are not considered to be serious, since the wage-earner and clerical-worker family group represents such a large proportion (nearly two-thirds) of these populations.

The index is not to be used to measure the changes in *total family spending*, since it measures only the effect of *price* change and does not take into account other factors, such as higher or lower incomes or income taxes. The index does not reflect the experience of the individual housewife, as she "shops around" to take advantage of the lowest prices, nor does it show the full effect of paying premium prices for scarce items. The index also does not reflect the change in costs experienced by families who move from one city to another or who change from renting to owning their own home.

Comparisons of city indexes show how much prices have changed in one city compared with another since the base period 1947–49. They do *not* show whether prices are higher or lower in one city than in another.

Because the index, like the other economic series prepared by the Bureau, serves the needs of all sections of the public, an effort is made to provide as much information about it as possible, and to consult the users on ways of making the index better and more useful. Committees of advisors drawn from business and labor organizations and from professional associations advise on problems that arise; they were active in the comprehensive program of index revision completed January 1953. Other outside technical experts are also consulted on occasion.

TABLE 2.—*List of items priced and the relative importance of each item in the major groups of items and in the total index, December 1952 (after revision)*

Item	Percent to—	
	All items total	Group total
FOOD	29.84	100.00
Food at home	25.28	84.72
Cereals and bakery products	3.08	10.33
Cereals:		
Flour, wheat	.54	1.84
Biscuit mix	.16	.54
Corn flakes	.10	.32
Rolled oats	.07	.24
Cornmeal	.05	.15
Rice	.09	.29
Bakery products:		
Bread, white	1.43	4.82
Soda crackers	.15	.50
Vanilla cookies	.49	1.63
Meats, poultry, and fish	7.70	25.79
Beef:		
Round steak	.92	3.09
Rib roast	.17	.57
Chuck roast	.58	1.95
Hamburger	.61	2.05
Veal:		
Veal cutlet	.20	.67
Pork:		
Pork chops	.73	2.44
Smoked ham	.66	2.22
Bacon	.84	2.80
Lamb:		
Leg of lamb	.19	.62
Other meats:		
Frankfurters	.74	2.49
Canned luncheon meat	.26	.87
Poultry:		
Frying chickens	1.23	4.12
Fish:		
Fresh and frozen fin fish	.31	1.02
Canned salmon	.09	.30
Canned tuna	.17	.58
Dairy products	4.18	14.02
Butter	.49	1.66
Cheese, American process	.52	1.75
Milk, fresh (delivered)	1.25	4.18
Milk, fresh (grocery)	1.30	4.33
Milk, evaporated	.29	.98
Ice cream	.33	1.12
FOOD—Continued		
Food at home—Continued		
Fruits and vegetables	4.55	15.25
Fresh fruits:		
Oranges	.33	1.13
Lemons	.05	.17
Grapefruit	.06	.21
Apples	.34	1.13
Bananas	.23	.79
Peaches	.10	.34
Grapes	.07	.24
Strawberries	.08	.25
Watermelons	.16	.53
Fresh vegetables:		
Potatoes	.54	1.86
Sweetpotatoes	.07	.23
Beans, green	.13	.42
Cabbage	.04	.14
Carrots	.10	.33
Onions	.11	.38
Tomatoes	.22	.75
Celery	.10	.34
Lettuce, head	.18	.60
Canned fruits:		
Orange juice	.20	.67
Peaches	.17	.57
Pineapple, sliced	.10	.33
Fruit cocktail	.09	.29
Canned vegetables:		
Corn	.14	.46
Peas	.16	.53
Tomatoes	.20	.66
Strained baby food	.14	.46
Frozen fruits:		
Orange juice, concentrate	.11	.35
Strawberries	.03	.10
Frozen vegetables:		
Peas	.08	.27
Green beans	.05	.17
Dried fruits and vegetables:		
Prunes	.08	.25
Navy beans	.09	.30
Other foods at home	5.77	19.33
Partially prepared foods:		
Soup, vegetable	.38	1.26
Beans with pork	.15	.51

See footnotes at end of table.

TABLE 2.—*List of items priced and the relative importance of each item in the major groups of items and in the total index, December 1952 (after revision)*—Continued

Item	Percent to—	
	All items total	Group total
FOOD—Continued		
Food at home—Continued		
Other foods at home—Continued		
Condiments and sauces:		
Sweet gherkins	0.24	0.79
Tomato catsup	.10	.34
Nonalcoholic beverages:		
Coffee	1.12	3.76
Tea	.12	.40
Cola drinks	.33	1.10
Fats and oils:		
Margarine	.24	.82
Lard	.08	.28
Vegetable shortening	.29	.96
Salad dressing	.17	.59
Peanut butter	.10	.32
Sugar and sweets:		
Sugar, white	.38	1.29
Corn syrup	.13	.42
Grape jelly	.13	.42
Chocolate bar	.27	.90
Eggs, fresh	1.43	4.81
Miscellaneous foods:		
Flavored gelatin dessert	.11	.36
Food away from home:		
Restaurant meals	4.56	15.28
HOUSING	32.19	100.00
Residential rents	5.46	16.95
Other shelter	12.00	37.29
Housing away from home [1]	.37	1.17
Homeowner expenditures:		
Sales prices of homes	6.02	18.70
Real estate taxes	.99	3.08
Mortgage interest rates	1.54	4.77
Property insurance rates	.21	.66
Repairs and improvements:		
Garage repaint job	.14	.45
Exterior house paint	.26	.81
Contract price of repainting dining room	.27	.83
Paint brush	.32	.98
Reshingling house roof	.29	.90
Replacing hot water heater	.74	2.29
Kitchen cabinet sink, noninstalled	.12	.38
Sink faucet, installed	.29	.90
Refinishing dining room floor	.16	.50
Lumber for porch flooring	.28	.87
Gas and electricity	1.93	6.00
Gas: Residential heating	.32	.99
Other than residential heating	.60	1.88
Electricity	1.01	3.13
Solid fuels and fuel oil	1.32	4.09
Anthracite	.25	.78
Bituminous coal	.53	1.60
Briquets	(2)	.01
Wood and prestologs	.02	.06
Fuel oil	.48	1.50
Range oil	.04	.14
Housefurnishings	6.45	20.05
Textile housefurnishings:		
Sheets	.23	.73
Blankets	.09	.27
Bedspreads, cotton	.09	.27
Towels	.07	.23
Tablecloths, cotton	.04	.11
Drapery fabrics, cotton	.18	.57
Curtain, cotton and rayon	.17	.53
Floor coverings:		
Rugs, wool, Axminster and broadloom	.41	1.28
Rugs, cotton, scatter	.06	.19
Rugs, felt base	.13	.39
Furniture:		
Living room suites	.53	1.65
Dinette sets, wood	.14	.42
Dinette sets, chrome	.21	.66
Bedroom suites	.53	1.67
Sofa beds	.18	.55
Bedsprings, coil	.07	.20
Mattresses, innerspring construction	.17	.53
Major household appliances:		
Refrigerators, electric	.84	2.63
Cookstoves	.43	1.34
Washing machines, electric	0.51	1.59

Item	Percent to—	
	All items total	Group total
HOUSING—Continued		
Housefurnishings—Continued		
Major household appliances—Continued		
Vacuum cleaners, electric	0.22	0.68
Sewing machines, electric	.17	.52
Small household appliances:		
Toasters, electric	.22	.70
Housewares:		
Dinnerware, 53-piece set	.16	.49
Saucepans, aluminum	.22	.69
Brooms	.10	.31
Miscellaneous:		
Napkins, paper	.04	.11
Toilet tissue	.19	.59
Electric light bulbs	.05	.15
Household operation	5.03	15.62
Laundry soap and detergents	.61	1.90
Dry cleaning	1.25	3.86
Laundry service	.74	2.29
Automatic laundry service	.11	.35
Domestic services	.56	1.74
Telephone rates	1.13	3.49
Residential water rates	.29	.90
Postage	.25	.78
Ice	.09	.31
APPAREL	9.41	100.00
Men's apparel	2.55	27.07
Topcoats	.23	2.41
Jackets	.14	1.46
Sweaters	.05	.58
Suits, heavy wool	.41	4.31
Suits, light wool	.10	1.09
Suits, rayon	.12	1.26
Slacks, wool	.15	1.59
Slacks, rayon	.05	.54
Trousers, work	.21	2.22
Overalls	.13	1.39
Shirts, work	.07	.78
Gloves, work	.04	.43
Shirts, sport	.11	1.15
Shirts, business	.19	1.98
Shorts, cotton	.05	.52
Undershirts, knit	.16	1.75
Pajamas	.06	.62
Socks, cotton	.13	1.41
Socks, rayon	.07	.78
Hats, felt	.08	.80
Boys' apparel	.45	4.79
Suits, wool	.12	1.27
Jackets, rayon	.06	.61
Slacks	.04	.44
Dungarees, blue jeans	.09	.97
Shirts, sport, woven	.10	1.05
Undershorts, knit	.04	.45
Women's apparel	3.46	37.03
Coats, heavy wool, plain	.39	4.16
Coats, heavy wool, fur-trimmed	.09	.97
Coats, light-weight wool	.18	1.92
Coats, fur	.10	1.11
Suits, wool	.26	2.79
Suits, rayon	.09	.98
Dresses, wool	.09	.96
Dresses, rayon	.39	4.14
Dresses, cotton, street	.19	1.99
Housedresses	.14	1.46
Skirts, wool	.03	.31
Skirts, rayon	.09	.95
Blouses, rayon	.14	1.53
Sweaters, wool	.08	.88
Shorts, cotton, sport	.03	.29
Slips, nylon tricot	.07	.76
Slips, rayon	.11	1.19
Panties, rayon	.10	1.02
Girdles	.12	1.30
Brassieres	.10	1.06
Nightgowns, rayon and cotton	.10	1.11
Stockings, nylon	.42	4.50
Gloves, cotton and leather	.04	.47
Handbags, fabric	.11	1.18
Girls' apparel	.70	7.19
Coats	.20	2.07
Dresses, cotton	.14	1.45

See footnotes at end of table.

TABLE 2.—*List of items priced and the relative importance of each item in the major groups of items and in the total index, December 1952 (after revision)*—Continued

Item	Percent to—	
	All items total	Group total
APPAREL—Continued		
Girls' apparel—Continued		
Skirts, wool	0.08	0.81
Sweaters, cardigan, wool	.08	.80
Panties	.12	1.25
Anklets	.08	.81
Footwear	1.44	15.25
Men's:		
Oxfords	.28	3.01
Work shoes	.13	1.33
Rubbers, dress	.08	.88
Women's:		
Oxfords and pumps, street	.36	3.77
Play shoes	.15	1.60
Children's oxfords	.28	3.01
Shoe repairs, men's and women's	.16	1.65
Other apparel	.81	8.67
Diapers	.19	2.06
Yard goods:		
Cotton	.12	1.33
Rayon	.04	.40
Miscellaneous [1]	.46	4.88
TRANSPORTATION	11.33	100.00
Automobiles:		
New cars	2.91	25.70
Used cars, 3- 4- 5-years old	2.04	18.00
Auto repairs	1.08	9.55
Tires	.35	3.05
Gasoline	2.23	19.66
Motor oil	.21	1.84
Auto insurance	.96	8.49
Registration and license fees	.28	2.44
Local public transportation:		
Streetcar and bus fares	.99	8.76
Railroad fares	.28	2.51
MEDICAL CARE	4.78	100.00
Physician:		
Office visit	.71	15.00
Home visit	.72	15.08
Obstetrical care	.17	3.57
Surgeon: Appendectomy	.17	3.54
Specialist: Tonsillectomy	.09	1.79
Dentist:		
Filling	.67	14.13
Extraction	.17	3.45

Item	Percent to—	
	All items total	Group total
MEDICAL CARE—Continued		
Optometrist: Eyeglasses, complete	0.28	5.78
Hospital rates:		
Men's pay ward	.07	1.40
Room	.14	2.79
Group hospitalization	.81	17.14
Prescriptions and drugs:		
Prescriptions, narcotic and nonnarcotic	.26	5.52
Penicillin tablets	.09	1.81
Multiple vitamin concentrates	.19	4.03
Aspirin	.18	3.80
Milk of magnesia	.06	1.17
PERSONAL CARE	2.12	100.00
Men's haircut	.60	28.68
Permanent wave	.13	6.00
Shampoo and wave set	.19	8.89
Toilet soap	.21	9.98
Cleansing tissues	.14	6.41
Toothpaste	.20	9.52
Shampoo, liquid	.11	5.22
Shaving cream	.06	2.85
Home permanent refill	.04	1.96
Face powder	.12	5.61
Face cream	.12	5.62
Razor blades	.14	6.50
Sanitary napkins	.06	2.76
READING AND RECREATION	5.32	100.00
Radios, table model	.34	6.38
Television sets	1.04	19.51
Television repairs	.04	.78
Motion picture admissions:		
Adult	1.04	19.60
Child	.28	5.17
Toys	.31	5.78
Sporting goods	1.28	24.20
Newspapers	.99	18.58
OTHER GOODS AND SERVICES	5.01	100.00
Cigarettes	1.65	32.84
Cigars	.15	3.03
Beer	1.50	29.99
Whiskey	.88	17.57
Miscellaneous [1] [3]	.83	16.57

[1] Not actually priced; imputed to another priced item or group of items.

[2] 0.005 percent or less.

[3] Miscellaneous service; such a [legal services, banking fees, burial services, etc.

B. L. S. 347
Rev. (4) 3-1-50

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U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON 25, D. C.

RENTS

Budget Bureau No. 44-R433.6.

City, Zone, State ....

Address* .... Apt. No. ......

Phone .... Suburb ....

Name of tenant (*optional*) ....

Managed by—Name and address ....

Sample No. ....

Time to contact ....

Owner ☐ / Agent ☐ } Phone No. ....

District	Schedule No.	Block	Special	Rent Group

Type		No. of Units	Race
Single: Detached ☐ Semi ☐ Attached ☐	Apt. ☐ Other ☐		White ☐ Negro ☐ Other ☐

CWFB No. | 1674 Page No. | Line No.

If unit created by structural conversion, enter year ______.

DESCRIPTION OF DWELLING UNIT:

1. *Year built:* Before 1920 ☐
   1920 to 1939 ☐
   1940 and after ☐ Specify year ......
2. *Condition:* Dilapidated ☐
   Not dilapidated ☐
3. *Number of rooms:* 1 2 3 4 5 6 7 8 +
4. *Running water in unit:* Hot and cold ☐
   Cold only ☐ None ☐
5. *Bathroom:*

	Private	Shared
Complete	☐	☐
Half bath	☐	☐
Flush toilet	☐	☐
None ☐		

6. *Refrigeration:* Gas ☐ Electricity ☐ Ice ☐ None ☐
7. *Cooking fuel:* Gas ☐ Electricity ☐ Other ☐
8. *Heating equipment:* Central ☐ Other installed ☐ Other not installed or none ☐
9. *Garage:* Yes ☐ No ☐

Facilities: Check if included in rent												Occupancy					Contact					Rent		Office Use	
Furniture		Light	Water	Hot Water	Heat	Heating Equipment	Cooking Fuel	Inst. Cook Stove	Refrigeration Unit	Garage	Other Specify	Tenant			Owner	Vacant	Personal	Phone	Mail	Date	Notes	Per Week	Per Month		
Full	Part											New	Same	No. Persons	Explain on Back										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

*If mail address differs, enter under note 2 on back.

Date of Rent Change	Reason for Rent Change

NOTES

1. Capital improvements and changes in facilities and in services (explain on back).
2. See comments on back.

Code: Columns 18, 19, and 20: 1—Tenant, 2—Owner, 3—Landlord, 4—Manager, 5—Neighbor.

BLS 2390
(9-1-53)

CONFIDENTIAL

Budget Bureau No. 44-R224.10.
Approval expires Dec. 31, 1956.

U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON 25, D. C.

RETAIL PRICES
FOOD STORES—MASTER SCHEDULE

City and State .....

Outlet No. .....

Name of Store .....

Street Address ..... Zone ..... Telephone No. .....

If information ☐ or authorization ☐ is obtained elsewhere, enter: .....
(Name of organization)

Address ..... Zone ..... Telephone No. .....

Persons who authorize reporting of information:

Name	*Title*	*Location*	*Extension*

Appointment necessary: Yes ☐ No ☐ Shopping area: Central ☐ Suburban ☐ Neighborhood ☐

Time to visit store .....

Nearest transportation (if not in central shopping area) .....

SALES TAX

Tax in percent to be added to all prices, except items noted below as exempt:

Sales tax in effect:	CHANGES	
	DATE	NATURE OF CHANGE
FOODS		
Date ..... City .....% State .....%		
NONFOODS		
Date ..... City .....% State .....%		

Exempt items: .....

Remarks: .....

PRICING RECORD

Field Representative	*Pricing Date*	*Field Representative*	*Pricing Date*

16—60540-1

Line	Commodity Code and Title	Brand and Grade	Unit Quoted	195— Dec.	Year: 195— Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	**CEREALS** **F–100.0—Flour,** white, wheat, all purpose.		5-lb. sack													
2	**F–106.0—Biscuit mix.**		20-oz. pkg.													
3	**F–110.0—Corn meal,** white or yellow.		____ oz. pkg.													
4	**F–120.0—Rice,** fancy, whole grain.		16-oz. pkg.													
5	**F–126.0—Rolled oats,** regular or quick.		20-oz. pkg.													
6																
7	**F–130.0—Corn flakes.**		____ oz. pkg.													
8																
9																

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Chapter 10. Wholesale Price Indexes*

The Bureau of Labor Statistics regularly compiles and issues three measures of price movements in primary markets—(1) the comprehensive monthly index; (2) a weekly estimate of what the monthly index would be if all the prices in the monthly index were collected and tabulated each week; (3) a daily index based on the prices of 22 commodities traded on organized markets or exchanges. All three indexes were revised during 1952 as part of the Bureau's general program for the maintenance and modernization of its statistical series.

Monthly and Weekly Indexes

Background and Uses

The wholesale price index is the oldest continuous statistical series published by the Bureau, and one of the oldest nonfiscal series of the Federal Government. The origins of the index are associated with a resolution of the United States Senate in 1891 which authorized the Committee on Finance to investigate the effects of the tariff laws "upon the imports and exports, the growth, development, production, and prices of agricultural and manufactured articles at home and abroad." This investigation established the basis for the first index of primary market prices. The function of continuing this work was assigned to the United States Bureau of Labor, the predecessor agency of the current Bureau of Labor Statistics, and it has been maintained in the BLS as a continuous series since 1890. Since that time many changes have been made both in content and in methods of calculating the index. These changes have reflected the development of the Nation, the demands for more complete and more detailed information, and the advance in techniques for measuring economic phenomena.

The original data included prices for about 250 commodities. This number slowly increased and by 1940 approximately 900 commodities were covered, based on approximately 2,000 separate price quotations. The 1952 revision doubled the number of commodities and quotations covered; most of the additions were made in the area of manufactured products such as machinery, apparel, industrial chemicals, and consumer durable goods.

Official monthly indexes are available separately for major groups of commodities, as well as for the total, for the period since 1890. A finer classification by subgroups of commodities is available since 1913. In 1952, a third level of classification—product class—was introduced; these have been extended back to 1947.

The monthly index is the official wholesale price index which is made up of two segments: (1) up to and including December 1951, the official series is the former index, 1926=100; (2) commencing in January 1952, the only official series (and in fact the only series issued) is the revised index, 1947–49=100. The movement from December 1951 to January 1952 was based on the revised index. The revised index has been published in complete detail for the period January 1947 to date. However, prior to January 1952 this index is to be used only for historical and analytical purposes and is not official. In addition, the Bureau has traced price movements of many components, as well as the total index, back to 1926 on the basis of the month-to-month movements of the former index prior to January 1947.

A weekly wholesale price index independent of the monthly index was maintained from 1932 through 1948, when it was replaced by an index based on a small sample of the commodities in the comprehensive index. This sample index was closely tied to the monthly index and was adjusted periodically for deviations from the monthly index to form a continuous series. In the 1952 revision, the weekly index was redesigned as an estimate of the monthly index but no attempt has been made to maintain it as a continuous series. As soon as a monthly index becomes available, it supersedes all the weekly indexes relating to that month.

*Prepared by Edgar I. Eaton of the Division of Prices and Cost of Living.

The index has three main uses:

First, as the measure of price movements at other than the retail level, it is one important indicator of change in the economy. The index is widely used by business and economic analysts in setting policies, measuring their effectiveness, and in the administration of such policies.

Second, the index is used as a measure of the purchasing power of the dollar (excluding retail, where the Bureau's Consumer Price Index is used), and is therefore a key factor in the periodic adjustment or escalation of many long-term purchase or rental agreements. The uses of the index for escalation fall into two main categories:

(1) Specific segments of the index (sometimes coupled with the Bureau's statistics on wages or earnings in specific industries) are used to adjust for changes in the prices of the raw and semi-finished materials which go into the construction of a finished product which must be produced or constructed over a relatively long period of time. A broad general index like the Bureau's wholesale price index, even though it may not actually contain the price of the specific materials that enter into the final product being escalated, may produce a satisfactory adjustment for price trends.

(2) The index is used as a means of taking account of the purchasing power of the business dollar in long-term contracts—for example, the long-term lease for business, industrial, or commercial property; a royalty or patent licensing agreement; or the continuous delivery of a commodity or service such as natural gas or electric power. In these contracts, the base price is established, and is then adjusted periodically by the changes in the index. In most of these contracts, the parties use the total index—All Commodities—or All Commodities other than Farm Products and Processed Foods. The use of the index protects both parties against wide changes in the price level. Again, in any individual case, the index may not be exact, since purchasing power must be defined in terms of the commodities and services bought with the dollar.

The third main use of the index is by buyers and sellers of commodities—purchasing agents and sales managers. In most of these cases, it is not the total index, but rather the group indexes and the individual price series which are employed. Buyers of commodities are able to check both the amounts which they pay for goods and the general movement of their purchase prices against the index. The use of the index for checking absolute price levels is sharply limited, however. The Bureau's main goal has been to measure the direction and amount of change, and only incidentally to measure actual selling prices.

The index, as a measure of general and specific price trends, is also widely used in budget making and review, both in Government and in industry; in planning the cost of plant expansion programs; in appraising inventories; in establishing replacement costs, etc. The index is also used in LIFO [1] accounting by some organizations.

Concepts and Scope

The wholesale price index is a general purpose index designed to provide a continuous monthly series showing price changes, singly and in combination, for all commodities sold in primary markets of the United States. The index measures the general rate and direction of price movements in primary markets and specific rates and changes for individual commodities or groups of commodities. The rate and direction are gaged by a carefully selected and classified list of commodities, specifications, and markets.

"Wholesale" as used in the title of this index refers to sales in large lots, not to the prices paid or received by wholesalers, distributors, or jobbers. The price data used in constructing this index are those which apply at primary market levels—that is, the first important commercial transaction for each commodity. Most of the quotations are the selling prices of representative manufacturers or producers, or prices quoted on organized exchanges or markets.

The index does not measure the price movements of retail transactions, transactions for services (including construction of finished structures or of other composite items which are not reproduced on a repetitive base), printing and publishing, real estate, transportation, and securities. But the prices of the raw and finished materials used in construction and in printing and publishing—lumber, bricks, structural steel, millwork, ink, paper, etc.—are reflected in the index.

All sales of goods by or to manufacturers or producers (except those sales which represent interplant transfers within the same company

[1] Last-in, first out.

and are therefore only internal book transactions) are included in the base weights. Thus, the "universe" or coverage is the total of primary-market transactions in the United States. Each commodity price series in the index, as a representative of a class of prices, is assigned its own weight (i. e., the direct sales of that individual commodity) plus the weight of other commodities not directly priced in the index, but known or assumed to move similarly pricewise. The commodity universe includes imports because they are sold in domestic markets; it also includes transactions in exports up to the point at which they leave the domestic market.

For certain commodities, such as ships and railroad rolling stock, fabricated plastic products, and some machinery which is largely custom-made, it has not been possible for the Bureau to obtain any direct measures of price movement. For these, the Bureau obtained advice from industry and other experts, and assigned their weight to other commodities or groups of commodities included in the index. In some instances, this assignment was made to the most important raw materials used in the manufacture of the unpriced commodity; in others, to priced commodities which have a similar manufacturing process. In so doing, the Bureau decided that it is more realistic to assign the weight for this type of product specifically to priced commodities than to assume that its price will move with the all-commodities index which includes farm products and foods. This last assumption would be implicit in excluding the weight from the index structure. The use of the index is such that if the Bureau failed to make the specific imputation, the users would do so implicitly whenever they used the total index to measure the purchasing power of the dollar in primary markets, or to compare price movements with total production or similar data.

New items are not included in the index until they have become established both technologically and in the market. During their first few years of production, the changes in the prices of such items may reflect product changes rather than those price changes which the index is designed to measure. In the developmental stage, too, the sales volume of these new items is usually too limited to influence the index appreciably.

The index is intended to measure "real" or "pure" price changes between two periods of time, i. e., to measure price changes not influenced by changes in quality, quantity, terms of delivery, etc. Therefore, identical lists of commodities must be used in the periods compared in order to prevent the index from measuring changes in the product-mix or "nonprice" factors. To do this, the commodities included in the index are defined by precise specifications which incorporate the principal price-determining characteristics of the commodities and also the terms of sale from specified types of sellers to specified types of purchasers.

In general, the prices used in the index are selected to conform with the concept of seller's net realization per unit of precise specification. As far as possible, the commodities are priced at the focal point of price making. Machinery, therefore, is priced f. o. b. factory; grains on the organized exchanges; fresh produce at central auction markets, etc. Net realization, as defined by market practice, means actual sales of precisely defined commodities, less normal discounts, in approximately similar quantities to similar classes of buyers—it does not mean an average realized value per unit for a range of similar commodities. In other words, net realization means the price for a steel girder of precise size, shape, and quality to a precise class of buyers at a precise shipping point—not for a range of girders, buyers, or shipping points.

List or nominal prices quoted by trade journals and manufacturers have a proper place in the structure of the index when they satisfy the above criteria and reflect the industry's customary pricing practices. These types of prices satisfy the purposes of the index since they indicate price movements and relationships, even though they are not always good measures of the absolute level of prices.

Transportation costs are included in the index only insofar as they are directly included in the primary market price. Usually, prices are selected f. o. b. production or central marketing points, in order to avoid direct reflection of changes in transportation costs in the index. Delivered prices are included only when the customary practice of the industry is to quote on this basis. Subsidies and direct excise taxes are similarly excluded from the index as far as possible; these are not considered

part of the "price" as defined above for purposes of the Bureau's index.

The classification system of the wholesale price index is essentially based on products or commodities rather than on industry, source, or end-use. It does not exactly match either the Standard Industrial Classification, the Standard Commodity Classification, or the United Nations Commodity Classification. However, regroupings of the current classification can be made which will closely approximate any of these three classifications. The basic index is divided into 15 major groups and 88 subgroups. In addition, in the 1952 revision, a third layer of classification called the "product class" was added. A product class approximates a grouping of commodities produced by a single industry or by related industries characterized by similarity of raw materials or production processes.

The index is so designed, however, that it can be readily recomputed in accordance with any acceptable classification scheme. Each commodity is a separate cell, and these cells can be easily combined in any desired way. The general approach of flexibility is carried throughout the index, so that product classes, subgroups, and groups can also be readily added.

The classification of the revised index is considerably different from that of the former index (which had only 10 groups and 50 subgroups). It is closely related to and dictated by the needs of the users of the data. Care should be taken in making detailed comparisons between the former and revised indexes to be certain that groups with similar titles are actually comparable. For example, the former group for Metals and Metal Products was divided into two new groups—(1) Metals and Metal Products, and (2) Machinery and Allied Products—neither of which is comparable with the former group index.

Survey Methods and Estimating Procedures

Selection of Sources. The monthly index is based upon a sample of commodities, specifications, reporters, and primary-market levels of transactions, because it is neither necessary nor possible to cover all specifications, producers, markets, and buyers. Although a comparatively small list of commodities might suffice for a reliable summary all-items index, the Bureau has included some 2,000 separate commodities in response to the demands of the users of the index. This permits the development of reliable indexes for small subdivisions of the economy. For example, the prices of one type of cotton and one type of raw wool could yield general measures of the price movements of plant and animal fibers for the all-commodities index; the prices of abaca and other minor fibers are necessary to support a subindex for hard fibers, within the plant-and-animal-fibers classification, as more detail is needed, especially by business users of the index.

The commodities included in the index are not chosen by probability sampling. The selections are based upon knowledge of each industry and its important products, and are made after consultation with leading trade associations and manufacturers within each field. In general, the commodities included in the index are the most important ones in each field (using Census and similar data to determine importance); some, although not important in terms of sales volume, were selected since they appear to offer good representation of price movements because of particular industry or trade characteristics.

The particular specifications for each commodity were also selected on the basis of advice from the industry and other expert sources. They are designed to represent, in combination, the various qualities, grades, levels of distribution, markets, or producers of each commodity. In some instances, a single specification is used by the producers and sellers as a standard and all others are quoted as differentials from the standard. Samples of such standards are $1\frac{5}{16}$″ cotton, or No. 2 hard winter wheat, or tin of a specific purity. When there is no standard commodity, the Bureau has made a judgment selection, taking into account that one requisite of a price index is comparability from period to period. It is thus essential to price a specification which is precise or which does not change from period to period.

Examples of specifications of commodities included in the index are:

Pears, California, Bartletts (except early Bartletts), Oregon Rose, U. S. No. 1 grade, Oregon Nelis, U. S. No. 1 grade, Oregon Anjous, U. S. No. 1 and fancy grades, Washington anjous, fancy and combination (extra and fancy) grades, average market price, New York auction market..... Box

Boys' mackinaw, 35% virgin wool, 65% reprocessed wool, 32 oz./yd., junior boys' sizes, manufacturer to retailer, f. o. b. factory---------- Each

Rails, standard, carbon steel, No. 1 O. H. with 8% seconds arising, 39' std. lengths with usual shorts, section No. 11525 (115 lbs. per lineal yard), ASTM, AREA or equivalent spec., control cooled, base quantity, mill to user, f. o. b. mill, extra for controlled cooling---------- 100 lbs.

End mill, high speed steel, ½–¾", straight or taper shank, manufacturer to users, f. o. b. factory---------- Each

A detailed report describing all of the price-making characteristics of the commodity is prepared each time a reporter is added to the index. A copy of this report (Form BLS 1810) is shown on the following page.

In selecting the price reporters for each series, informed judgment and industry advice were also relied upon. If any organized exchange or market exists for a product, the exchange or market price is used. If a trade journal is generally recognized as reliable by industry, and independent spot checks by the Bureau confirm its accuracy, the quotation is used. In other instances, such as for most agricultural products and fish, prices for individual specifications are officially collected and published by other Government agencies. For quotations from individual sellers (the Bureau does not use prices from buyers) reporters are selected by taking into account the distribution of sellers by geographic region (where such distribution is important), by degree of integration, by volume, by market and by degree of "price leadership." Whenever possible, at least three reporters are obtained for each specification. In the case of a commodity such as brick which is locally produced for a small geographic market, reporters are selected to represent all important markets. In order to avoid disclosure of information collected on a confidential basis, the Bureau does not publish composite prices which are based on quotations from less than three individual reporters.

Weights. The basic weights for the revised index are total transactions as reported in the Census of Manufactures for 1947. Interplant transfers are excluded insofar as available data permit. Data for agricultural and extractive industry products were obtained from the Agriculture and Minerals Yearbooks for 1947; import data cover the year 1947, as reported by the U. S. Department of Commerce. The data for 1947 were used to establish the relationship among the groups, subgroups, and product classes. Within product classes, however, the Bureau has attempted to approximate the most typical postwar (up to 1950) relationship between commodities within the same class. Therefore, the best information available is used for this purpose, and it does not necessarily relate to 1947. For example, 1947 was a year in which the production pattern for agricultural machinery was seriously distorted by the prolonged closing of one major plant and industry data for 1949 were used to determine the relative weights within the product class. The relationship of agricultural machinery to total agricultural equipment and the relationship of each to construction machinery, however, are based upon the 1947 experience. In moving from individual commodities to larger groupings, any distortions which existed in 1947 become progressively less important. Moreover, any such distortions are more than offset by the advantage of having the general pattern of the index reflect a concrete time period and set of conditions—mutually consistent, marketwise and valuewise. Finally, 1947 is the only postwar year for which complete censuses for manufacturing, mining, and agriculture are available. The base value weights and their percentage distribution among groups of commodities is shown in table on page 91.

Calculation. The base period for the Bureau's revised wholesale price index is the average of three years, 1947, 1948, and 1949, which conforms to the postwar base period for Federal index numbers, recommended by the Bureau of the Budget.

The index was formerly computed by clerks using standard desk calculating machines. In the 1952 revision the increase in the number of series, the expanded classification system, and the expectation that many special index numbers would have to be calculated (for example, for use in deflating dollar values in interindustry analysis techniques) led the Bureau to shift to punch card techniques. Briefly, the procedure followed in calculation is as follows:

(1) All individual price reports (BLS Form 473) are edited for changes in specifications, etc., and then posted to summary records. Commodity

SPECIMEN OF SCHEDULE

BLS 1810
(Rev. 1-4-52)

CONFIDENTIAL

Budget Bureau No. 44-R602.2.
Approval expires 12-31-54.

U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON 25, D. C.

Code No. .....

Commodity .....

COMMODITY PRICE INFORMATION SHEET

1. (*a*) Firm name .....

(*b*) Plant or division name ..... (*c*) Mfr. ☐ (*d*) Other ..... (Specify)

Address ..... (Street) ..... (Postal zone) ..... (City and State)

(*e*) Information authorized by ..... Title .....

(*f*) Information furnished by ..... Title .....

(*g*) Schedule to be mailed to ..... (Informant) Title .....

Address ..... (Street) ..... (Postal zone) ..... (City and State)

2. Description of commodity: Mfr's (*a*) Style No. ..... (*b*) Lot No. .....

(*c*) Model No. ..... (*d*) Grade ..... (*e*) Brand name .....

(*f*) Additional .....

.....

.....

.....

..... (*g*) Check sheet attached: Yes ☐ No ☐

3. (*a*) Price quoted is from ..... (Class of seller) to ..... (Class of purchaser)

(*b*) Type of quotation: (1) List price ..... (2) Actual transaction price .....

(3) Other (specify) .....

(*c*) Unit quoted .....

(*d*) Minimum and maximum size of sale to which price applies .....

(*e*) Current delivery period ..... (*f*) Normal delivery period .....

4. (*a*) Delivery terms (f. o. b., etc.) .....

(*b*) Principal means of delivery (carrier) .....

5. Type of package used. (*a*) Crate ☐ (*b*) Carton ☐ (*c*) Bag ☐ (*d*) Other (specify) .....

6. Refund for returnable containers? (Explain) .....

.....

.....

16—66771-1

7. Discounts applicable to prices for the commodity described above when sold to the class of purchaser listed in question 3 (*a*).

(*a*) Trade ..... percent (*b*) Quantity ..... percent on purchases of .....

(*c*) (1) Cash discount terms ..... (2) Extent of use .....

(*d*) Other discounts, allowances, or free deals (explain in detail) .....

.....

(*e*) Circle any of these discounts which have been deducted in arriving at the prices listed in question 13.

8. Duties or excise and other taxes applicable to prices listed under question 13 which have:

(*a*) Been included in prices quoted (specify) .....

(*b*) Not been included in prices quoted (specify) .....

9. Usual method of effecting price changes:

(*a*) Change in list price ☐ (*b*) Change in discounts ☐

(*c*) Other (explain) .....

10. Channels of distribution, percentage of sales made, discounts and other allowances by type of distributor for type of commodity described in No. 2 above.

Sales and discounts	Other mfr. (assembler)	Wholesaler	Jobber	Distributor	Retailer	Consumer	Other (specify)
(*a*) Sales (percent)							
(*b*) Cash discount							
(*c*) Trade discount							
(*d*) Quantity discount							

11. Market area served .....

12. Major products manufactured or distributed by this firm. List products in descending order as percent of total sales during the last typical year.

(*a*) ....% (*c*) ....% (*e*) ....%

(*b*) ....% (*d*) ....% (*f*) ....%

13. History of prices for commodity described in questions 2 to 5.

Date	Price	Remarks	Date	Price	Remarks

14. BLS Representative ..... *Date* .....

U. S. GOVERNMENT PRINTING OFFICE 16—66771-1

BLS 473
(Rev. 8-15-53)

CONFIDENTIAL

Budget Bureau No. 44-R194.4.
Approval expires 1-31-56.

PERMANENT OFFICE RECORD
Kindly return promptly

U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON 25, D. C.

Code No. .....

INFORMATION FOR WHOLESALE PRICE INDEX

1954–1955

1. FIRM:
2. ARTICLE:

3. BASIS OF QUOTATION:

4. DISCOUNTS: Trade ..... Cash .....
Other allowances (explain) .....

5. HAVE THE DISCOUNTS BEEN DEDUCTED FROM THE PRICES SHOWN BELOW?
Trade: Yes ☐ No ☐ Cash: Yes ☐ No ☐ Other: Yes ☐ No ☐

6. MANUFACTURER'S EXCISE TAX: ..... percent or $..... Has this tax been included in prices below? Yes ☐ No ☐

7. PRICE AS FURNISHED FOR .....: $.....
(Date)

8. Please enter below prices as of the dates indicated

1954	PRICE	DATE OF PRICE CHANGE (IF ANY)[1]	1955	PRICE	DATE OF PRICE CHANGE (IF ANY)[1]
Jan. 12			Jan. 11		
Feb. 16			Feb. 15		
Mar. 16			Mar. 15		
Apr. 13			Apr. 12		
May 11			May 10		
June 15			June 14		
July 13			July 12		
Aug. 17			Aug. 16		
Sept. 14			Sept. 13		
Oct. 12			Oct. 11		
Nov. 16			Nov. 15		
Dec. 14			Dec. 13		

9. If there have been any changes in discounts or specification since the last report please enter appropriate note below:[2]

DISCOUNTS			SPECIFICATION	
DATE OF CHANGE	TYPE OF DISCOUNT	AMOUNT OF NEW DISCOUNT	DATE OF CHANGE	LIST NATURE OF CHANGE OR INDICATE WHERE DETAILED INFORMATION IS GIVEN

[1] If more than one price change occurred during month, please show all changes as a footnote on reverse side.
[2] Please show change in appropriate column, or by lining out old information and inserting new information in items 2 and/or 3 and/or 4 above, or on reverse side, or on separate sheet of paper, whichever is most convenient.

Please Make Any Other Explanatory Remarks on the Reverse Side

16—67035-2

304523—55——7

specialists are informed, in accordance with a progressive time-schedule, of missing reports and they are responsible for supplying data by specified dates.

(2) An average price is computed for each commodity, taking account of changes in specifications, numbers of reporters, etc.

(3) These average prices are then turned over to the Machine Tabulation Unit. The first major tabulation results in a listing, by commodity, of absolute prices and the percent changes in prices over the month. This listing is reviewed by the commodity specialists with particular attention to relatively large changes.

(4) Chain relatives [i. e., (current monthly percent change+100) times previous index] are then computed for each commodity. These relatives are weighted, and the aggregates are totaled by product classes, subgroups, groups, special combinations, and all commodities. The aggregates are then converted back to indexes.

(5) The machine tabulation system also prepares a detailed report which is photographed for publication with a minimum of typing or other clerical assistance.

Each month a small percentage of the prices used in constructing the index is not available. The Bureau has a specific system both to minimize the effect of the missing prices and to fill in the gaps. Inasmuch as the initial index is preliminary and subject to revision, estimates can be used in the first month when necessary. Standard estimating procedures have been established for each commodity, to be applied in the first month a quotation is unavailable. In general, in the case of commodities where there is more than one reporter, the average of the others is used. If there is only a single reporter for the commodity, or all reporters are missing, the price is estimated to move like that of another commodity or to be unchanged from the previous month. The decision as to which course to follow is based upon the price history of the commodity.

When an estimated price is still unavailable at the time of mailing of schedules for the following month, a duplicate schedule is sent out, and the commodity specialist is responsible for checking on the reporter, obtaining a new reporter or specification, or supplying an estimated price.

A missing quotation cannot be estimated for more than 3 months; after that the series is dropped from the index. This procedure is not applied to commodities which are regularly marketed in only part of the year, because the price can be estimated for the entire "off-season," regardless of length.

Publication and Revisions. In the first month of publication the monthly indexes are preliminary and subject to revision. In the following month all available revisions and substitutions of actual for estimated prices are incorporated. The indexes published at this time are final. Any revisions which come to light after the final index has been published are fully incorporated in the indexes then being computed, but previous indexes are not adjusted because of their use in contracts. The individual commodity price records of the Bureau will show the revisions as of the actual date to which they apply, and are furnished to users on a corrected or revised basis. If such price histories are released in answer to a specific request, the correct data are given out, but carry footnotes indicating when the revision was actually incorporated in the index.

The Weekly Index. The weekly index represents the Bureau's best estimate of what the comprehensive index would be if all 5,000 individual quotations for the approximately 2,000 series were collected each week, and if the complete index was calculated. The weekly index is based on actual prices for fewer than 200 commodities and estimated prices for all others. It is calculated as a percent change from the latest monthly index and converted to index form for publication. As soon as a comprehensive index is published for any month, all weekly indexes falling in that month are replaced by the monthly index. No attempt is made to maintain a continuous series by correcting these indexes.

Index Formula. The index is a chain of relatives each calculated by the Laspeyres formula. This formula, $\left(\frac{\Sigma P_i Q_o}{\Sigma P_o Q_o}\right)$, where P_i and P_o are current and base period commodity prices and Q_o is the base period quantity is one widely used in the construction of current index numbers. In theory, most authorities agree that the ideal formula for determining a wholesale price index would be one in which the weights represent the conditions

existing in both of the periods which are compared. In practice, however, there is no practical method of obtaining and using data which reflect the current quantity relationships; it is generally accepted that use of the Laspeyres indexes, chained together with fairly frequent revisions of the weights, will give a satisfactory approximation of the ideal situation.

In actual operation, the necessity for making allowance for changing specifications of individual commodities raises certain difficulties. Strict observance of the Laspeyres formula, using quan-

Revised Wholesale Price Index

Base weights for groups and subgroups

[1947–49=100]

Group and subgroup	Value (millions of dollars)	Relative importance	
		Total	Within group
All commodities	$205,940	100.0	------
Farm products	30,089	14.6	100.0
Fresh and dried produce	2,690	1.3	8.9
Grains	4,395	2.1	14.6
Livestock and poultry	10,712	5.2	35.6
Plant and animal fibers	2,745	1.3	9.1
Fluid milk	4,095	2.0	13.6
Eggs	1,855	.9	6.2
Hay and seeds	1,737	.9	5.8
Other	1,860	.9	6.2
Processed foods	31,807	15.4	100.0
Cereal and bakery products	5,583	2.7	17.6
Meats, poultry, fish	9,256	4.5	29.1
Dairy products	6,974	3.4	21.9
Canned, frozen fruit and vegetables	1,750	.8	5.5
Sugar and confectionery	3,445	1.7	10.8
Packaged beverage materials	946	.5	3.0
Fats and oils	2,154	1.0	6.8
Other	1,699	.8	5.3
Textiles and apparel	19,771	9.8	100.0
Cotton products	5,534	2.7	28.0
Wool products	2,212	1.1	11.2
Synthetics	2,361	1.2	11.9
Silk products	28	(1)	.1
Apparel	9,199	4.6	46.6
Other	437	.2	2.2
Hides, skins, and leather products	4,235	2.1	100.0
Hides and skins	678	.3	16.0
Leather	967	.5	22.8
Footwear	1,869	.9	44.1
Other	721	.4	17.1
Fuel, power, light materials	17,556	8.7	100.0
Coal	3,063	1.5	17.5
Coke	193	.1	1.1
Gas	1,440	.7	8.2
Electricity	3,933	1.9	22.4
Petroleum and products	8,927	4.5	50.8
Chemicals and products	10,754	5.3	100.0
Industrial chemicals	4,009	1.9	37.3
Paint and materials	1,754	.9	16.3
Drugs, pharmaceuticals, cosmetics	1,594	.8	14.8
Fats and oils, inedible	553	.3	5.1
Mixed fertilizer	404	.2	3.8
Fertilizer materials	388	.2	3.6
Other	2,052	1.0	19.1
Rubber and products	3,185	1.6	100.0
Crude rubber	594	.3	18.7
Tires	1,475	.7	46.3
Other	1,116	.6	35.0
Lumber and wood products	5,363	2.6	100.0
Lumber	4,329	2.1	80.7
Millwork	670	.3	12.5
Plywood	364	.2	6.8
Pulp, paper, and products	$6,961	3.4	100.0
Woodpulp	889	.4	12.8
Waste paper	124	.1	1.8
Paper	1,797	.9	25.8
Paperboard	581	.3	8.3
Converted paper products	3,409	1.6	49.0
Building paper	161	.1	2.3
Metals and metal products	23,814	11.7	100.0
Iron and steel	10,420	5.1	43.8
Nonferrous metals	4,883	2.4	20.5
Metal containers	819	.4	3.4
Hardware	1,001	.5	4.2
Plumbing equipment	366	.2	1.6
Heating equipment	1,029	.5	4.3
Fabricated structural products	2,124	1.0	8.9
Fabricated nonstructural products	3,172	1.6	13.3
Machinery and motive products	28,688	14.1	100.0
Agricultural machinery	1,653	1.3	9.0
Construction machinery	1,004	.8	5.5
Metal working machinery	1,704	1.3	9.3
General purpose machinery	2,941	2.3	16.0
Miscellaneous machinery	1,945	1.5	10.6
Electrical machinery	2,586	2.0	14.1
Motor vehicles	6,535	5.0	35.5
Assigned to group	10,320	------	------
Furniture and household durables	7,862	3.9	100.0
Household furniture	1,865	.9	23.7
Commercial furniture	594	.3	7.6
Floor covering	716	.4	9.1
Appliances	2,194	1.1	27.9
Radio and television	896	.4	11.4
Other	1,597	.8	20.3
Nonmetallic minerals	2,790	1.4	100.0
Flat glass	265	.1	9.5
Concrete ingredients	950	.5	34.0
Concrete products	413	.2	14.8
Structural clay products	502	.2	18.0
Gypsum products	136	.1	4.9
Prepared asphalt roofing	352	.2	12.6
Other	172	.1	6.2
Tobacco manufactures and bottled beverages	4,776	2.4	100.0
Cigarettes	1,143	.6	23.9
Cigars	313	.1	6.6
Other tobacco products	135	.1	2.8
Alcoholic beverages	2,433	1.2	50.9
Nonalcoholic beverages	752	.4	15.8
Miscellaneous	6,096	3.0	100.0
Toys and sporting goods	764	.4	12.5
Manufacturing animal feed	3,152	1.6	51.7
Notions and accessories	181	.1	3.0
Jewelry and photo equipment	1,290	.6	21.2
Other	709	.3	11.6
All excluding farm and food total	144,044	70.0	------
Assigned to all excluding farm and food	2,193	------	------

[1] Less than 0.05 percent

tity weights, would require adjustments in both prices and quantities to prevent index distortion whenever there is a change in the specification of an individual commodity. To avoid this constant adjustment process the Bureau uses a modification of the formula, in which the individual commodity indexes are computed by chaining together the month-to-month price relatives and weighting these by the value of sales, rather than using absolute prices weighted by physical quantities related to the base period. The net result is equivalent to using the Laspeyres formula and adjusting the base quantities whenever a price change results solely from a change in specification.

This procedure has certain advantages in calculation, not only because ready substitution of one commodity for another can be made without introducing adjustment factors to eliminate distortions in level, but also because it permits ready substitution of a new weighting diagram and lends itself to automatic calculation with built-in mechanical checks.

The prices used in the indexes from 1947 through 1951 are the simple arithmetic averages of the 4 or 5 weeks in each month; each weekly price is that which prevailed on a specific day of the week. Beginning in 1952, the prices used in the indexes are those which prevail on a particular day of the month—in most cases Tuesday of the week containing the 15th. A careful comparison of the movement of an index based on 1-day-a-week with an index based on 1-day-a-month prices revealed no significant differences.[1] Furthermore, since any of the minor differences which might occur are not systematically biased in one direction or another, no cumulative error arises in the index from the choice of a single pricing date.

[1] The actual tests of the differences between indexes calculated on 1-day-a-week and 1-day-a-month prices covered the period 1947–51, a period of great price movement and variability. One test was based on an unweighted average of 12 very sensitive commodities, the other on the complete index.

The first test (12 sensitive commodities), for two separate 12-month periods, indicated that the direction of movement in the indexes was identical in all but 2 months. The degree of movement between successive months varied as much as 50 percent, but these differences tended to be offsetting. For example, if one of the indexes dropped excessively from January to February, the February to March decline was smaller in this index than in the other so that the January–March changes were approximately equal.

In the second test, which covered 59 months (January 1947 through November 1951) there were only 2 instances in which the index for all commodities, based on once-a-month prices, differed by as much as 2 percent from the index based on 1-day-a-week prices. In both these cases, the differences were balanced out within the next 2 months. In the case of the index for all commodities other than farm products and foods, the two indexes were never as much as 1 percent apart.

Limitations

Some limitations on the use of the wholesale price index have already been mentioned. The index is designed to measure change, not absolute levels of prices, and the quotations used in the index for individual commodities do not necessarily measure the average dollars-and-cents levels of prices. The index is not a true measure of the general purchasing power of the dollar—it does not include prices at retail, prices for securities, real estate, services, construction, or transportation. Even at wholesale or primary market levels, the index, while a good approximation, is not a perfect measure—since it is based on a relatively small sample of the many commodities which flow through these markets. In addition, there are some real price changes which the Bureau cannot measure—for example, some improvements in quality, hidden discounts, differences in delivery schedules, etc.

The index has not been designed for use in measuring margins between primary markets and other distributive levels. Thus, direct comparisons of the wholesale and consumer price indexes cannot be used to estimate or evaluate margins. The index does not measure prices paid by industrial consumers since it normally excludes transportation costs and similar factors affecting final prices. Finally, the index should not be used to forecast movements of the Consumer Price Index, particularly over the short run. Many components of the wholesale price index never enter retail markets (for example, machinery); similarly, many components of the Consumer Price Index (such as services and rents) are not covered by the wholesale price index.

Reliability

The wholesale price index is based on a sample of commodities which have been purposively selected rather than chosen by random methods. The standard statistical techniques for evaluating the error in a sample are, therefore, not applicable. The Bureau is currently experimenting with several approaches to the problem of measuring the reliability of this index, but results of this investigation will not be available for some time. However, experience with the index over a long period of time suggests that the index becomes increas-

ingly reliable as the group of prices covered is larger. That is, in most cases the reliability of a subgroup is greater than that of a product class, a group is more reliable than a subgroup, and the all commodities index is more reliable than a group index.

The Daily Index

The Bureau of Labor Statistics, as part of its general program for maintaining the currency of its various price indexes, revised the daily index of commodities traded on spot markets and organized exchanges in the autumn of 1952. The base for the revised index is the average for the years 1947, 1948, and 1949; the index formerly was based on August 1939. The revised daily index is based on the prices of 22 commodities and replaces the index based on 28 commodities, which had been published since January 1940. The daily index is designed to measure the price trend and movement of these commodities which, as a result of daily trading in fairly large volume of standardized qualities, are particularly sensitive to factors affecting spot markets and trade's estimates of current and future economic forces and conditions.

The revised index is not a continuation of the earlier daily index. It is a separate and distinct index. A comparison of the two indexes over the past several years shows that the amplitude of the fluctuations in the revised index is greater than in the former index.

The commodities included in the revised daily index are in most cases either raw materials or commodities very close to the initial production stage. Highly fabricated commodities which have relatively large fixed costs reflected in their prices are not included. In order to avoid having the index dominated by the influence of specific agricultural conditions or a seasonal pattern for a few raw commodities, certain commodities are priced at the semifabricated stage and some agricultural products have not been included. The exclusion of fabricated products and most semifabricated commodities and the careful selection of commodities which are particularly sensitive to forces acting on open markets and organized exchanges contribute to the greater sensitivity of this index compared with the Bureau's Wholesale Price Index. The influence of some international markets upon the economy is also reflected by the inclusion of various commodities which are important in international trade.

The specifications of all the commodities included in the former index were reviewed in 1951 and 1952 in light of market developments since World War II, and in some cases they were modified at that time. Six of the commodities included in the former index have been excluded because they either are no longer traded in large enough volume to permit accurate daily pricing, or their prices tend to be stable over long periods of time, or because they react to forces which reflect specialized conditions and not broad economic conditions.

The daily index is an unweighted geometric mean of the individual commodity price relatives, i. e., of the ratios of the current prices to the base period prices. This means that price differentials among the commodities have no distorting effect upon the index numbers. Thus, a 10 percent price change in tallow which is quoted in cents-per-pound has the same effect as an equal percent change in the price of steers which is quoted in dollars per 100 pounds.

However, the fact that each of the commodities in this index has equal weight means that a price change for rosin, a comparatively unimportant commodity, has as much effect as an equal percentage movement in the price of a very important commodity such as wheat, cotton, or steel scrap. The basic reason why no weights are assigned to the individual commodities is that each commodity tends to reflect the appraisal by experienced traders of the current and future economic forces affecting the organized markets, which is a principal purpose for the index.

In maintaining the index over time, it occasionally becomes necessary to change or modify commodity specifications. These changes in specifications are handled so that only the actual price movements are reflected in the index; substitution of commodities or specifications of a commodity does not in itself affect the level of the index. All substitutions will be properly indicated in the daily reports on the index.

In addition to the index based upon the prices of all 22 commodities, indexes are calculated and published according to the unique classification of each commodity as either a Raw Industrial commodity or as a Foodstuffs commodity. There are also four special group indexes—Livestock

and Products, Metals, Textiles and Fibers, and Fats and Oils. Not all commodities fall into one of these four groupings. Nor is each grouping mutually exclusive; lard, for instance, is included in both the Livestock and the Fats and Oils indexes. These group indexes are based on the prices for relatively few commodities, selected because of their extreme price sensitivity; consequently, *they are in no way comparable to corresponding groups in the comprehensive Wholesale Price Index.*

Because of interest that has developed through the years in the actual prices for commodities in the daily index, prices for five of the commodities (barley, coffee, copper ingot, lead, and shellac) included in the former index but not included in the revised index are published daily. However, the prices for these commodities are not used in the computation of either the *All Commodities* index or any of the special group indexes. The following tabulation lists the commodities and specifications for the daily index.

(1) Commodities included in index:

Commodity	*Specification*	*Market*
Burlap, yd	40″, 10 ounce yard	New York.
Butter, lb	Grade A, 92 score	Chicago.
Cocoa beans, lb	Accra	New York.
Copper scrap, lb	No. 1 heavy copper and wire, refiners' buying price.	New York.
Corn, bu	No. 3 yellow	Chicago.
Cotton, lb	15/16″ middling staple	10 markets.
Cottonseed oil, lb	Crude, Southeast and Valley.	Memphis.
Hides, lb	Cow, light native packers.	Chicago.
Hogs, 100 lb	Good to choice, 200–220 pounds.	Chicago.
Lard, lb	Prime steam, in tierces	Chicago.
Lead scrap, lb	Battery plates, flat price, smelters.	Chicago.
Print cloth, yd	39″, 80 x 80 count, 4 yds./lb.; average of spot and forward.	New York.
Rosin, lb	WG grade	New York.
Rubber, lb	Plantation ribbed smoked sheets.	New York.
Steel scrap, ton	No. 1 heavy melting, consumers buying price.	Chicago.
Steers, 100 lb	Good, 900–1100 pounds	Chicago.
Sugar, 100 lb	Raw, 96°, duty paid	New York.
Tallow, lb	Packers prime inedible	Chicago.
Tin, lb	Grade A, prompt delivery.	New York.
Wheat, bu	Average of:	
	No. 2 hard winter	Kansas City.
	No. 1 dark northern spring.	Minneapolis.
Wool tops, lb	Spot market	New York.
Zinc, lb	Prime western, pig	New York.

(2) Commodities for which prices are published but not included in the index computation:

Barley, bu.—Good malting, Minneapolis.
Coffee, lb.—Santos No. 4, New York.
Copper, lb.—Electrolytic ingot, New York.
Lead, lb.—Desilverized pig, New York.
Shellac, lb.—TN grade, New York.

(3) Special groupings:

(a) Foodstuffs—butter, cocoa beans, corn, cottonseed oil, hogs, lard, steers, sugar, and wheat.

(b) Raw industrials—burlap, copper scrap, cotton, hides, lead scrap, print cloth, rosin, rubber, steel scrap, tallow, tin, wool tops, and zinc.

(c) Livestock and products—hides, hogs, lard, steers, and tallow.

(d) Metals—copper scrap, lead scrap, steel scrap, tin, and zinc.

(e) Textiles and fibers—burlap, cotton, print cloth, and wool tops.

(f) Fats and oils—butter, cottonseed oil, lard, and tallow.

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Chapter 11. Studies of Occupational Wages and Supplementary Benefits*

Background and Uses

Surveys of wages have been made by the Bureau of Labor Statistics since 1888. The bulk of the earlier surveys were in selected manufacturing industries, such as steel, meatpacking, and cotton textiles. The primary result was information on hours and earnings of workers in selected production or plant occupations, generally on a nationwide basis supplemented by broad regional tabulations.

In recent years, an effort has been made to provide industry wage information on a narrower geographic basis. Increased emphasis has been placed on collecting data for office clerical workers, and the collection of information has been broadened to give much more attention to supplementary benefits such as insurance and pension plans, paid vacations, paid holidays, and shift differentials.

A new type of survey has also been developed, in which the principal emphasis is on the area rather than on the industry being studied. These community wage surveys are concerned with wages of occupations common to a wide variety of industries.

The findings of all of these studies are used in wage determination through collective bargaining or employer personnel action. They are also used for comparison of wage levels in various parts of the country, and by public agencies in making wage determinations for employees who are paid on the basis of prevailing rates. In addition, they provide necessary information for formulation of public policy on wages, as in minimum wage legislation, and for the analysis of trends in economic developments.

Concepts

Occupational wage surveys must be distinguished carefully from the Bureau's monthly Hours and Earnings Series. The latter are monthly estimates of average hours and earnings, by industry, derived from a regular group of reporters who furnish information on total employment, man-hours of work, and payrolls. The earnings figures include various forms of premium pay. No data for individual occupations are provided, nor is any distribution of individual employee's earnings presented. No data on supplementary benefits as such are obtained.

In the occupational wage surveys, the principal interest centers on the straight-time earnings or rates of pay, excluding shift differentials and premium overtime, for specific occupations. In most cases, this approach provides the closest approximation to the hourly rate of pay. In the case of professional and office clerical workers, the primary data are standard weekly hours and salaries, rather than actual hours and earnings. Production bonuses, commissions, and cost-of-living bonuses are counted as earnings, but nonproduction bonus payments (e. g., Christmas payments) are not.

No attempt is made to evaluate meals or other payments in kind, nor does the calculation of earnings take account of employer expenses for vacation pay, insurance, pension plans, or any other fringe benefits. Thus, the earnings figures represent cash wages (before tax and social security deductions) after the exclusion of premium payments.

In wage surveys, the rate of pay is obtained for each worker individually, making it possible to calculate a distribution of earnings as well as an average.

The occupational classifications surveyed are carefully defined in advance of the survey. The objective is to obtain maximum correspondence between the duties of the employee, and the descriptions provided by the Bureau, regardless of the plant job title. Wages of workers not falling within one of the selected occupations may be collected in some surveys in order to develop overall averages and distributions, regardless of occupation.

*Prepared by Samuel E. Cohen of the Division of Wages and Industrial Relations.

Scope of Survey

Before collection work is started in any survey, the scope of the study is rigorously defined as to industry, geographic and occupational coverage, size of establishments to be included, and payroll period to be covered.

Two distinct types of wage surveys—community and industry—are made.

Community wage studies are designed to provide earnings information on an area basis for occupations common to a variety of manufacturing and nonmanufacturing industries. The "community" covered is generally a standard metropolitan area. Industry divisions included are (1) manufacturing, (2) transportation (excluding railroads), communication, and other public utilities, (3) wholesale trade, (4) retail trade, (5) finance, insurance, and real estate, and (6) a selected group of service industries. Separate data are provided wherever possible for a limited number of industry divisions in addition to the all-industry averages and distributions of workers by earnings classes.

Cross-industry methods of sampling are utilized in compiling earnings data for the following types of occupations: (1) office clerical, (2) professional and technical, (3) maintenance and powerplant, and (4) custodial, warehousing, and shipping.

In addition, data are collected on weekly work schedules, shift operations and differentials, and certain supplementary benefits. These studies also provide estimates of the proportions of plant and office workers covered by union agreements, numbers of workers employed under incentive systems of wage payment, and the extent to which establishments have a formal wage structure for workers paid on a time basis, providing a single rate or range of rates for individual job categories.

The Bureau conducts two general types of industry wage studies—nationwide and by area. The majority of nationwide studies are made in industries in which there is little geographic concentration, or in which interest of the users of the data centers mainly on the industry as a whole rather than on particular areas. Examples are basic iron and steel, nonferrous metals, and electric and gas utilities.

Area studies are made of geographically concentrated industries such as machinery and apparel, which are among those found in large cities. From time to time these may be supplemented by nationwide surveys. The principal advantages of the localized industry surveys are comparatively low collection costs and speed of publication.

Area studies are generally limited to wage data for a selected list of occupations and information on related benefits—generally for a standard metropolitan area. In nationwide studies, earnings data are also obtained for workers in other occupations for presentation of data on the entire wage structure. In addition to data for the Nation as a whole, regional and area data may also be presented for some industries. The area may be a standard metropolitan area, a State, a group of counties, etc.

Survey Methods and Estimating Procedure

Planning. With respect to specific studies, consultations are held directly with appropriate management, labor, and Government representatives. Subjects dealt with generally relate to technical matters of industry definition or scope of study, minimum size limitation, timing of studies, selection of jobs for study, preparation of job descriptions, and the need for additional data on such subjects as fringe benefits and for other data of special interest.

The industry classification system used in wage surveys is practically always that in the Standard Industrial Classification Manual.[1] The scope may range from part of a 4-digit code for an industry study to a combination of 2-digit codes for a community wage study. The basic criterion is that the study should represent a fairly homogeneous unit insofar as wages and occupations are concerned.

The minimum size of establishment covered in any one industry study is uniform for that industry: in community wage studies the minimum size usually varies for different industry divisions. The minimum size is established after a study of the possible effects on the results, i. e., can representative or useful results be obtained from a study of the remaining establishments? Another practical reason for the adoption of size limitations is the difficulty encountered in classifying workers in small establishments where the degree of specialization differs sharply from that in large establishments.

[1] U. S. Bureau of the Budget, Washington. Vol. I, Manufacturing Industries, November 1945; Vol II, Nonmanufacturing Industries, May 1949.

Timing is an important factor in the conduct of wage studies. Because of the seasonal element in many industries, the time period of study must be selected with care in order to obtain useful results. Community wage studies are often timed to meet the needs of government agencies (Federal, State, and local) engaged in wage administration as required by law.

Wage surveys do not provide data for all occupations. In addition to the greater cost of obtaining data for all jobs, the usefulness of such data would be limited because of the wide differences in occupational structure from establishment to establishment. Hence, lists of key jobs are selected for study. In industry wage studies, the lists are, of course, confined to jobs found in the specific industries being studied; in community wage studies, the lists include occupations in operations common to all industries. In the selection of such jobs, the following criteria have been useful: (1) numerical importance, measured by the number of workers in the job; (2) clarity of content; (3) stability in terms of number of workers and content, from period to period; (4) prevalence among establishments; and (5) historical importance in wage structure. Occasionally technological changes require revision of job lists to bring them up to date. The entire list is selected to represent a reasonably complete range of rates in the wage structure—on the assumption that the rates of pay for these key jobs can be used as benchmarks for interpolating rates for other jobs.

Each key occupation is carefully defined in order to obtain maximum comparability of jobs from establishment to establishment. Such definitions are prepared from studies of plant operations by Bureau representatives and from suggestions of industry and labor representatives. A job description that is to be used in a survey involving many establishments includes the major determining classification characteristics of the job. It is flexible enough, however, to permit minor variations in duties from plant to plant. Above all, workers in the plants studied are classified on the basis of these job descriptions and not on titles of their jobs.

The needs for special data are quite broad in nature. In industry wage studies, separate tabulations may relate wages to unionization, method of wage payment, process of manufacture, wholesale price line, or other significant industry characteristics. In community wage studies, additional occupations are studied to meet the needs of government agencies in wage administration. Some wage studies may also include information on certain establishment policies such as the pattern of rate setting for supervisory employees and the prevalence of severance pay, in addition to the usual fringe benefits.

Questionnaires. Two schedules are used in obtaining data. The first (OWR–1) contains questions regarding product, size, unionization, paid vacations, insurance and pension plans, and related items applicable to the entire establishment. The second (OWR–2) is used in recording the occupation, sex, method of wage payment, hours (where needed), and earnings of each employee studied.

Sampling Procedure. The sampling design employed is almost always highly stratified. Before the sample is selected, information on all known establishments that might possibly fall within the scope of the survey is compiled from lists provided by regulatory governmental agencies, supplemented by data from trade directories, trade associations, labor unions, and other sources.

Establishments are then stratified as precisely as available information permits. Each geographic-industry unit for which a separate analysis is to be presented is sampled independently. Within these broad groupings, a finer stratification by product and size of establishment is made. Stratification may be carried still further in certain industries: textile mills, for instance, are classified on the basis of integration, i. e., whether they spin only, weave only, or do both. Such stratification is highly important if the occupational structure of the various industry segments differs widely.

The sample for each industry-area group is a probability sample, each establishment having a predetermined chance of selection. In order to secure maximum accuracy at a fixed level of cost (or a fixed level of accuracy at minimum cost), the sampling fraction used in the various strata ranges downward from all large establishments through progressively declining proportions of the establishments in each smaller size group, in accordance with the principles of optimum allocation. Thus, each sampled stratum will be represented in the sample by a number of estab-

lishments proportionate to its share of the total employment. Though this may appear at first to yield a sample biased by the overrepresentation of large firms, the method of estimation employed removes this bias by the assignment of proper weights to the sample establishments.

The size of the sample in a particular survey depends on the size of the universe, the diversity of occupations and their distribution, the relative dispersion of earnings among establishments, the distribution of the establishments by size, and the degree of accuracy required. Estimates of variance based on data from previous surveys are used in determining the size of the sample needed.

Collection. Bureau agents generally collect data by personal visit to each of the sample establishments. They secure data on wages from payroll records and those on supplementary benefits and other information pertaining to the plant as a whole from company officials. Earnings data are confined to the rate of pay for employees on a time basis; for incentive employees, both earnings (exclusive of premium overtime and shift premium pay) and the corresponding hours actually worked are obtained. For salaried workers, the standard weekly hours and salary are obtained. Occupational classifications are generally obtained by discussing with company officials the matching of the Bureau's descriptions and the plant job titles.

Estimating Procedure. Estimated average hourly earnings for an industry or an occupation are computed as the arithmetic mean of the individual employees' earnings. They are not estimated by dividing total payrolls by total hours worked, since these are almost never available on an occupational basis.

All estimates are derived from the sample data. The averages for occupations, as well as for industries, are weighted averages of individual earnings and not computed on an establishment basis. The proportion of employees affected by any fringe provision is likewise estimated from the sample; all workers in each establishment are considered to be covered by the predominant benefit policy in effect, and the entire employment of the establishment is classified accordingly.

As mentioned previously, the use of a variable sampling ratio in different strata of the population would result in biased estimates if straight addition of the data for the various establishments were made. Therefore, each establishment is assigned a weight that is the inverse of the sampling rate for the stratum from which it was selected—e. g., if a third of the establishments in one stratum are selected, each of the sampled establishments is given a weight of 3.

To illustrate the use of weights, suppose the universe were 7 establishments, from which a sample of 3 was selected. Assume that establishment A was drawn from a cell, or stratum, in which half of the plants were used in the sample. It is therefore given a weight of 2. Establishment B, on the other hand, was taken with certainty (or a probability of 1) and is thus given a weight of 1. Establishment C was taken from a group where a fourth of all plants were used in the sample, and hence is given a weight of 4. The following calculations are made in estimating average earnings for a given occupation.

		Workers in occupation in sample establishments at specified rate		*Estimates of total in stratum*	
Establishment	*Weight*	*Total number*	*Average hourly earnings*	*Workers*	*Earnings*
A	2	40	$1.50	2 x 40	2 x 40 x $1.50
B	1	30	1.70	1 x 30	1 x 30 x 1.70
		20	1.95	1 x 20	1 x 20 x 1.95
C	4	10	1.20	4 x 10	4 x 10 x 1.20
Estimated universe				170	$258.00

The estimated average hourly earning is thus $\frac{\$258.00}{170}$ or $1.52.

A similar method applies to any characteristic estimated from the sample. To estimate the proportion of employees in establishments granting paid vacations of 2 weeks after 2 years of service, for instance, the establishments are classified according to the length of vacation granted after 2 years' service, establishment weights are applied to employment, as in the previous example, and the proportion of the estimated employment in the 2-week category of the estimated total employment is then computed. Using the same three establishments as in the previous example, this can be illustrated as follows:

Establishment	*Weight*	*Actual total establishment employment*	*Weighted employment*	*Vacation provisions after 2 years*
A	2	100	200	1 week
B	1	500	500	2 weeks
C	4	75	300	1 week
Estimated universe			1,000	

Thus, the estimated percentage of workers in establishments granting 2 weeks' vacation after 2 years of service is $\frac{500}{1,000}$ or 50 percent.

Publication

Data for each important subunit of an industry are published only when information is available from all sample firms in that unit. Such data for individual segments of a survey may be published in advance of the broader survey. Thus, in a survey such as that of the machinery industry, publication of results for an individual city does not wait upon the completion of the survey in the rest of the country. Preprinted forms are utilized for the quick release of detailed data in local areas to supplement summary press releases. In nationwide surveys, preliminary data are also released in advance of the issuance of a printed bulletin, which gives detailed results for the country as a whole and for geographic breakdowns. Summaries of the data in these bulletins frequently appear also in the Monthly Labor Review.

Limitations

It must be remembered that some flexibility in the use of wage data is necessary. All occupations may not be studied, and the user must be prepared to interpolate for missing occupations on the basis of traditional rate relationships. The same kind of consideration applies to surveys in which data are presented for certain areas only.

A further limitation is the elimination of smaller firms from the universe. This is not serious with respect to occupational data, because small firms often do not have a degree of occupational specialization that permits meaningful classification for this purpose. The size-of-establishment limits in most surveys is such that a comparatively small part of the total employment is omitted.

The survey averages for a series of occupations do not necessarily show the same rate relationships as those found in the majority of establishments. If employment of workers in a given occupation is concentrated in a high (or low) paying establishment, the occupational average may be higher (or lower) than the traditional rate relationships would indicate. Then, too, incentive methods of wage payment may raise the earnings of specific occupations above those of related jobs for which skill requirements may be higher, but which are customarily paid on a time basis.

Year-to-year changes may be affected by changes in the scope of the survey, changes in the distribution of the labor force among and within establishments, and changes in methods of performing work. For instance, shifts in employment from low to high paying establishments may cause an increase in average hourly earnings when no change in establishments scales has occurred.

Reliability of Surveys. Results of the surveys generally will be subject to sampling error. This error will not be uniform, since, for most occupations, the dispersion of earnings among establishments and frequency of occurrence differ. In general, the sample is so designed that the chances are 9 out of 10 that the published average does not differ by more than 5 percent from the average that would be obtained by enumeration of all establishments in the universe. That error applies to the smallest breakdown published. Hence, the error of broader groupings will be somewhat less.

The sampling error of the percentage of workers receiving any given supplementary benefit differs widely with the size of the percentage. However, the error is such that rankings of predominant practices will almost always appear in their true position. Small percentages may be subject to considerable error, but will always remain in the same scale of magnitude. For instance, the proportion of employees receiving 4 weeks' paid vacation may be given as 2 percent, when the true percentage for *all* establishments might be only 1 percent. Such a sampling error, while considerable, does not affect the essential inference that the practice is a rare one.

Estimates of the number of workers in a given occupation are subject to considerable sampling error, due to the wide variation among establishments in the proportion of workers found in individual occupations. Hence, the estimated numbers of workers can be interpreted only as a rough measure of the relative importance of various occupations. The greatest degree of accuracy in these employment counts is for those occupations found principally in large establishments. This sampling error, however, does not materially affect the accuracy of the average earnings shown for the occupations. The estimate of

average earnings is technically known as a "ratio estimate," i. e., it is the ratio of total earnings (*not* payrolls) to total employment in the occupation. Since these two variables are highly correlated (i. e., the errors tend to be in the same direction), the sampling error of the estimate (average hourly earnings) is considerably smaller than the sampling error of either total earnings or total employment.

Since completely current and accurate information regarding establishment products is not available, the universe from which the sample is drawn may be incomplete. Sample firms incorrectly classified are accounted for in the actual field work, and the universe estimates are revised accordingly. Those which should have been included but are erroneously classified in other industries cannot be accounted for.

SPECIMEN OF SCHEDULE

BLS 1476
OWR-1
(Rev. '53)

Budget Bureau No. 44-R338.12.
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CONFIDENTIAL

U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON 25, D. C.

GENERAL ESTABLISHMENT INFORMATION

I. ESTABLISHMENT IDENTIFICATION SURVEY—.....

A. Establishment Scheduled

Payroll Period

.....
(Name)

195... .....

.....
(Street address) (City)

195... .....

.....
(County and State)

195... .....

NAME AND TITLE OF AUTHORIZING OFFICIAL	NAME AND TITLE OF OFFICIAL SUPPLYING DATA
195...	
195...	
195...	

.....

.....
(Address of office from which information was obtained, if different from above)

B. Central Office (if any)

.....
(Name)

.....
(Street address) (City and State)

II. CURRENT PRODUCTS OR SERVICES AND PROCESSES

A. Product or Service (To be used to assign industry classification)

E. Work Schedule (Day shift)

Indicate hours and days to one decimal, e. g. [375] for 37½ hours or [55] for 5½ days.

PRODUCTION (Plant)

MEN		WOMEN	
Hours Per Week	Days Per Week	Hours Per Week	Days Per Week
44–46	**47–48**	**49–51**	**52–53**

195...
195...
195...

OFFICE

MEN		WOMEN	
Hours Per Week	Days Per Week	Hours Per Week	Days Per Week
44–46	**47–48**	**49–51**	**52–53**

F. Rate of Pay for Overtime Work

Indicate the hours to one decimal, e. g. 400 for 40 hours, or 075 for 7½ hours, the predominant policy is to be coded. If no overtime premium is paid, i. e., codes 0, 1, or 8 below, enter scheduled weekly or daily hours.

PRODUCTION (Plant)

OVERTIME RATE			
WEEKLY		DAILY	
Hours After Which Effective	Rate of Pay Code	Hours After Which Effective	Rate of Pay Code
54–56	**57**	**58–60**	**61**

195...
195...
195...

OFFICE

OVERTIME RATE			
WEEKLY		DAILY	
Hours After Which Effective	Rate of Pay Code	Hours After Which Effective	Rate of Pay Code
54–56	**57**	**58–60**	**61**

CODES (Blocks **57, 61, 64, 67**)

0. No pay
1. Straight time
2. Time and one-half
3. Double time
4. Double time and one-half
5. Triple time
6. Equal time off
7. Other plan (specify in remarks)
8. No formal policy

B. L. S. 1475
OWR-2
(Rev. '53)

CONFIDENTIAL

U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
Washington 25, D. C.

Budget Bureau No. 44-R486.9.
Approval expires 7-1-54.

WAGE-RATE INFORMATION

Page 1 of ___

Industry or survey _____

Establishment name _____

Area _____ Payroll period _____

I. General Wage Rate Changes Since—

(also including cost-of-living and annual improvement adjustments)

Date Decided	First Pay Period With Change	Retroactive Date (if any)	Adjustments		Approximate Number of Workers Affected		Classes of Workers Affected by Wage Change
			Cents per hour	Percent	Production (plant)	Office	
A. WAGE CHANGES GRANTED							
B. WAGE CHANGES PENDING							
	xxx						
	xxx						

B. L. S. 1475A.
OWR-2—Continued
(Rev. 1953)

CONFIDENTIAL

(Schedule No.) (Page No.)

Establishment name .....

VI. Occupational Rates

Payroll period .....

OCCUPATION AND GRADE (1)	OCCUPATIONAL CODE (2)			SEX (3)	* M. W. P. (4)	NUMBER OF WORKERS (5)	HOURS (6)	EARNINGS (7)	RATE OR STRAIGHT-TIME HOURLY EARNINGS (8)	OFFICE USE ONLY (9)
	IND.	OCCUP.	GR.							

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Chapter 12. Collection and Compilation of Work Stoppage Statistics*

Background

Strike statistics are a broad indicator of industrial unrest. They provide a quantitative measure of the extent to which labor-management disputes result in stoppages of work. Estimates showing the number of stoppages, workers involved, and man-days idle in the United States are issued monthly by the United States Department of Labor's Bureau of Labor Statistics. Totals are compiled annually and the statistics are also presented by such classifications as industry, State, city, major issue, and duration.

The Bureau of the Census in 1880 made the first attempt to secure statistics on strikes and lockouts. In that year, schedules were sent to employers and workers in all disputes about which notices appeared in the public press. Information was received on 762 situations. Some data were obtained on causes of strikes and their results, as well as their State distribution. No information was secured on number of workers or man-days of idleness.

Subsequently, the method of collecting the information varied, and the statistical series on work stoppages thus automatically fall into several historical groupings. For the year 1880, data on strikes and lockouts were gathered at the time the Tenth Census was taken. For the period 1881–1905, the United States Bureau of Labor collected data on stoppages, excluding those that involved fewer than 6 workers or that lasted less than 1 day—a practice that the Bureau follows currently. In this period, data were published on the number of strikes and workers involved, with breakdowns by industry and State, number of establishments involved, and the percentage of strikes involving labor organizations.

No Federal agency collected national information on stoppages from 1906 to 1913. The Bureau of Labor compiled data only on the number of stoppages during 1914–15. Information on the number of workers involved was subsequently added for approximately two-thirds of the known stoppages in the 1916–26 period. Data available for all of these years are included in BLS Bulletin No. 651, "Strikes in the United States, 1880–1936."

Since 1927, a fairly uniform procedure has been followed in obtaining detailed information from the parties involved in work stoppages. Figures have been prepared on the amount of idleness during work stoppages each month as well as on the number of stoppages and number of workers involved.

Concepts and Scope

Coverage of the present series extends to all known strikes and lockouts within the continental United States that involve six or more workers and last a full day or shift. Stoppages of American seamen or other workers in foreign ports are not included, nor are strikes of foreign crews on foreign ships in American ports. All employees made idle in the establishment are counted as "involved," even though they may not be active participants or supporters of the controversy. All days on which work was scheduled are included in calculating man-days of idleness. In industries, such as basic steel and rubber, where there are continuous operations, appropriate adjustments are made for the fact that substantial proportions of workers are employed on Saturday and Sunday. The worker figure is a "peak"—that is, the number idle on the day of maximum idleness. However, computations of idleness take account of variations in the number of workers idle from period to period during the strike.

The Bureau defines a strike as a temporary stoppage of work by a group of employees to express a grievance or enforce a demand. Usually the issue in dispute is directly between the employer(s) and the striking employees, but there are significant exceptions. For example, in jurisdictional, as well as in rival union or representation strikes, the motivating factors may largely involve two or more unions rather than the employer directly. In a sympathy strike, no

*Prepared by Lily Mary David and Ann J. Herlihy of the Bureau's Division of Wages and Industrial Relations.

dispute usually exists between the striking workers and their immediate employer. The purpose of such strikes is to give union support or broaden group pressure for the benefit of another group of workers. Some protest strikes are intended to register the dissatisfaction of workers with action (or lack of action) by local, State, or Federal Government agencies on matters affecting their interests.

A lockout is defined as a temporary withholding of work by an employer (or a group of employers) to enforce terms of employment upon a group of employees. No attempt is made to distinguish statistically between strikes and lockouts because of the difficulty of determining the facts. Stoppages are included in the series regardless of who may be deemed "responsible," or which party takes the initiative, and the terms "strike" and "work stoppage" are used interchangeably.

So-called slowdowns, where employees continue at work but at reduced production speed, are not included, nor are those instances in which workers report an hour or two late each day as a protest gesture or quit work several hours before closing time to attend rallies or mass meetings.

Survey Methods and Sources

The Bureau seeks to obtain complete coverage of all stoppages of six or more workers, lasting at least a full shift. It does not base the strike series upon a sample, but includes all stoppages of the specified size and duration for which verified information is obtained.

Information on the existence of a stoppage is currently obtained from various sources, including: (1) clippings on labor disputes from daily and weekly newspapers throughout the country; (2) notices received directly from the Federal Mediation and Conciliation Service; (3) a periodic compilation by the local offices of State employment security agencies provided through the Bureau of Employment Security of the U. S. Department of Labor; (4) information received from other State agencies (such as State mediation boards and State labor departments); (5) various employers, and employer associations; (6) international unions and their publications; and (7) construction firms doing work for the Atomic Energy Commission.

These sources were developed over a period of years. Thus in 1943, a cooperative arrangement was set up with the Solid Fuels Administration which resulted in additional strike leads. When this agency went out of existence at the end of World War II, cooperative arrangements were made with local associations of coal companies. Requests are sent also to several hundred individual coal companies, not members of associations. Before 1943, undoubtedly many of the small, short local strikes in coal mining were missed.

Cooperation of State agencies was developed gradually, mostly in the period after World War II. By 1950, about half the States were providing information and in mid-1950 arrangements for obtaining information from the others were completed.

It is estimated that these changes have added 10 percent or more to the number of strikes reported. Since most of the added stoppages are small, the numbers of workers involved and of man-days of idleness have been very little affected.

Questionnaires are mailed to all parties to any work stoppages reported by one of the previously mentioned sources. This procedure is designed to secure first-hand knowledge of the number of workers involved, the dates and duration of the stoppage, major issues involved, method of settlement, and related information. In some instances, field representatives of the Bureau secure the necessary data; in others, representatives of cooperating States may contact the parties.

Strikes, by their very nature, are usually a matter of public knowledge and of reporting by newspapers and other publications. However, the Bureau holds confidential the individual reports submitted by employers and unions, as well as supplementary data collected through State or Federal agencies.

Calculation Procedures

The Bureau's preliminary monthly strike series is based in part on estimates, although these totals seldom vary significantly from the later final reports prepared from the parties' replies. This is mainly due to the availability of reasonably accurate data on the larger stoppages when preliminary estimates are made. The final strike

statistics compiled annually are the result of compilation of actual data received on the schedule form from the parties involved in the stoppages. These final statistics are published each year in the May issue of the Monthly Labor Review. More detailed data are included in an annual bulletin.

Estimates are prepared and published monthly on the three measures of work stoppages: (1) number of stoppages; (2) number of workers involved; and (3) man-days of idleness. Such estimates are compiled about 4 weeks after the end of the month of reference from the most accurate information available on all stoppages known to the Bureau. As there is a lag between the occurrence and reporting of a number of relatively small strikes, allowance is made (depending upon several variables) for these smaller stoppages in preparing the estimates of the number of disputes occurring within the month. In estimating the number of workers involved and total idleness, efforts are made to obtain as much preliminary information as possible on the size and duration of individual large stoppages (those of at least 500 workers or 5,000 man-days of idleness); estimates of workers and man-days idle in smaller stoppages are based largely on previous experience as to average size and duration of such stoppages.

The total man-days of idleness during the month because of strikes is published as a percentage of estimated working time of all workers. "Estimated working time" is computed for purposes of this table by multiplying the average number of employed workers by the number of days worked by most employees. This number excludes Saturdays when customarily not worked, Sundays, and established holidays.

"Total employed workers" used in making these computations before 1951 refers to all workers except those in occupations and professions in which there is little if any union organization or in which strikes rarely occur. Beginning in 1951, the concept of "total employed workers" was changed to coincide with the Bureau's figures of nonagricultural employment, excluding Government but not excluding workers in other occupational groups. Tests show that the percentage of total man-days of idleness computed on the basis of the new and the old figures usually differs by less than one-tenth of a point.

The annual series includes total number of stoppages, workers involved, and man-days of idleness. Compilation of such statistics is essentially a process of assembling the necessary information on individual cases, followed by analysis, evaluation, and classification into groups. Application of technical statistical formulas is not involved.

The statistical unit is the individual strike or lockout, irrespective of size. If groups of employees (regardless of their number or geographic distribution) join in a work stoppage for a common objective, their action is classed as a single strike.

The figure for the number of workers involved in a strike or lockout is the maximum number actually made idle in the establishment directly involved. As already indicated, no distinction is made between the actual participants in a strike and those respecting, or kept idle by, picket lines or those sent home by the employer when a stoppage in one department closes the plant. In such instances all employees of the employer are included in the count of workers affected by the dispute.

Man-days of idleness, like the number of workers involved, are based on the idleness at the establishments directly involved. Workers involved multiplied by days of idleness equal total man-days idle. When the number of workers idle varies significantly during the period of the stoppage, adjustment is made accordingly in the calculation of man-days of idleness. In this calculation, holidays and days not normally worked are omitted from the count of days of idleness.

The annual statistics are classified according to a number of significant factors, briefly described here:

(1) *An industrial classification* is made of each strike in accordance with the Standard Industrial Classification Manual published by the United States Bureau of the Budget. A few stoppages directly affect workers in more than one industry. Small stoppages falling in this category are classified in the industry having the majority of workers involved; in large interindustry stoppages, there is proportionate allocation.

(2) *The duration* of each stoppage is computed on the basis of calendar, rather than working

days, i. e., the number of calendar days from the beginning until the end of the stoppage. For stoppages which begin at a definite time and are terminated by a formal agreement at a definite time, no problem arises in determining duration. Some strikes, however, are never formally settled, although the workers may gradually go back to their jobs or find other employment; employers may be able to resume production with new employees or may close their plants permanently. In such cases, the stoppages are terminated, for statistical purposes, when a majority of the vacancies are filled. On occasion, if actual settlement is reached later, the statistical record of the stoppage is adjusted correspondingly.

(3) *Number of establishments involved.* The standard definition of establishment is used (chap. 1). It is a single workplace, for example, a factory, mine, or store. In a widespread strike of intercity bus drivers, truckdrivers, or railroad workers, the establishment is regarded as the terminal out of which the employees work; in a strike of seamen, the ship is the establishment; and in a strike of dockworkers, the individual dock or loading place is regarded as the place of work.

(4) *Geographical classification* of stoppages followed State and city boundary lines through 1951. Data were compiled each year for 150 separate cities (excluding suburban areas outside the corporate limits). Beginning in 1952, the compilation of data by standard metropolitan, or industrial, areas superseded city boundary lines. Information is now compiled for approximately 180 such areas. In interstate stoppages, the workers involved and man-days idle are allocated to their respective States.

(5) *The causes* of most strikes are multiple and varied, and do not always lend themselves readily to immediate and exact classification. After evaluation of the information available, the stoppages are classified by issues into four broad categories: (1) wages and/or hours and/or fringe benefits; (2) union organization matters (representation, union security, and the like); (3) other working conditions, such as job security, physical working conditions, administrative policies, and workload; or (4) interunion or intraunion matters. Within these groups there are further subdivisions into more specific categories.

(6) *Union involved* is another major classification. For this purpose the union is the organization whose contract was involved or which has taken active leadership in the stoppage. Disputes involving more than one union are classified as jurisdictional or rival union disputes or as involving cooperating unions. If unorganized workers strike independently, a separate classification is used. For publication purposes, the union information is presented by major affiliation of the unions, i. e., American Federation of Labor, or Congress of Industrial Organizations, or nonaffiliation such as "Independent," "single firm," or "no union."

(7) *Method of termination* of stoppages involves classification into the following categories: (1) disputes in which the parties agree directly to terminate the stoppage without any third-party assistance; (2) those terminated with the assistance of Government agencies; (3) those terminated with the assistance of private or non-Government mediators, (4) those ending without formal settlements; and (5) those in which the employers discontinued business.

(8) *Disposition of issues* presents information regarding the settlement of the issues in the stoppage. In most strikes the issues are usually settled or disposed of before the return to work is effected, but provision is made for the cases in which adjustment of issues occurs after resumption of work by: (1) direct negotiations between the employers and the union (or workers); (2) negotiations with the aid of Government agencies; (3) arbitration; and (4) other means (cases referred to NLRB, union boards, tribunals, and other agencies where method is other than by negotiation).

The questionnaire on page 111 is used in collecting detailed information from both employers and unions.

Limitations

It is not known to what extent the methods used to locate and obtain information on work stoppages result in a complete count of the number of work stoppages. However, they provide a virtually complete record of all large work stoppages so that the statistics on numbers of workers and of man-days lost are believed to be essentially complete. As indicated earlier, the addition of new sources of strike information from time to time probably has

not seriously affected the continuity of the series on workers and man-days idle. The new sources of information, however, have resulted in some lack of strict comparability in the number of strikes reported from period to period.

Some of the classifications requiring more detail may be relatively less complete than the overall statistics. Thus, while the figures by individual States are reasonably complete, in isolated cases the figures for a specific tabulation by State and industry group may be appreciably affected by lack of information about one strike.

Within the limits that the Bureau places on the series, work stoppages involving few workers or lasting short periods (i. e., fewer than six workers or lasting less than a full shift) are omitted from the count. Such disputes usually would be of little importance in the overall count, and frequently cause no significant idleness or interruption to production.

This series is not intended to measure the cost of strikes in terms of the amount of production and wages lost. The calculation of such items involves many complex and interrelated factors for which information is not available, including for example, production schedules before and after the stoppage, diversion of output or services to other plants or employers, flow of raw materials, and the amount of overtime worked by employees before or after the dispute.

Secondary idleness is not measured; that is, the figures do not cover those employees made idle in other establishments or industries as a result of material or service shortages resulting from a work stoppage. At times, the idleness of employees directly involved (at the site) in a strike may be considerably less than the idleness of other workers brought about indirectly. No satisfactory measurement, however, has been evolved to measure or estimate such indirect effects adequately. The Bureau's work stoppage series is limited to the establishments in which the actual strike idleness occurs, except in the case of workers who refuse to cross picket lines set up by a striking union at other establishments.

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U. S. DEPARTMENT OF LABOR
BUREAU OF LABOR STATISTICS
WASHINGTON 25, D. C.

DUPLICATE
To be retained by respondent

File .....

CONFIDENTIAL

The Bureau of Labor Statistics has received information

The Bureau is responsible for the collection of statistics on work stoppages. To insure accuracy of our figures, we try to obtain reports from the parties involved. We shall appreciate your furnishing the information requested as soon as possible. The envelope enclosed for your reply requires no postage. Thank you very much for your cooperation.

Very truly yours,

Ewan Clague

Commissioner of Labor Statistics.

1. Employer .....

   Address .....

2. Principal products or services of establishment(s) involved in stoppage (in order of importance):

   .....

3. Number of establishments involved ..... Location .....
   (If more than one establishment, please use reverse side of sheet)

4. Unions involved: (*a*) Name ..... AFL ..... CIO ..... Ind. .....

   (*b*) Local No. ..... (*c*) Address .....

5. Dates of stoppage: (*a*) Date stoppage began ..... (*b*) Date settlement was reached ..... (*c*) Date work was resumed .....

6. Total workers idle one full shift or more ..... (Did the number idle change during the stoppage? Yes ..... No ..... *If it changed, please report on reverse side.*)

7. Number of days worked per week by most employees before stoppage .....

8. *Major* issues in dispute .....

   .....

9. *Principal* terms of settlement .....

   .....

10. Did any major issues remain unsettled at end of stoppage? .....

    If "yes," indicate remaining issues and how they are to be adjusted .....

    .....

11. Did a Federal, State, or local government agency assist in arranging for return to work? Yes .....

    No ..... If so, please identify agency .....

    .....

....
(Signature and title of person making report) (Date) (Company or organization)

16—69785-1

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Chapter 13. The Collection and Analysis of Collective Bargaining Agreements*

Background and Uses

Collective bargaining agreements and related documents setting forth the provisions of health, insurance, and pension plans provide a valuable source of information on industry wage practices, supplementary benefits, job and union security, the timing of wage negotiations, the nature of plant operations and working conditions, occupational wage levels, and many of the day-to-day aspects of employer-employee and union-management relationships.

The Bureau of Labor Statistics has utilized these basic industrial relations materials for public and Government informational purposes in three major ways, by: (1) maintaining a file of current agreements and employee-benefit plans open to public inspection and inquiry, (2) preparing reports which reproduce representative agreement provisions or the variety of provisions relating to similar problems, or digests of selected identified agreements or benefit plans, and (3) by preparing studies measuring the prevalence and characteristics of specific types of agreement and benefit plan provisions or of other aspects of collective bargaining such as multiemployer bargaining.

The studies of agreement provisions, and health, insurance, and pension plans are of practical use to companies and unions engaged in collective bargaining, to arbitrators and fact-finding boards, to administrators of company wage and industrial relations programs, and to legislators and Government officials. Persons not directly involved in collective bargaining or in related administrative functions (e. g., teachers and students of labor problems, writers for newspapers and trade and technical journals, and foreign observers) find value in the broader aspects of employer-employee relationships revealed in these studies.

The development of industrial relations practices that are now so widely prevalent is reflected in the Bureau's studies over the years. The Bureau's interest in the collection and analysis of union agreements dates back over 50 years.[1] Systematic efforts to collect agreements began in 1912. The first of a number of BLS bulletins devoted entirely to the subject of collective bargaining agreements appeared in 1925. A large number of reports and bulletins, on a wide variety of industrial relations subjects, have since been published.[2]

The Bureau's responsibility in the field of agreement collection and analysis received additional sanction and guidance in the Labor-Management Relations Act of 1947, Section 211, which reads as follows:

> Sec. 211. (a) For the guidance and information of interested representatives of employers, employees, and the general public, the Bureau of Labor Statistics of the Department of Labor shall maintain a file of copies of all available collective bargaining agreements and other available agreements and actions thereunder settling or adjusting labor disputes. Such file shall be open to inspection under appropriate conditions prescribed by the Secretary of Labor, except that no specific information submitted in confidence shall be disclosed.
>
> (b) The Bureau of Labor Statistics in the Department of Labor is authorized to furnish upon request of the [Federal Mediation and Conciliation] Service, or employers, employees, or their representatives, all available data and factual information which may aid in the settlement of any labor dispute, except that no specific information submitted in confidence shall be disclosed.

Concepts and Scope

Collective Bargaining Agreements. Although the substance of collective bargaining rests partly upon a foundation of unwritten industry, company, and union practices, and upon various legal requirements, the basic unit in agreement collection and analysis is, of necessity, the written agreement itself. The agreement may cover a single plant, a number of plants of a multiplant company, or a

*Prepared by Joseph W. Bloch of the Division of Wages and Industrial Relations.

[1] A bulletin of the Bureau of Labor (now the Bureau of Labor Statistics), Number 42, September 1902, included this note: "It is the purpose of this [Bureau] to publish from time to time important agreements between large bodies of employees and employers with regard to wages, hours of labor, etc. The [Bureau] would be pleased to receive copies of such agreements wherever made."

[2] Many of these studies appear first in the Monthly Labor Review and are later brought together in bulletins. See, for example, Labor-Management Contract Provisions, 1953, Bureau of Labor Statistics (Bull. 1166.)

number of companies, in some cases over a thousand, bound together formally or informally in an association for collective bargaining purposes. It may express conditions of employment in simple terms, leaving much of the administrative details and other matters to the day-to-day relationships between the parties, or it may attempt to cover all details and, thus, leave as little as possible to later bargaining or haggling. Agreements vary in size from a single sheet to over a hundred pages of a pocket-sized booklet, reflecting the diversity of employment conditions among industries and companies and of the scope of the issues over which bargaining takes place, as well as differences in the degree of precision sought and the language used.

Estimates of the number of agreements currently in effect range upwards of 100,000. The number of workers covered by agreements is estimated to exceed 16 million. The Bureau presently maintains a file of approximately 5,000 current agreements covering about 8.5 million workers.[3] All industries are represented in the file with the exception of railroads and airlines. Since railroads and airlines are required to submit copies of agreements to the National Mediation Board, the Bureau does not attempt to collect these agreements.

The Bureau's quantitative analysis of selected agreement provisions can be grouped into five major categories: (1) wage practices and supplementary benefits such as paid holidays, paid vacations, shift differentials, premium pay of various types, etc., (2) plant administration practices such as layoff and recall procedures, technological change provisions, safety, etc., (3) agreement administration procedures including grievance machinery and arbitration provisions and no-strike clauses, (4) types of union security (union shop, etc.) and checkoff systems, and (5) other characteristics of collective bargaining revealed in the agreements, such as the scope of the bargaining units, the term of agreements, etc. The basic assumption underlying quantitative agreement analysis is that the variety of subjects in each of these categories can be defined, classified, and counted.

In its general analysis of agreements, as distinct from special industry studies, the Bureau is concerned with these major objectives: (1) the presentation of data by industry group and for manufacturing and nonmanufacturing as a whole, (2) the presentation of data by region or union affiliation if the subject requires it, (3) a realistic measure of representativeness in the agreements studied, and (4) the study of practices which are (as yet) relatively uncommon in collective bargaining agreements.

Since it would be prohibitively expensive for the Bureau to base its provision studies on all agreements in its file (assuming that the file was a representative sample), a selection of agreements for analysis is required. In the absence of universe data indicating the extent of collective bargaining by industry and region, precise sampling procedures and the use of weighting comparable to those used in the Bureau's occupational wage surveys are not feasible. During the past few years, the Bureau has attempted to achieve its objectives in agreement studies by means of a large selective sample of from 2,000 to 3,000 agreements. Modifications in this approach, now being made, provide for a study base comprising all agreements (approximately 1,600) covering 1,000 or more workers.[4]

Health, Insurance, and Pension Plans. Health, insurance, and pension plans have developed into issues of major significance in collective bargaining during the past decade. Generally, these plans are either negotiated in detail in a supplementary agreement or reference is made to their establishment in the basic contract. In the latter case, the details and documents necessary to their implementation, including trust agreements, insurance contracts, rules and regulations, and descriptive booklets for distribution to employees, are subsequently developed.

It is estimated that over 11 million workers are covered by health, insurance, and pension plans under collective bargaining. In line with its general responsibility in the field of industrial relations and in keeping with the provision of the Labor Management Relations Act of 1947 cited

[3] During much of the postwar period, the number of agreements on file exceeded 12,000. In the most recent reduction in the size of the file, agreements covering fewer than 100 workers were eliminated.

[4] The number of establishments covered is always considerably greater than the number of agreements because of the inclusion of many multicompany or association agreements.

above, the Bureau maintains a file of such plans and conducts studies dealing with their extent, scope and characteristics. At the present time, the Bureau's plan file includes approximately 1,000 health and insurance plans and 500 pension plans, selected largely to provide broad industry, union, and regional representation.

During the past 10 years, the Bureau has conducted several studies based upon its file of benefit plans. This has become a part of the Bureau's continuing program. However, different types of studies are undertaken each year. These studies have included digests of selected plans, the analysis of plans in specific industries, and, more recently, the analysis of a selection of plans considered representative of the entire field (e. g., pension plans). At this stage of the development of collective bargaining practices and general knowledge, the Bureau's emphasis is placed on describing the terms of these relatively new elements in industrial relations rather than on measuring the prevalence of particular provisions.

Methods of Collection and Analysis

Each of the four parts of this program—the maintenance of a current file of collective bargaining agreements, the maintenance of a file of employee benefit plans under collective bargaining, the analysis of agreements, and the analysis of employee benefit plans—presents different and substantially independent methodological problems.

Collection of Agreements. The selection of agreements for the file is currently based on two guides: to maximize the opportunities for public and governmental use of the file[5] and to provide a diversified collection of agreements for special reports, which the Bureau is occasionally called upon to prepare. The extent to which these objectives are fulfilled is obviously affected by the size of the file. A third guide—that of constructing a file which truly represents all agreements and thus provides a firmer basis for sound generalizations on all agreements—has long been a goal of the Bureau; completion of this program, however, must await more precise information on the extent of collective bargaining, by industry, by region, and by size of establishment.

The maintenance of a current file of agreements is a continuous undertaking because of two factors: (1) The typical agreement has a duration of one year, after which it is no longer considered current (unless notice of renewal without change has been received), and (2) submission of agreements to the Bureau is voluntary on the part of employers or unions. To allow for the ratification and the printing of new agreements, requests for copies are mailed about 2 or 3 months after the expiration date indicated in the previous agreement or upon other notice of contract change. As in other phases of the Bureau's work, the voluntary cooperation of employers and unions is of utmost importance. Any restrictions imposed by respondents on the public use of agreements are scrupulously observed by the Bureau.

To facilitate the use of the file in accordance with the types of requests customarily made, each agreement received is coded for a series of identifying features, which include: the name of the company or association and union, location, number of workers covered, industry, and effective and expiration dates.

Agreement Analysis. The Bureau's utilization of the agreements it collects has moved through different stages over the years, in pace with, or controlled by, the increasing prevalence and maturity of collective bargaining. During the early years, significant agreements were reproduced in their entirety. With the spread of collective bargaining, and the increase in the size and representative character of the Bureau's file, attention was directed towards reproducing and analyzing the variety of agreement clauses relating to similar subjects, culled from a large number of agreements. The Bureau's widely used Bulletin Series 908 (1–19), issued during 1947, 1948, and 1949, represents the Bureau's most comprehensive efforts along these lines to date. While illustrative clauses continue to be utilized in most of the Bureau's agreement studies, major emphasis during recent years has been devoted to measuring the prevalence and characteristics of particular provisions and of types and levels of benefits. It

[5] The agreements file is located in the Washington Office of the Bureau's Division of Wages and Industrial Relations. Agreements submitted to the Bureau with a stipulated limitation on public use are not available for inspection. Requests for information concerning specific agreements or agreement clauses are accomodated, depending upon the nature of the request, within the limits of staff resources.

is in this kind of analysis that problems relating to sampling and techniques of coding and analysis come to the fore.

The number of agreements studied and the method of analysis bear directly upon each other; together, they control the nature of the Bureau's studies in this field. In a small sample study (e. g., 300–400 agreements) there are virtually no inherent limitations on the intensity and the scope of the analysis. Many shadings of terms can be conveniently handled. A large sample (e. g., 1,500–2,000 agreements) requires machine tabulation techniques if the cost of analysis is not to be prohibitive. However, machine tabulation for agreement analysis has its limitations. Thus, if the size of the sample is such as to make machine tabulation an advantage or a necessity, some of the flexibility and thoroughness possible under so-called "hand" analysis must be sacrificed.

In 1948 and 1949, when the Bureau's file consisted of more than 12,000 agreements and the potentialities of machine tabulation techniques for agreement analysis were first explored, it was decided that a sample of 3,000 agreements would be feasible. The selection of specific agreements was based on a number of factors, including industry, agreement coverage, location, union representation, and bargaining practices. Limited data upon which to base a representative selection of agreements was compensated for, at least in part, by extensive experience with collective bargaining practices on the part of the sample selectors.

During subsequent years, however, available staff resources were not sufficient to deal with a sample of this size. The feasibility of reconstituting a sample of 1,500 to 2,000 agreements, which had become the maximum work load, and of assuring appropriate safeguards against deterioration, were rejected as being beyond the resources of the staff and the available data. The most advantageous alternative, considering all things, was to base the agreement studies on *all* agreements above a predetermined size of worker coverage and, thus, to avoid sampling. It is estimated that agreements covering 1,000 or more workers number approximately 1,600. The Bureau's file already contains almost all of these; the Bureau's Monthly Report on Current Wage Developments is a ready source of information on those that are not included. The total number of workers covered by these 1,600 agreements is in excess of 7,500,000, representing a very substantial worker coverage in agreement studies. The number of establishments covered is not known.[6]

A key analysis list containing all agreements covering 1,000 or more workers, while not the ideal coverage, has definite advantages: (1) it achieves maximum worker coverage in the studies for a given investment of staff resources, (2) it provides a simple, objective measure of the coverage of the studies, (3) it permits the presentation of various combinations and breakdowns of the data without the necessity of complicated weighting schemes and without the bias resulting from the lack of proper weighting, (4) it is safeguarded against obsolescence since the Bureau is best able to keep abreast of changes in agreements of this size, and (5) it has a significant meaning to users of these studies. Further experience will presumably reveal any shortcomings in this approach.[7]

The use of machine tabulation techniques in large-scale statistical work is so commonplace in Government and private industry that it ordinarily merits little comment in describing a Bureau program. However, the use of machine tabulation techniques for the type of research exemplified by agreement analysis is believed to be quite uncommon. The distinguishing feature of agreement analysis is that it deals mainly with legalistic language, which requires interpretation, rather than with numbers or other universal, sharply defined attributes. The process of analysis with the use of machine tabulation consists of interpreting provisions, reducing them to numbers (codes), aggregating the numbers, and converting the aggregates back to types of provisions and prevalence. Data are presented in terms of number of agreements and number of workers covered. Since agreement provisions on the whole are notable more for their variety of expression and details than for their uniformity, the process of analysis, particularly when done by machine,

[6] The distinction between size of agreement (employees covered) and size of establishment is an important one. A substantial proportion of these agreements are association-negotiated and cover a large number of small establishments. Two agreements, for example, involving the United Mine Workers (Ind.) cover most of the anthracite and bituminous-coal mines in the country. Some association agreements in New York State cover more than a thousand firms.

[7] The transition from a representative selection to the universe of all agreements covering 1,000 or more workers was in process at the time of this writing.

becomes a simplification process by which some of the original content and variety is lost. Under such circumstances, the preplanning of studies acquires a special importance if significant differences are not to be buried.

The keystone of agreement analysis study is obviously the interpretation of the agreement and the assignment of the predetermined code number. For some subjects, an agreement must be read in its entirety; for others, only a portion. Long and legalistic provisions must be reduced to their essentials. Since the interpretation of agreement provisions is often a troublesome matter for the parties themselves (as reflected in the widespread adoption of provisions for arbitration), misinterpretations undoubtedly occur. These are kept to a minimum by a staff experienced in agreement analysis and by continuous efforts to assure consistency of interpretations.

Under present conditions, approximately 5 or 6 agreement provision studies are planned per year. Over a period of 4 or 5 years most of the significant provisions are covered. As agreements are received, they are coded for each item being studied; hence each agreement is generally handled only once. Coding over a period of a year accounts for the bulk of the current agreements (those with a 1-year term); thus it generally takes a minimum of a year from the start of a survey to the end of coding (long-term agreements are covered during the course of the year). Preparing tabulations and analyzing the results follow. As one study nears conclusion, another is readied to take its place.

Collection and Analysis of Employee-Benefit Plans. Different techniques of collection and analysis are used for health, insurance, and pension plans. This is due, in large part, to the relatively recent spread of employee-benefit plans and to the Bureau's allocation of resources as between agreement and plan files and studies. There are, however, other factors which tend to complicate the collection of employee-benefit plans. In the first place, these plans, as negotiated, frequently have no expiration dates or precise reopening dates as do agreements. Employee-benefit plans are generally established as long range undertakings, although they are, perhaps, dependent upon the continuance of collective bargaining relationships. Secondly, employee-benefit plans, particularly health and insurance plans, are subject to more frequent modification than are basic agreements. These changes may come about through such factors as: adjustments to changing costs or premium rates, recognition of the inadequacy or superfluity of particular benefits, substitution of benefits, and changing legal requirements and benefits. Revisions may be made through action of the trustees or through mutual understanding or negotiations between the parties. Since many changes can be made within the cost limitations agreed to in collective bargaining, the process tends to be far less formal than negotiating changes in the basic agreement, which are usually permitted only at specified times.

Because of the frequency of change, it is difficult to maintain the employee-benefit plan file on a current basis. The Bureau's present practice is to request copies of changed or new plans once a year or upon learning of a change through various informational sources such as the Bureau's Monthly Report on Current Wage Developments and the commercial services in this field. When a sample of plans is selected for an analytical study, each plan is checked for currency before analysis is begun.

The Bureau's study of pension plans under collective bargaining, published in 1953 (Bull. 1147), represents its most comprehensive analysis of such plans to date. The study was based on a selection of 300 current plans from the Bureau's file, chosen to represent various industries, unions, and types of plans, and covered such provisions as vesting, compulsory retirement, and types and levels of benefits. An analysis of health and insurance plans now in process is based on a similar selection. Machine tabulation techniques have not been applied in these studies, mainly because the small size of the samples and the complexity and variety of the plans studied are more adaptable to so-called "hand" tabulation and a flexible approach.

The Bureau's work in employee-benefit plan analysis has yet to exploit fully the potentialities of analysis applicable to this area of study. However, as in the case of agreement analysis, the controlling factors are the nature of the public demand for information, as gaged by the Bureau, and the limitations of staff resources.

Limitations

The limitations of these studies of agreement provisions and employee-benefit plans are determined, in large part, by their application. For studies of paid holiday provisions or other supplementary benefits, the fact that these studies cover only the area of collective bargaining may constitute a limitation on generalizations applying to all workers but not necessarily on their uses in collective bargaining or in wage and employee administration. On the other hand, these studies do not show locality practice, which may reduce their usefulness for some collective bargaining purposes but not for broad generalizations relating to workers under collective bargaining.

Additional limitations of agreement provision studies are inherent in the selection of agreements for study—the exclusion of railroads and airlines agreements and, under the revised approach, of agreements covering fewer than 1,000 workers—and in the technique of analysis, as indicated previously. There are also limitations connected with the particular subjects studied, which are pointed out in each study. A fundamental limitation which must be borne in mind in connection with certain studies (e. g., grievance procedure) is that they relate to written policy rather than actual practice. Practices which are not provided for in the agreements but are, instead, matters of company policy going beyond the agreement, traditional industry policy, informal acceptance by management and unions, or arbitrators' decisions, can be neither detected nor measured in agreement analysis.

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Chapter 14. The Measurement of Trends in Output per Man-hour*

Background and Uses

The development of indexes of output per man-hour for American industry is a long-established program of the Bureau of Labor Statistics. One of the early research studies undertaken in this field was Commissioner Carroll D. Wright's study of *Hand and Machine Labor* in 1898. This monumental collection of statistics on labor time and labor costs for manufacturing various commodities revealed striking examples of industrial progress between the 1840's and the 1890's.

Industrial developments after World War I aroused widespread interest in productivity trends. The Bureau undertook the publication of annual indexes of output per man-hour for individual manufacturing industries on the basis of readily available production data from the censuses of manufactures and employment statistics collected by the Bureau of Labor Statistics.

In 1940, the Congress authorized the Bureau of Labor Statistics to undertake continuing studies of productivity and technological changes in American industries. The Bureau revised and extended earlier indexes of output per man-hour and published selected measures in its publication, Productivity and Unit Labor Costs in Selected Manufacturing Industries, 1919–1940 (February 1942). This work was reduced in volume during World War II, however, owing to the lack of meaningful production and man-hour data for many manufacturing industries affected by conversion and other factors. It was resumed after the war, and beginning in 1946 was supplemented by studies of trends based on data collected directly from plants. This direct reports program has been in abeyance since 1952; more recently the Bureau has devoted considerable attention to the development of indexes of output per man-hour for manufacturing as a whole, on the basis of published data from industrial censuses and surveys and other secondary sources.

Measures of productivity for broad sectors of the economy are of interest because of the necessarily close relationship of rising productivity with growth in the real standard of living and the strength of the American economy. They are of special importance in studying probable future demands for manpower, in both normal times and periods of national stress. Productivity developments are also of interest in studying the progress of individual industries, and conversely, developments in particular industries may have significance for the economy as a whole.

Measures of productivity covering a span of some years generally reflect the influence primarily of changing technology and methods of production. Over short periods, e. g., from year to year, the effect of other and perhaps temporary factors such as changes in the volume of production may dominate. The interpretation of productivity indexes and their application to specific problems requires particularly careful understanding of the definitions, concepts, sources of data, weighting procedures, limitations, and statistical techniques used in preparing the series.

Some General Concepts

(1) *Definition.* The term "output per man-hour" refers to the ratio of the volume of goods produced to the input of one factor of production-labor time. The Bureau's indexes of output per man-hour measure the relative change from year to year in this ratio for a specific industry or group of industries.

Changes in the ratio show the joint effect of a large number of separate, though interrelated, influences such as technical improvements, rate of operations, flow of materials and components, as well as skill and effort of the work force, efficiency of management, and status of labor relations. It is obvious, therefore, that output per man-hour does not measure the specific contribution of labor to production.

(2) *Unit man-hour requirements and output per man-hour.* Indexes are computed in terms of both

*Prepared in the Division of Productivity and Technological Developments.

unit man-hour requirements and output per man-hour. When an industry produces more than one product the latter index (based on output divided by man-hours) is computed as the reciprocal of the former (man-hours divided by output). This is conceptually necessary because the former implies comparison of the relative amounts of labor required in different periods to reproduce a specified production composite, which is feasible; the latter implies comparison of the differing amounts of production which might be achieved in different periods with the same expenditure of labor, which has no unique answer.

(3) *Sources for indexes.* The Bureau has employed two separate approaches in measuring output per man-hour and unit man-hour trends in individual industries. First, annual indexes are computed from data on aggregate production, employment, and hours of work, collected through industrial censuses and surveys. Since a comprehensive body of data is available from these sources, indexes can be constructed for a fairly wide range of industries over a number of years.

The second approach, in abeyance since 1952, involves developing industry indexes of unit man-hour requirements on the basis of data for specific products collected through field surveys of plants. This method has the advantage not only of supplementing the data which can be secured from secondary sources, but also makes it possible to obtain information on industry developments and factors influencing observed trends.

Descriptions of Industry Indexes Based on Secondary Source Data

The Bureau has published indexes of unit man-hour requirements and output per man-hour and per production worker, for selected industries in the manufacturing, mining, and public utilities divisions. Table I presents a list of industries and the years for which indexes are available in 1954. The descriptions which follow deal specifically with these industries. In addition, indexes for industry groups—mining, agriculture, railroads, and electric light and power—are available for varying time periods. Along with output per man-hour indexes, the Bureau publishes indexes of production, man-hours, and production worker employment from which the series are derived. The base for these series is being revised to 1947–49=100. The base for the previously published studies was 1939=100. The definitions of industries are generally those presented in the Bureau of the Budget's Standard Industrial Classification Manual.

Industries for which the Bureau of Labor Statistics has published output per man-hour series from secondary source data

Industry	Period covered
Manufacturing	
Beet sugar	1939–50
Bread and other bakery products	1939–47
Cane sugar refining	1939–47
Canning and preserving	1939–50
Cement	1939–50
Clay construction products	1939–50
Coke products	1939–50
Condensed and evaporated milk	1939–50
Confectionery	1939–51
Fertilizer	1939–47
Flour and other grain-mill products	1939–51
Footwear (except rubber)	1939–47
Glass containers	1939–51
Hosiery	1939–50
Ice cream	1939–51
Leather	1939–47
Malt liquors	1939–50
Primary smelting and refining of copper, lead, and zinc	1939–50
Rayon and other synthetic products	1939–50
Tobacco products	1939–50
Mining	
Anthracite	1935–50
Bituminous coal	1935–51
Copper	1935–50
Iron	1935–48
Lead and zinc	1935–50
Trends in output per man-hour in mining	1935–49
Public utilities	
Electric light and power industry	1917–48
Railroad transportation	1935–51
Telephone and telegraph industries	1935–47
Agriculture	
Agriculture	1909–50

CONCEPTS

The Bureau's series on unit man-hour requirements relate to the man-hours required for the industry's output, expressed in physical terms. Output per man-hour is the reciprocal of this ratio. For an industry producing a single uniform product, an index of unit man-hour requirements for a particular period is simply the ratio of man-hours per unit of the specific item produced to unit man-hours in the base period. To derive an index for an industry producing a number of different products—the more typical case—it is necessary to specify a particular composite of products.

The industry indexes of unit man-hour requirements computed from secondary source data are based on the formula for a changing composite of products. Expressed as a relative of two weighted aggregates, the formula is $I_t = \frac{\Sigma l_t q_t}{\Sigma l_o q_t}$, where q is the

quantity of a given product of the industry; l is man-hours required to produce one unit of product; t refers to current year; and o, to base year. The index measures the change in total man-hours required to produce the current year composite of goods compared with the man-hours that would have been required in the base year to produce the current output composite.

Because it is frequently difficult to obtain secondary data on annual changes in man-hour requirements for individual products of a multi-product industry, it is necessary to derive the unit man-hour indexes by relating production indexes to man-hour indexes for the industry. The aggregative type index—with changing quantity weights—is equivalent to the ratio of an index of actual man-hours to an index of physical output, with base year unit man-hour requirements as product weights:

$$\frac{\Sigma l_t q_t}{\Sigma l_o q_t} = \frac{\Sigma l_t q_t}{\Sigma l_o q_o} \div \frac{\Sigma q_t l_o}{\Sigma q_o l_o}$$

Since the index is intended to measure changes in unit labor requirements, in terms of physical units of output, unit man-hours are used as weights to combine product quantities. The industry index is an average of the indexes for individual products and lies within the range of unit man-hour requirement indexes for individual products.

Indexes based on aggregate production and man-hour data from secondary sources are affected by changes among the establishments comprising the industry. That is, the indexes are affected by shifts in volume of production from less efficient to more efficient plants—or vice versa—even though unit man-hour requirements in the individual plants may show no change.

SOURCES AND METHODS OF CALCULATION

Because the available data on output and man-hours are collected for general purposes, rather than for specific use in productivity measurement, it is frequently necessary to make certain adjustments and adopt approximations. In the following paragraphs, methods used in measuring trends in output are described first; the measurement of man-hour change is discussed beginning on page 123.

PHYSICAL PRODUCTION MEASUREMENT

(1) *Unit of output.* Data on quantities of individual products are used wherever possible in measuring physical output. The Bureau tries to obtain measures of output in physical units which are related to man-hour requirements. These vary according to industry. In the rayon industry, production is measured in terms of weight rather than in length of various types and deniers produced. In copper mining, the measure is both in terms of tons of raw ore and of recoverable ore mined. The output of the electric light and power industry is defined as kilowatt-hour sales by private utilities. The volume of freight and passenger revenue traffic and freight and passenger car miles are used in line haul operating railroads. For the telephone industry, the measure is the number of local and toll calls.

Output may also be estimated on the basis of the physical volume of materials consumed. Consumption provides a satisfactory indicator of production trends in industries where no significant change has occurred in the amount of material consumed per unit of final output.

(2) *Source of data.* Production data used in measuring output are published by various public and private agencies. The production classes and definitions employed by these agencies are necessarily the basis of the indexes. The Bureau of the Census of the U. S. Department of Commerce is the most important source of product statistics for the manufacturing industries. The Bureau of Mines compiles most of the production data used in the series for mining, as well as those for cement, coke, and nonferrous metals industries. Other important Government sources include Department of Agriculture, Department of Interior, Interstate Commerce Commission, Tariff Commission, and Bureau of Internal Revenue. Trade associations providing data include the Tanners Council, Textile Economics Bureau, National Association of Hosiery Manufacturers, National Canners Association, Millers National Federation, National Fertilizer Association, and the American Iron and Steel Institute.

(3) *Weights.* For most industries, output is measured by combining product quantities by base year weights. The output index is constructed

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by relating the weighted aggregate in the given year to the base year aggregate. In a few industries where one product is predominant, the measure of output is the unweighted aggregate of the physical volume produced.

Unit man-hour weights for combining product quantities will be preferred on theoretical grounds for constructing indexes of man-hour requirements. Unit man-hours for individual products are available for a few large industries. Lacking these data, the Bureau uses as product weights, in decreasing order of preference, data on unit labor costs, unit value added (value per unit less unit cost of materials, supplies, etc.), and unit value. In selecting an alternative weighting system, the Bureau attempts to ascertain whether the substitute reflects approximately the relative differences in unit man-hour requirements among products. Data on unit labor cost and unit value added are available for a few industries. Where unit values are used as substitutes for unit man-hour weights, the data are generally derived from information on quantity and value published in industrial censuses and surveys. As indicated earlier, the weights refer to the base rather than to the current year.

Indexes of unit man-hour requirements constructed with unit value weights show the change in man-hours per unit per dollar of total value, in terms of base year value per unit for each item. Changes in these indexes may reflect shifts from products with high man-hour per dollar of total value, and vice versa, without any change in the unit man-hour requirements for any particular product of the industry. The index for the industry may, therefore, fall outside the range of changes in unit labor requirements for individual products.

Measures to determine the extent of error or bias which value weights may introduce are too fragmentary to be reliable. An index weighted with unit values is equivalent to one weighted with unit man-hours if (1) unit man-hours and unit values are proportional or, (2) if the weighted correlation coefficient between the relative change in quantity and value per man-hour is zero.[1] There is some reason to believe that unit values are fairly reliable approximations of unit man-hours requirements for individual products in industries where wages constitute a large proportion of total value of output.

(4) *Coverage of output measures.* The Bureau's measures of production are constructed from data on physical output of items comprising a high percentage of the total value of an industry's output. Coverage varies between 60 and 100 percent. Complete coverage is generally obtained in mining and other well defined industries with a relatively homogeneous output.

Indexes for manufacturing industries are generally based on quantity data for a portion of total output. Quantity data relate to primary products of an industry—the set of products accounting for the principal portion of its total shipments. Information on secondary or relatively less important products and on custom, contract, and repair work are reported in terms of dollar value, rather than physical quantity. Although the proportion of an industry's output covered by quantity data is generally substantial, this ratio may vary from year to year.

Another important aspect of the quantity data used is that the data relate to products primary to an industry wherever made. The data, therefore, include quantities produced by establishments in other industries where these products are secondary to their primary items of production. If the proportion of an industry's secondary production and the proportion of products covered by the index but made outside an industry remain unchanged or if changes in one offset changes in the other, no adjustment is necessary.

The Bureau attempts to make some adjustment for changes in these proportions. For the years 1939 and 1947, coverage adjustment factors for selected industries are computed from the Census of Manufactures. For other years, data are seldom available. This adjustment is based on the ratio of the value of items in the index to total value of an industry's products and assumes uniformity of price movements of products normally classified in the industry, irrespective of whether made in the industry or elsewhere. This assumption is not made with respect to secondary products, whose prices may move in accordance with those in the industry which would normally produce them. The decision as to whether or not to make a coverage adjustment is based on which factor contributes principally to the coverage change—change in production of primary

[1] Siegel, I. H., Further Notes on the Differences Between Index-Number Formulas, Journal of the American Statistical Association XXXVI (December, 1941) (pp. 519–524).

products outside the industry, or change in secondary product manufacture within the industry. The method followed in making coverage adjustments is the same type as that used by the Bureau of the Census, the Federal Reserve Board and the National Bureau of Economic Research.[2]

Closely related to the problem of the changing proportion of primary and secondary products is the problem of industry classification of individual plants. Plant man-hours are classified by Census and BLS in appropriate industries on the basis of the group of products accounting for the principal portion of the total value of shipments by the establishment.

Plants in which manufacture of secondary products is a high proportion of total output may sometimes increase the proportion of products secondary to the industry to exceed that of the primary products. Theoretically, such a plant should be reclassified to the industry indicated by the new production pattern. In practice, the Bureau of the Census and other collecting agencies do not automatically reclassify establishments following shifts in production pattern. Where the change is significant plants are shifted from one industry to another.

Where sizable proportions of products normally made in a particular industry are made in another industry or where secondary output is important, the problem can sometimes be solved by grouping industries. For example, separate indexes for butter, cheese and ice cream would be affected by the fact that these industries make each other's products. The index for dairy products as a group, however, is not subject to this overlapping since very little of these products is made outside the dairy industry.

(5) *Product detail.* Changes in product specification and the introduction of new products occur in many industries. The Bureau uses as much product detail as is available and also attempts to group product data into relatively homogeneous categories and to weight each category appropriately in order to minimize the effect of changes in specification on the indexes. In a large number of cases information is not available for specifically measuring such changes.

[2] Census of Manufactures: 1947 Indexes of Production, Joint Publication of U. S. Bureau of Census and Board of Governors of the Federal Reserve System. Washington: 1952, Appendix D. S. Fabricant, Output of Manufacturing Industries, 1899-1937. New York: 1940 (pp. 366-369).

The individual industry indexes published by the Bureau are those for which there is generally evidence that the product changes are appropriately reflected in the industry composite for purposes of measuring output per man-hour. Thus, the Bureau has refrained from publishing an index for the sawmills and planing mills industry, in which the available data relate to the number of board feet of lumber produced each year. However, an index of production and of output per man-hour based on the number of board feet of lumber sawed may be influenced by such factors as a shift in manufacture from small dimensional lumber to large timbers, or vice versa. More man-hours per board foot are required for smaller dimension lumber than for large timbers, and a production indicator in terms of board feet alone may be insufficient for computing a productivity index.

The various adjustments described in the previous sections are based on available secondary source data and therefore do not always solve completely the problems set forth. As part of its evaluation of industry indexes which are published separately, the Bureau reviews the methods, data and adjustments employed with management and labor officials of the industry. Additional industry data, not otherwise available, are frequently obtained through these consultations, and utilized in constructing the index.

MAN-HOUR MEASUREMENT

The principal sources of man-hour series are the Bureau of Labor Statistics and the Bureau of the Census. Indexes based on BLS data are computed from aggregate man-hours derived by multiplying the annual average number of production workers employed by annual average weekly hours worked in the industry. The Bureau of the Census publishes estimates of aggregate production worker man-hours worked in individual industries. For mining and other nonmanufacturing industries, BLS data on production and nonsupervisory workers are used. Information from the Bureau of Mines and the Bureau of Agricultural Economics supplement these sources.

Indexes of man-hours measure the relative change from the base year of the unweighted

aggregate volume of labor time. Labor time or man-hours are considered a homogeneous total, each unit interchangeable with another. Data on changes in qualitative aspects of man-hour input, such as the skill, efficiency, health, experience, age, and sex of the persons composing the aggregate are generally not available. Thus, a shift from skilled to unskilled labor, without any change in total man-hours, is not reflected by man-hour indexes.

The man-hour data utilized relate to the time expended in establishments classified in the industry; they cover not only employment on primary activities of establishments but also on the manufacture of secondary products and on nonmanufacturing auxiliary activities such as power production. However, the definition of man-hour input excludes indirectly required labor—labor required beyond the manufacturing plant stage for transportation or marketing. Also excluded is "embodied labor"—labor applied to the making of machines, tools, fuel, etc., consumed in the industry's manufacturing process.

The standard definition of "production and related workers" is used (chap. 1, p. 6). The BLS definition of average weekly hours covers all hours paid for, including some hours not worked, such as standby or reporting time, rest periods, portal to portal time, military and paid sick leave, paid holidays, and paid vacations. The term refers to time expended, not scheduled or standard hours. "Man-hours paid for" is a measure of the amount of labor time used for production within a framework of existing industrial and legal institutions and practices. The Bureau of Census man-hour statistics also refer to production worker plant man-hours, worked or paid for, but exclude hours on paid vacations, paid holidays, and paid sick leave. Although less inclusive than the BLS definition, Census man-hours data also cover hours for standby, and similar types of man-hours paid for but not worked.

LIMITATIONS

The basic objective of the BLS industry indexes is to provide a measure of change in average man-hour requirements for a unit of physical output. This type of index serves a wide variety of purposes and is extensively used in business research and general economic analysis. Certain characteristics of the indexes, however, should be kept in mind in applying them to particular problems.

First, indexes of unit labor requirements or output per man-hour measure productivity change in terms of labor input only. This type of index is especially relevant in estimating labor requirements and analyzing employment fluctuations. This does not mean, however, that labor is the sole or principal factor responsible for gains in output per man-hour. Also, it is evident that an index of unit fuel, energy, capital, or total factor requirements would not necessarily follow the trend of man-hour requirements.

Second, the indexes do not generally reflect changes in the quality of an industry's output. Adequate data are not generally available for quantifying changes in the specifications or serviceability of various commodities.

Third, the industry indexes reflect changes not only within plants but also the effects of shifts of production among establishments at different levels of efficiency. The series do not represent the trend for any individual firm.

Finally, a small difference between two annual indexes subject to varying margins of error should not be interpreted as a significant change. BLS indexes of output per man-hour over the years, though approximate, provide useful indicators of the growth characteristics of American industries

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