

1953

A statistical analysis of wage rates in the radio and allied products industry in the United States, during 1947.

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BOSTON UNIVERSITY

College of Business Administration

THESIS

A STATISTICAL ANALYSIS OF WAGE RATES IN
'THE RADIO AND ALLIED PRODUCTS INDUSTRY
IN THE UNITED STATES, DURING 1947.

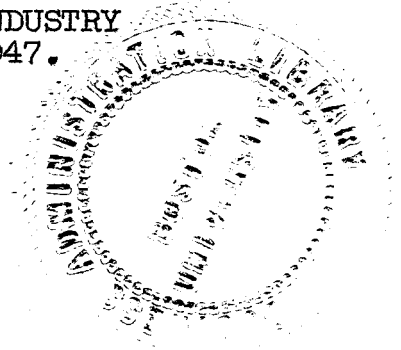
by

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(B.S. in B.A. Boston University, 1951)

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

1953



9/8/53
95008

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ACKNOWLEDGEMENT

I wish to acknowledge my indebtedness to Professor Henry H. Stafford, Chairman, Statistics Department, College of Business Administration, Boston University, for advice and counsel. I am indebted further to Dr. Albert Roy, Librarian, College of Business Administration, Boston University.

I. Introduction

A. Purpose and Scope of Study

One of the paradoxes of modern society is the irregularity of the distribution of the rewards of economic activity. There exists widespread variation in wage levels for similar occupations throughout the United States. This marked geographic differentiation which has persisted in this country is not without its social and economic consequences. Industrial establishments have been torn up by the roots and transplanted from one region to another. The Federal government has found it necessary to introduce of recent years minimum wage regulation beginning with the National Industrial Recovery Act of 1933 and then with the Walsh-Healy Public Contracts Act of 1935 and followed by the Fair Labor Standards Act of 1938.

The basic objective of this analysis is to study regional wage differences in the light of experiences of a specific industry, namely, the radio and related products industry# for the year, 1947.

The fact that this industry is a relatively new one, growing rapidly nationally, and that relatively little has been written about wages in this industry

#, Allied products industry-manufacturers of radio receiving sets, transmitters, television sets, phonographs, radio equipment and radio parts except tube manufacturers.

were determining factors in the selection of the subject of the thesis.

Specifically, wages for selected occupations will be compared to determine the differences, if any, for comparable work, during 1947, in New England, Middle Atlantic Region, Border States, South East and the Pacific States.#

A further objective of the analysis will be to compare wage levels of the radio industry in New England with the national average for the industry for 1947.

The procedure will be to measure and analyze, using appropriate statistical methodology, the inter-regional wages of 16 selected occupations within the radio industry.

Wherever possible, emphasis will be on the more readily measureable factors accounting for wage differences, namely, those due to the mode of payment, sex, company size, community size, the effect of employee organizations, and the factor of minimum entrance rates.

#, New England.....Connecticut, Maine, Massachusetts,
New Hampshire, Rhode Island, Vermont
Middle Atlantic..New Jersey, New York, Pennsylvania
Border States...Delaware, District of Columbia,
Kentucky, Maryland, Virginia, and
West Virginia
Great Lakes.....Illinois, Indiana, Michigan, Minne-
sota, Ohio, Wisconsin
Pacific.....California, Nevada, Oregon, Wash-
ington

B. Historical Background of the Radio Industry

Early in the year 1900, Marconi solved the problem of connecting England and America without the use of cable and its prohibitive cost of \$2500.00 per mile. His crude radio transmitter and receiver were the granddaddy of the present multi-million dollar radio industry.

During World War I, another milestone occurred in the infant industry when the General Electric Company invented an efficient alternator.* This new "power-pump" for the radio transmitter paved the way for unlimited power output, i.e., muscles with which to bridge not only the Atlantic but the Pacific as well. England, then the commercial giant of the World, acting as the terminal of a radiating web of oceanic cables, made the General Electric Company a handsome offer for exclusive use of the alternator. The company was on the point of accepting when extraneous considerations brought an abrupt halt to negotiations.

For, upon hearing of the pending sale, President Wilson hastened his Naval Chief of Communications, Admiral W. H. G. Ballard to the General Electric Company with the urgent request that the British

* 1, p. 60-63

offer be declined on patriotic grounds. The Company complied, but in so doing found itself without a customer for an invention which represented a heavy financial investment.

However, it remained for the Navy representative to propose a business-like solution to the Company's problem. He suggested the merger of the radio interests of the American Telephone and Telegraph Company, the Western Electric Company, The General Electric Corporation, The Westinghouse Electrical and Manufacturing Company and The United Fruit Company to form, in 1919, the communications organization known as the Radio Corporation of America. The rise of R.C.A. is symbolic of the rise of the radio industry in the United States.

The products of the now giant industry are now to be found in almost every home in the nation. In the decade 1940-1950 production of domestic radio sets nearly doubled climbing from 51,000 to 90,000.* Furthermore, radio has become of increasing importance in National defense. Technical improvements developed during World War II, such as frequency modulation and Television have tended to heighten the demand for radio products.

* 36, p. 57

For the immediate future, Color Television, Radio Photography, Ultra High Frequency Automatic Relays, Radio facsimilie, are but a few of the developments which should continue to sustain demand for radio products indefinitely.

C. Historical Background of Industrial Wage Differences in the United States

1. Early Wage Levels

Statistics indicate that by 1810, wage levels had become fixed and showed somewhat the same differences between geographic localities and trades that exist today.* Historian, J. B. Master, reports that industrial wage rates in 1810 were highest in New England and the New York area extending as far west as Ohio, and lowest in the South, with the territory west of Ohio holding the middle ground.

2. Far West-South Differentials

One century later, in 1907, a shift in the high wage area was noticeable with the manufacturing establishments in the Far West supporting the highest average wage levels in the country. However, consistent with its position 100 years earlier, the South paid the lowest wages for work similar in character as that performed elsewhere.*

* 37, p. 56

** 38, p. 511

From the comparison of each region, in Chart 1, page 9, it appears that the level of occupational wages was 51 percent higher on the average in the Far West than in the South in 1907. By 1919 this spread has been reduced to approximately 32 percent by reason of the loss of position of the Far West. This over-all wage gap widened after 1919 as the South lost ground again so that in 1931-1932 the spread between the Far West and the south amounted to 53 percent. Later improvements in the position of the South accounted for the reduction in the Far West-South differentials to about 35 percent by 1945-1946.

3. Position of the South

The status of occupational earnings in the South relative to the rest of the Country or usually to the North has long been considered the core of the regional wage problem. The persistence of lower wage levels in the South has, among other things, influenced the pattern of industry location and labor migration. During recent years the wage gap between the South and other regions has narrowed, yet over the 40 years included in the Bureau's study*, as shown in Chart 1, page 9, the relative average position of the South showed no

* 38, p. 373

TABLE 1: REGIONAL DIFFERENCES IN OCCUPATIONAL WAGE RATES IN MANUFACTURING INDUSTRIES, BY SKILL AND SEX, IN THE UNITED STATES, FOR SELECTED PERIODS, 1907-1946

(Wage Rates in Northeast^{1/} =100)

Occupational Category and Period	Percentage Relatives		
	^{2/} South	^{3/} Middle West	^{4/} Far West
<u>Total Occupations:</u>			
1907	86	100	130
1919	87	97	115
1931-1932	74	97	113
1945-1946	85	101	115
<u>All Men's Occupations:</u>			
1907	88	100	131
1919	88	98	117
1931-1932	74	97	114
1945-1946	84	102	115
<u>Only Men's Skilled Occupations:</u>			
1907	93	99	131
1919	95	98	a/
1931-1932	83	96	a/
1945-1946			
<u>All Women's Occupations:</u>			
1907	a/	a/	a/
1919	81	92	a/
1931-1932	73	a/	a/
1945-1946	86	98	114

^{1/}: Northeast- New England and Middle Atlantic States

^{2/}: South- Southeastern and Southwestern States

^{3/}: Middle West- Great Lakes and other Medwestern States

^{4/}: Far West- Mountain and Pacific States

a/: Number of occupations covered too small to justify selection of data

Source: Bloch, J. W., "Regional Wage Differentials: 1907-46," Monthly Labor Review, U. S. Dept. of Labor, Bureau of Labor Statistics, April, 1948.

progressive improvement that might be attributable to long-term forces affecting the industry and population of the South. Notwithstanding gains in recent years, the percentage gap between manufacturing job rates in the South and in other regions was as wide in 1945-1946 as in 1919. In relation to the industrially dominant Northeast and Northwest the wage position of the South was the same at the end as at the beginning of the 40 years.

The widening of differentials between the South and the Northeast between 1919 and 1931-1932 and the narrowing between 1932 and 1945-1946 as shown in Table 1, page 7, are highly significant as indicators of the forces that tend to promote regional differentials. The widening of the gap between the two regions during the earlier period is related to the 1930-1932 depression. However, as Chart 1, page 9, indicates, the Northeast, Far West, and Middle West maintained fairly stable relationships to one another through 1919, 1931-1932, and 1945-1946; hence there is reason to believe that the conditions that made for changing status of the South were peculiar to that region.*

The reasons for the improvement in the position

* 39, Chaps. 1 & 2

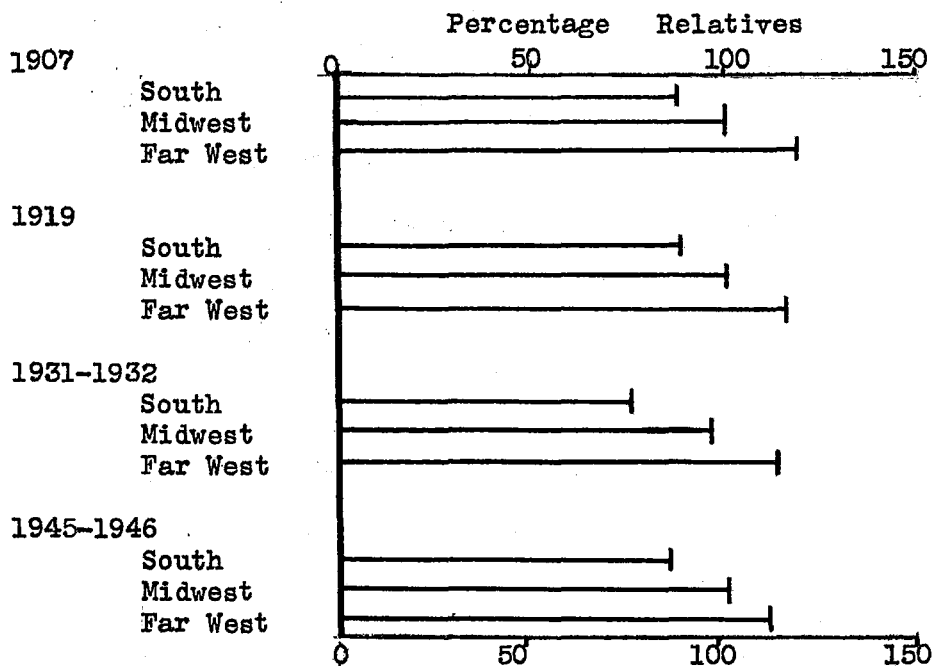
CHART 1: REGIONAL WAGE RATE DIFFERENTIALS

IN THE UNITED STATES

SELECTED PERIODS ^{1/}

1907-1946

(Wage Rates In Northeast = 100)



^{1/} : Northeast- New England and Middle Atlantic States
 South - Southeastern and Southwestern states
 Midwest - Great Lakes and other midwestern states
 Far West - Mountain and Pacific states

Source : Block, J.W. "Regional Wage Differentials: 1907-46",
Monthly Labor Review, U.S. Dept. of Labor, Bureau of
 Labor Statistics, April, 1948.

of manufacturing wages in the South between 1931-1932 and 1945-1946 are more readily apparent than those for the earlier loss. Because of the relatively low wages paid in the South, this region undoubtedly was affected to a greater proportionate extent than others by the NRA codes; the Fair Labor Standards Act; and other Federal Wage legislation; by the spread of unionization; and by the full employment of the war years of World War II.

Skilled workers were consistently in a more favorable position than other wage groups in the South, but the range of differentials between southern and northeastern skilled operations was quite wide. In all periods a substantial proportion of southern skilled groups earned less than 80 percent of the wages for similar workers in the northern region. This variation reveals that the acquisition of a skilled status did not in itself assure the southern worker of 1907-1946 a wage equal or close to that received by similarly classified workers in other regions.

The percentage relatives also indicate that the wage advantage of the skilled over the semi-skilled and unskilled was greater in the South than in the Northeast and all the regions in all periods. Moreover, the wider spread between the pay of the skilled and the

unskilled in the South was due to the fact that the wage standards of the low-skilled occupations in the South, as a group, were further below those of low-skilled in other regions than were those of the skilled.

4. Position of the Northeast

Between the 1907 and the 1945-1946 periods, the Northeast advanced in relation to the Far West but its status relative to the South and Middle West remained about the same as shown in Chart 1, page 9. The wage advantage of the Northeast over the South increased substantially between 1919 and 1931-1932 and decreased to about the same extent between 1931-1932 and 1945-1946, thus bringing the Northeast-South differential to the 1907 and 1919 level. The Northeast-Far West average differential which favored the latter region throughout the 40 years covered, narrowed markedly between 1907 and 1919.* The magnitude of the differential in 1945-1946 was substantially smaller than in 1907 but was about the same as in 1919. Compared with the Middle West, the Northeast tended to gain slightly in relative status between 1907 and 1919 but experienced an offsetting loss between 1932 and 1945-1946, the Northeast lost ground to each of the other regions -- a considerable loss relative

* 38, p. 513

to the South. This movement reversed the trend that operated between 1907 and 1932.

5. Summary of Historical Background

The historical data has provided some measure, insofar as available data allow, of the long-range movement of regional differences in manufacturing wage rates as a whole rather than in terms of specific industries. In contrast, our ultimate objective is to measure the movement of regional differences within a specific industry for the year 1947.

The analysis of long-range wage movements is limited to four periods for which the occupational wage data collected, covers a large and diversified group of industries-1907, 1919, 1931-1932 and 1945-1946. These periods have the advantage of being spaced rather evenly and represent severe depression as well as post war peaks.* While the data covering four such periods do not form a connected series they do attain the objective in that they indicate long-range movement and identify those intervals in which significant changes in regional differentials took place.

The major conclusions are:

- (1) Percentagewise, geographic wage differentials narrowed between 1932 and 1945-

* 38, p. 511

1946 in major industries. The data for the years prior to 1932, however, do not support the conclusion that the narrowing of the differentials was a consequence of long term pressure.

- (2) In terms of cents-per-hour, differences among regions and cities tend to compare with the level of money earnings. Thus, geographic wage differentials in money were generally greater in 1945-1946 than in any previous period.
- (3) It is significant that from the results of the study a more profound modification of regional wage differentials was not indicated. There was no significant change in the ranking of the four regions studied - the Far West remained the high-wage region, the South the low-wage region, and the Middle West and Northeast were in the middle at about the same level.

D. Characteristics of the Data Employed

1. General

To infer that the price of labor, i.e. the wage, can be measured strictly in monetary terms is erroneous.*

* 2, p. 103

Complicating all studies of wage differentials must be the consideration of interlocking fringe benefits. Over and above the gross weekly pay, benefits such as paid vacations, pension plans, group insurance, etc., constitute integral elements of the workers' earnings. An attempt to evaluate the many varieties and the variations within the type of fringe benefit and to weigh their individual effect on wage differentials is beyond the scope of this study. Nevertheless, consideration in general, will be given herein to the effects of fringe benefits on wage differentials in the radio industry during 1947.

Further complicating studies of wage differentials, is the mode of payment. Straight time, overtime, incentive payments of every conceivable variety, shift differentials, hourly rates, day-time, weekly wage are some of the more common garden variety types of differences in payment plans. Here again an attempt to evaluate the many varieties and to weigh their affect on wage differentials in detail is beyond the scope of this study. However, some consideration will be given to this factor in explaining wage differentials.

Therefore, in order to measure differences in wage levels, average monetary wages paid per hour,

despite obvious inadequacies, will constitute for purposes of this study the basic tool for evaluation.

The wage data used in the analysis of the radio and allied products industry are drawn in part from nation-wide surveys of the industry made by the Wage Analysis Branch, Industry Wage Studies Division, Department of Labor, Bureau of Labor Statistics in the years 1945, 1947.

The 1947 Survey covered somewhat more than half of the 302 plants primarily engaged in manufacturing radio receiving sets, transmitters, television sets, phonographs, and radio parts, employing 8 or more workers.* These establishments accounted for about three-fifths of the estimated 143,000 workers primarily engaged in manufacturing these products in the industry during January 1947.

In all three surveys selected occupations, i.e., those most representative within the radio industry were used for comparison purposes. Field representatives, under the direction of the Bureau Regional Wage and Industrial Relations Analysts, collected the data.

Wage comparisons in this investigation will revolve around 16 occupational classifications representing skilled, semi-skilled and unskilled types of

* 41, p. 2

work. Included will be both male and female workers, maintenance, supervisory, inspection and custodial personnel.

2. Limitations of the Data

The basic wage rate data used in our study, provided by the Bureau of Labor Statistics was obtained by sampling the 143,000 workers in the Radio and Allied Products industry during January of 1947. To use the data, we must make the assumption that they are free from bias and that any inherent errors are due solely to chance and hence free from bias.

The Bureau[#] surveyed wage rates in the radio industry twice during the decade 1940-1950, first in 1945, again in 1947. While the Bureau has made a profusion of data available as a result of these surveys, no practical way was found, for purposes of our study, to compare the two years. The regions included in the earlier survey are not consistent with those included in the 1947 study.

Consequently, the later of the two surveys, dated January 1947 has been used in our study as the basis for analyzing regional wage differences in the radio and allied products industry.

[#], Unless otherwise identified, the "Bureau" refers to the Bureau of Labor Statistics.

3. Terminology

Wages and earnings are sometimes used interchangeably to designate the amount of money paid to a worker for a specified period of time, that is, hour, day, or week. Since the term "earnings" could more accurately be used to refer to total remuneration including overtime, bonuses, etc., it will not be used as the basic measuring tool in this study.

Wages, on the other hand, are usually understood to cover regular pay for work performed under normal conditions, exclusive of overtime, bonuses, etc. However, since wage earners are paid only for actual time worked it becomes a less trustworthy base unit than wage rates.

The wage rate, which represents the amount of pay for a specified unit of time, most commonly an hour, will serve as the basic unit of measurement throughout this study.

The term "differential" as applied to wages is used herein in its generic sense, and is intended to mean differences in overall wage levels. By the same token, it is not used in its restricted sense of supplements to basic wage rates for working the second or third shift, i.e., shift differentials.

4. Summary and Method of Approach

It is readily apparent, from earliest available information, that regional wage differences have persisted in industries of the United States. The wage rates in the Far West have consistently ranked highest in the country; wage rates in the South have consistently ranked lowest in the country; while wage rates in New England have hovered midway between the extremes. Although the regions have maintained their relative standing since earliest recorded data the spread between the extremes, the Far West and the South, has varied considerably, from 51 percent in 1907 to 32 percent in 1919.

Leaving the examination of long-range variation in wage differentials common to all industries of the United States, it is planned to turn to an analysis of regional wage rates in a specific industry for a specific year. Ultimately it is intended:

- (a) to determine whether or not regional wage differentials exist for comparable jobs in the radio and allied products industry during 1947.
- (b) to measure the extent of the differences, if any, that existed in the radio and allied products industry during 1947.

- (c) to determine whether or not regional wage patterns for comparable jobs in the radio and allied products industry are similar to historical wage patterns common to industry in the United States prior to 1947.

Before undertaking the specific analysis of regional wage rates in the radio industry during 1947, it is planned:

1. To examine some of the factors which help to explain long-range regional wage variation common to industry in the United States to-date.
2. To note the degree of agreement amongst economists with respect to the hypotheses developed to explain the phenomenon of regional wage differentials common to industry in the United States to-date.
3. To evaluate the premise that the greatest disparity in regional

wage rates for similar jobs exists
amongst the unskilled occupations.

II. Elements of Universal Wage Market Differentials

A. The Problem of Labor Market Analysis

The existing wage structure throughout American industry includes a medly of rates which are the result of a commingling of all the factors and influences discussed below. No particular rate in any industry, plant or area can be explained on the basis of any one factor alone and seldom is it possible to evaluate the degree of influence of the several factors.* The best that can be done is to portray some of the outstanding characteristics of the general wage structure and to suggest some of the considerations which may have an effect in causing regional wage differentials to be what they are in the radio and allied products industry.#

It must always be borne in mind that wages are in a constant state of flux; that a factor which may have become dominant in certain sections of an industry or area may not yet have been felt but soon may be evident

* 3, p. 303

#, Allied products industry - manufacturers of radio receiving sets, transmitters, television sets, phonographs, radio equipment and radio parts except tube manufacturers.

throughout the entire industry or area. Wages may be comparatively low in one branch of an industry because it has not yet been affected by unionization. Nevertheless, there may be wide differences in the wage structure of an industry even though all sections of it are under union agreements, simply because these differences existed prior to unionization. Collective bargaining is of too recent origin in some sections to have become effective in bringing up the lower rates. Likewise, wage differences due primarily to shortages or abundance of the labor supply may disappear at any time as workers migrate in search of new job opportunities. Some of the factors which affect inter-regional wage levels may be summarized as follows:

- (1) The labor market itself.
- (2) Supply and demand for the manufactured products of the industry.
- (3) The proportion that labor costs constitute of total cost of production.
- (4) Competition from labor substitutes.
- (5) The relationship of industry capacity to demand.
- (6) The business cycle.
- (7) Employee organizations and Collective Bargaining.

- (8) Employer organization.
- (9) The economic organization and financial structure of the industry.
- (10) Federal legislation.
- (11) The attitude and behavior of workers.
- (12) Fringe-benefits.
- (13) Prevailing wage practices.
- (14) Movement of workers (voluntary).
- (15) Mode of payment.
- (16) Real wages vs. money wages.
- (17) Custom and social policies within the community, within the region, within the industry.
- (18) Productivity and efficiency of management and labor.
- (19) Sex differences in wage payments.
- (20) Company size.
- (21) City or community size.
- (22) Urban vs. rural variances.
- (23) Individual bargaining strength of employees.
- (24) Natural resources of the region.
- (25) Population growth factors of the region.

- (26) Internal factors.#
- (27) Occupational and industrial differentials.

The above factors are not to be construed as an all inclusive enumeration of determinants of regional wage differences. Nor has the attempt been made to rank the factors in accordance with importance. However, some appreciation of the innumerable interactions which should be considered in analyzing wage differentials, may be gleaned from the listing.

While labor economists agree that the reasons for wage differentials are legion, few agree on the relative importance of specific factors. For example, some of the reasons commonly presented for the North-South wage differentials, (over and above those presented on page 9) follow:

"...absence of state labor legislation, lack of recency of labor unionism, racial discrimination, lower labor efficiency, cheaper living costs, higher freight rates and greater distances from markets, poorer machinery and capital equipment...."

Internal factors - include training and skill requirements of the job; responsibility and authority attached to the job; opportunity for advancement, regularity of employment, etc.

However, one authority refutes, in order, each and every one of the above reasons. Professor R. A. Lester provides facts and figures in profusion, both to support his detailed reputation and to bolster, in turn, his counter thesis that "The most important factor explaining the continued existence of differentials in wage levels appears to be the high rate of population growth that causes a rapid expansion in the Southern labor supply."*

To present a detailed discussion of the factors responsible for regional differentials is far beyond the scope of this effort. However, for better understanding of the reasons behind wage differentials, past, present, and future, some development is in order.

B. Major Factors

1. Supply and Demand of Labor

Economic theory focuses on the concept of the market. Our economy is viewed as a system of inter-related markets including the market for productive services. Labor appears as the leading type of productive service.** The market for labor is integrately related to the market for the product which it helps to

*52, p. 243

**4, p. 1

produce. Price - quantity changes in the market are reflected in the labor market and vice versa. The market for one kind of labor, moreover, is related to the market for every other kind by the willingness and ability of workers to change jobs in response to relative wage rates.

In a completely laissez-faire economy, the condition of the labor market in relation to the need for labor would be the ultimate determinant of all wage rates because the cash value of everything would be determined solely by its utility and scarcity.* In our present-day society there are forms and controls which mitigate some of the automatic operation of the law of supply and demand as it affects wages. Laws and union pressure intervene to alleviate some of the effects of a redundancy of labor and act as a brake on the downward swing of wages.

The circumstances of a scarcity or abundance of qualified workers at the time and place needed have a major influence on the amount of wages paid. Common laborers in an extremely isolated community may receive wages as high as those paid skilled workers in other communities. The wages of skilled workers in a pioneer

*3, p. 294

expanding country are likely to be higher than the rates for similar work in an older community. In 1698 an historian in Pennsylvania asserted that "Poor people of all kinds can here get three times the wages for their labor they can get in Wales."* In 1633 Governor Winthrop of Massachusetts Bay Colony noted that the "scarcity of workers caused them to raise their wages to an excessive rate."

2. Imperfections of the Labor Market

Concomitant with theories of the labor market, of supply and demand factors, must be the realization of the practical imperfections of the market and their effect on regional wage differentials.

In a purely competitive market the commodity or service must be homogenous or so standardized that no buyer will prefer any particular seller and vice-versa.** An hour of labor, of course, is not a standardized or homogenous unit; it varies with the hour of day, the working facilities, the management, the worker's experience, and many other circumstances.

With pure price competition there is but one price in the market and sellers are not able to sell

*43, p. 7

**2, pp. 51-67

their services or commodities above that price nor are buyers able to purchase below that price. There is no single wage rate for each class and grade of labor. Instead of one price for each occupation and grade of labor there is a whole range of prices.

In a perfect market the number of buyers and sellers is so large that any one buyer or seller will have a negligible effect upon the total supply or demand and therefore no seller or buyer can influence the market price by his own actions. Though there are usually large numbers on the sellers' side of the market, there is normally but a restricted number on the buyer's side. In American industry as a whole, the sellers of labor probably outnumber the regular buyers of labor by at least 15 to 1.

The situation on the buyer's side of the labor market may range all the way from monopsony (a buyer's monopoly) to oligopsony (a few buyers) to in very rare cases, a sufficient number of small buyers to constitute pure competition.

In a perfect market both buyers and sellers must possess full knowledge of market conditions and opportunities in other markets. The buyers of labor services, especially the larger ones, do have full knowledge of the market. Employees on the other hand,

usually have relatively little knowledge about the labor market even in their locality to say nothing of other localities.

Above all there must be, in a perfect market, no cooperation or collusion among sellers or among buyers. It is obvious that a labor union represents an attempt at cooperation on the sellers' part, but it is less widely recognized, that cooperation and collusion on the buyers' side is frequent and often more effective.*

In most markets, persons trading, frequently switch from the buying to the sellers' side (and vice-versa) as the price changes. In the labor market, however, the sellers seldom, if ever, change to the buying side, nor do buyers frequently switch to the selling side.

Imperfections in the labor market are further discernible in the behavior of wage rates. Wage rates lag far behind movements in the general level of prices or in many cases fail to follow price levels at all.

Concerning the supply of labor, factors limiting the mobility of workers tend to make the labor supply curve inelastic within narrow ranges of wage rates and that, with a slight lowering of rates an employer would experience no reduction in his labor supply.

*2, p. 81

On the demand side, one or more buyers may dominate the labor market. Employers usually name their own price in the market. They may follow the practice of not bidding labor away from other employers. A large employer is likely to realize that in bidding up wage rates he may be bidding against himself. In many localities the competition for labor is restricted because a few large employers of labor follow a common policy with regard to wage rates or because employment in the locality is largely controlled by one firm, as is usually the case in small villages of the South, Company towns in the North and West, and in some of the smaller cities in various parts of the country.

3. The Effect of Federal Legislation on Wage Differentials

Federal minimum-wage legislation brought about a greater reduction in North-South differences in the lower-paid than in the higher-paid occupations because the nation-wide minima resulted in a proportionately greater lifting of rates which were below the legal minima (more prevalent in the South than in the North) than of the rates which were above the minimum levels.* In 1933, before the NRA codes, the average wages of cotton textile workers were 42 percent higher in the North

*3, p. 307

than in the South. Ten years later the difference was reduced to 21 percent. This reduction in the spread was due primarily to the greater-than-average lifting of wages in the lowest-paid occupations in southern textile mills.

When the 30 cent minimum wage under the Fair Labor Standards Act went into effect in 1939, more than half the southern loggers were earning below this amount while almost no loggers in the northern areas were receiving less than 30 cents an hour.

4. Financial Structure of the Industry

A company's ability to pay any proposed amount of wages is a fundamental issue in most wage negotiations. In the long run, a company's ability to pay represents the outside limit beyond which wages cannot go. If an employer's wage bill is higher than he can afford he will eventually go bankrupt or close his business. What is true at the company level holds equally true at the industry level.

5. "Prevailing Wage" Practices

One of the most prevalent criteria for determining new wage rates or measuring existing rates is the scale of wages paid for similar kinds of work in

other industries and by competition.* The payment of prevailing wages is commonly associated with the concept of "fair" wages. If plant A happens to be located in a low-wage area and wages are based on prevailing wages in the community, employer A obviously has an advantage over his competitors located elsewhere. In the long run the latter are encouraged to move into low-wage areas. If, on the other hand, wages in plant A are based on those prevailing throughout that particular industry, they will be "out of line" with other wages in the community and may work to the disadvantage of other local employers.

Irrespective of the basis used for determining prevailing wages, it is obvious that if wage adjustments were solely contingent upon their measuring up to prevailing rates, there would never be any rise in existing levels. If there is to be any advancement in the trend of wages in line with industrial and social progress or to accommodate increases in the cost-of-living there must be, and there usually is, a breakthrough somewhere.

6. Natural Resources of the Region

The southern wage differential, has been explained on many grounds. Of fundamental importance in

*3, p. 291

all regional and national wage differentials is the population - resources ratio or the natural resources per capita.* The South is not rich in minerals and its soil has been depleted and eroded. In the past, cotton farmers have tended to use up the land and to move on. That helps to explain why economic productivity, measured by money income, including wages, is much lower for southern agriculture than for agriculture in other regions of the country. In 1929 the income of farmers in California averaged 10 times that of farmers in South Carolina. Yet almost one-half the working population of the South depend on agriculture for its support.**

The quality of the region's population or human resources is also an important factor in economic productivity and the resulting wage rates.

The particular industries which employ the largest number of workers in the South are industries that use mostly unskilled or semi-skilled labor. Half the industrial workers in the South are concentrated in textiles and lumber and both of these industries are low-wage industries, generally employing a relatively

*6, pp. 58-62

**2, p. 117

low-grade of labor.*

It is in unskilled occupations that the wage differentials between southern industry and industries of other regions are greatest. In highly skilled occupations, wage differentials are at a minimum and in some cases, practically disappear.**

*6, pp. 63-65

**2, p. 118

III. Elements of Universal Wage Markets (Con't)

A. Major Factors (Con't)

7. Rural vs. Urban Differences

The disparity in the cost of living is partially responsible for rural - urban wage differentials. Partially responsible also, are occupational differences. The rural wage-earners or laborer generally is less highly skilled than his urban counterpart. Further, there is a marked variance in wage rates depending on the size of the city which is being compared with the country. Skilled trades in larger cities of 500,000 or above generally receive markedly higher wages than their rural counterpart. The greater degree of labor unionization among workers in the cities than in the country is undoubtedly responsible in great part for differentials of this nature.

8. Occupational and Industrial Differentials

Occupational differences in wages persist because workers are divided into "non-competing groups", that is, groups who cannot be substituted for one another. The street cleaner cannot take the place of the Doctor, nor the university janitor the place of the professor.*

Various artificial restrictions upon the supply

* 4, p. 130

of labor in an occupation may increase occupational differentials in wage rates. The establishment of certain requirements for admission to the occupation like those fixed by medicine and bar associates or those determined by common practice such as the P.H.D. degree for college professors affect the supply of eligible labor in an occupation. The same is true of various other artificial barriers to entrance into a trade like those set up by labor unions, for example, a required period of apprenticeship training, the closed shop agreement, restrictions on hours of work, rates and on output, etc.

9. Elasticity or Inelasticity of Demand for Product

Closely allied to an employer's ability to pay is the relative elasticity of demand for a given product or service.* During a business depression the wages of persons attached to luxury industries tend to decline more than the earnings of people who are providing necessities. The earnings of caterers, for example, may drop proportionately more than those of waiters in moderately-priced and cheap restaurants. Even in normal times there is a good deal of competition for the consumer's dollar; and, to the extent that wages affect prices, wages are more or less influenced by the consumer's willingness to

* 3, p. 296

buy or not buy certain products or kinds of services.

10. Mode of Payment

Another element affecting wage levels is the presence or absence of incentive methods of wage payment. Average hourly earnings tend to be higher under incentive systems than under time-work methods of wage payment.* Some unions have opposed incentive systems, and the absence or smaller proportion of incentive wage plans in union shops would thus minimize the earning differences between union and non-union employees within the specific industry. Where unions have accepted incentive systems, earnings are usually higher than in non-union shops under such systems of wage payments.

11. Strength of Union Organization

Generally, wages in organized plants are anywhere from 10 to 30 percent higher than in unorganized plants engaged in similar lines of work.** It is almost impossible to make any accurate comparison, however, because of the difficulty of isolating the influence of unionization from the other factors which affect wage levels. Within any industry, unionization may be confined to the larger plants, regardless of region, or it

*2, p. 119

**3, p. 297

may be much more extensive in northern than in southern regions. If this is the case, the higher wages prevailing in unionized plants may be due as much to the size and location of the plants as to the fact of unionization, although it might be argued that the wages paid in the smaller plants, or those located in the South, would be higher if they were under collective bargaining agreements. In some industries wages may be higher in the smaller-sized plants than in the larger plants regardless of unionization because jobs are less mechanized and therefore require a higher and more varied degree of manual skill.

Government action may, and frequently does, result in lessening the differences between union and non-union rates. The lowest rates that are automatically lifted by minimum wage legislation are predominantly non-union rates. While this lifting of the wage "floor" tends to advance all wages, some time may elapse before the unions are able to obtain advances sufficient to restore the differentials which existed prior to the minimum wage legislation. Indirectly, wage levels of non-union employees are raised by the efforts of unions to improve the wages of their members.*

*4, p. 194

B. Summary

A discussion (however limited) of several of the elements of the wage market, directly or indirectly responsible for regional differentials has helped establish the following conclusions:

- (1) Area differences do exist and have existed throughout the history of our country.
- (2) Imperfections in the labor market help to explain the differences.
- (3) Since regional differences, with some slight modifications, have persisted to-date, it seems apparent that the positive and negative charges of wage market elements have tended to offset each other. For, in spite of some factors which tend to minimize area differences, such as industry-wide collective bargaining and fixing of certain rates by the Federal Government, job rates continue to be established in relation to prevailing wages which are in turn sustained by the natural and human resources of the region.

IV. Measurement of Wage Differentials in The Radio And Allied Products Industry

We have, up to this point (1) examined the characteristics of long-range wage variations in the domestic manufacturing industry; (2) analyzed some of the factors held responsible for the variations; (3) noted the variation in weight given these factors by economists; and (4) we have found that the greatest disparity in regional wage rates for comparable jobs generally exists amongst the unskilled occupations of manufacturing industries.

The preliminary objectives of the study have therefore been attained and we turn from an analysis of general industrial wage differentials in the United States to the analysis of a specific industry. The first step in this basic phase of the study is the measurement of wage differentials for comparable jobs in the radio and allied products industry. Average hourly wage rates, including straight-time average hourly wage rates for piece-rate and other incentive workers will be included but premium overtime and shift differential payments will be excluded.#

#, Incentive wage payments are defined and discussed more fully in Chapter V.

TABLE 2: BASIS FOR SELECTION OF ESTABLISHMENTS STUDIED
BY BUREAU OF LABOR STATISTICS IN THE
RADIO AND ALLIED PRODUCTS INDUSTRY
IN THE UNITED STATES
JANUARY, 1947

	<u>United</u> <u>States</u>	<u>New</u> <u>England</u>	<u>Middle</u> <u>Atlantic</u>	<u>Border</u> <u>States</u>	<u>Great</u> <u>Lakes</u>	<u>Pacific</u>
Total All Establishments	<u>165</u>	<u>17</u>	<u>58</u>	<u>7</u>	<u>62</u>	<u>17</u>
<u>Unionization</u>						
Union establishments	84	5	34	3	34	5
Nonunion establishments	81	12	24	4	28	12
<u>Establishment Size</u>						
501 or more employees	42	5	13	2	20	1
101 - 500 employees	59	8	19	4	24	4
8 - 100 employees	64	4	26	1	18	12
<u>Community Size</u>						
100,000 or more population	129	14	47	2	49	15
25,000 and under 100,000	18	2	3	2	7	2
Under 25,000	18	1	8	3	6	-

Source: U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, January, 1947, Series 2, No. 62, P. 10

An inkling as to the size of the Universe and the sample selected by the Bureau is provided in Table 3 below. The Bureau selected only establishments with eight or more workers for their purposes.

TABLE 3: SAMPLING PROCEDURE USED BY THE BUREAU OF LABOR STATISTICS IN WAGE SURVEY OF RADIO AND ALLIED PRODUCTS INDUSTRY, BY REGIONS, IN THE UNITED STATES
JANUARY, 1947

	<u>Total Industry</u>		<u>Sample</u>			
	<u>Establish- ments</u>	<u>Workers</u>	<u>Establish- ments</u>	<u>%</u>	<u>Workers</u>	<u>%</u>
United States ^{1/}	<u>302</u>	<u>143,000</u>	<u>165</u>	<u>54.6</u>	<u>88,200</u>	<u>62.0</u>
New England	17	10,750	17	100.0	10,750	100.0
Middle Atlantic	115	65,750	58	50.5	38,100	56.2
Border States	7	4,000	7	100.0	4,000	100.0
Great Lakes	129	57,550	62	48.0	31,900	55.4
Pacific	27	2,950	17	63.0	1,700	60.0

^{1/} Includes data for other regions in addition to those shown separately.

Source: U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, January 1947, p. 9.

A. Selection of Data

The Bureau of Labor Statistics, in its wage survey of the radio industry, sampled about three-fifths of the 143,000 workers in the industry in January 1947.

In selecting their sample, the Bureau took into consideration the "chief factors" that frequently affect wage rates; notably location, size of establishment and community, and unionization, see Table 2 page 41.

The profusion of sample data, shown in Table 3 above, provided by the Bureau in their general wage surveys of the radio industry constitutes fertile area for measuring regional wage differentials.

It is anticipated that reliable and valid results may be obtained on the basis of a stratified sample of the Bureau's already detailed coverage. An analysis of the reliability of the sample data selected for this investigation is provided in Appendix II, page 96.

The list of occupations selected for this investigation is designed to meet the specifications of a stratified sample. The purpose of stratification is to insure that the various strata of the universe, that is, all the hourly wage rates in the radio industry, are proportionately represented in the sample.* The occupations were chosen for their numerical importance; their representativeness of the entire range of radio manufacturing wage rates; and for the completeness of occupational data provided by the Bureau.

The strata, in this instance, are job classifications into which the wage structure of the radio industry are commonly subdivided. Only occupations common

* 7, p. 300-302

to all regional areas are included.

The job classifications selected for analyzing regional wage differentials follow:

Assemblers, Class A
 Assemblers, Class B
 Assemblers, Class C
 Carpenters, Maintenance
 Electricians, Maintenance
 Inspectors, Class A
 Inspectors, Class B
 Machinists, Maintenance
 Machinists, Production
 Mechanics, Maintenance
 Stock Clerks
 Testers, Class A
 Testers, Class B
 Testers, Class C
 Tool and Die Makers
 Working Foremen (Processing)

In several instances, as is indicated above, job classifications are subdivided into grades designated as A, B, and C. In each instance, Class A is the most highly skilled grade within the classification and Class B and C represent successively lower grades of skill.

B. Rank and Indexes of Regional Wage Differences

The immediate objective is to attain some idea of the rank of the five regions with respect to their relative levels of pay for comparable work and thus compare the nature and extent of wage differentials throughout the nation (see Table 4 below).

Before we can rank the five regions, some means of summarizing the varying wage levels into representative.

expressions, one for each region, must be employed. It is possible to approach this problem of summarization in a variety of ways depending upon the characteristics of the basic data and the intended objectives. The wage rate level may be expressed in terms of cents per hour (absolute) or as an index number (relative). The method of absolute differences is rejected because of the tendency to introduce bias by use of extreme items. This study will therefore utilize the alternate method, employing index numbers to rank the regions in accordance with their relative differences in wage rates.

TABLE 4: RANK AND INDEXES OF REGIONAL WAGE RATES FOR SELECTED OCCUPATIONS IN THE RADIO AND ALLIED PRODUCTS INDUSTRY IN THE UNITED STATES
JANUARY, 1947

(Average of Regional Averages - \$1.222=100)		
<u>Location</u>	<u>Weighted Average# Hourly Wage Rates</u>	<u>Index</u>
Border States	\$1.290	105.5
Pacific	1.280	104.8
Great Lakes	1.260	103.1
Middle Atlantic	1.160	95.0
New England	1.120	91.6
United States	1.222	100.0

See Appendix III for detailed calculations.

Source: Computed from data issued by the U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, January, 1947.

The indexes (shown in Table 4 above) are based on average hourly wage rates for sample occupations weighted by the number of employees in each occupation,

and related to the average hourly wage rate for all regions, namely \$1.222.

As is apparent from Table 4 above, there exists a disparity in wage rates for similar occupations amounting, in the case of the extremes, the Border States and New England, to 14 index points or more than 15 percent. The average dispersion from the national average was 6.6 cents, for all five regions surveyed.

The Bureau has this to say about the high rates in the Border States, "The predominance of men workers in the Border region is reflected in the high over-all average earnings."* Two regions, in addition to the Border States, i.e., the Pacific and the Great Lakes regions, averaged above \$1.222, the national average. Concerning the position of the Great Lakes and the Middle Atlantic regions, the Bureau has this to say, "Entrance rates tended to be higher in the Great Lakes than in the Middle Atlantic...."*** which helps to account for the higher rates shown for the Great Lakes.

It may be noted from Table 4 above that the regional wage rate patterns for the radio industry are not consistent with historical differentials. The

* 41, p. 3

** 41, p. 4

Pacific States, in 1947, were not paying the highest average wage, while New England instead of its customary intermediate level, was responsible for the lowest average rate of all the five regions surveyed.

Ranking the regions and computing regional indexes of average wage rates constitutes only one phase of the measurement problem, namely, the over-all picture. Some idea of possible interactions responsible for the variation in regional wage rates was discussed, generally, in Chapters 2 and 3. A more specific discussion of causes of regional wage diversity in the radio industry is presented in the final chapter (5) which follows.

The second phase of the measurement problem requires a more refined analysis intended to show the detailed variation in average wage rates, within each occupation, that make up the regional averages and indexes shown in Table 4 above.

C. Occupational Wage Differentials

The measurement of interregional wage differentials was accomplished by developing wage indexes for each of the five regions. These specialized averages (indexes) have served their purpose indicating that regional wage differences for comparable work exist in the radio industry. A measure of the extent of difference is available from the indexes computed.

It now remains (phase two) to examine the data more closely to note the manner in which the elements within and between each region have combined to produce the indexes.

The development of a cross-sectional measurement of wage differentials, again is to be handled, because of the great diversity in wage rates and the varying number of workers per occupation, by index numbers.

TABLE 5: INDEXES OF AVERAGE HOURLY WAGE RATES FOR SELECTED OCCUPATIONS OF THE RADIO AND ALLIED PRODUCTS INDUSTRY BY REGIONS IN THE UNITED STATES
JANUARY, 1947

(Average of Regional Averages - \$1.222=100)

<u>Occupation</u>	<u>Border States</u>	<u>Pacific</u>	<u>Great Lakes</u>	<u>Middle Atlantic</u>	<u>New England</u>
Assemblers, Class A	111	111	124	120	99
Assemblers, Class B	96	96	89	95	74
Assemblers, Class C	74	85	83	76	66
Carpenters, Maint.	111	104	109	110	98
Electricians, Maint.	118	n.a. ^{1/}	115	108	98
Inspectors, Class A	111	128	109	112	96
Inspectors, Class B	108	96	95	95	90
Machinists, Maint.	121	129	115	118	95
Machinists, Prod.	118	121	121	122	112
Mechanic, Maint.	106	99	95	118	98
Stock Clerks	88	100	87	84	78
Testers, Class A	126	123	117	114	110
Testers, Class B	108	101	91	97	78
Testers, Class C	96	n.a. ^{1/}	82	90	77
Tool & Die Makers	132	145	137	136	122
Working Foreman (Processing)	120	115	105	110	90

^{1/} Data not available

Source: Computed from tabulations issued by the U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, January 1947, p. 16.

In order to construct indexes for individual occupations, average hourly wage rates for each job classification was related to the base rate. (The base rate used is the average of \$1.222, shown under Table 4). The results were then multiplied by 100 and shown as percentage relatives in Table 5 above.

These wage indexes, therefore, show the relationship of each occupation, by region, to the national composite of all wage rates paid in the radio industry. Table 5 further shows the pattern of wage rates for selected occupations which require varying degrees of skill and experience. Also, the table provides some idea of the variance in wage rates within a specific occupation, (within the same region). For example, the range of rates for Assemblers, Classes A, B, and C, in the Border States, amounts to 37 index points, the spread for comparable work in the Pacific amounts to 26 index points, in the Great Lakes to 41 index points, in the Middle Atlantic to 44 points, and in New England the range amounts to 33 points. These then, are the nature of the many variations in occupational rates which are summarized into regional averages and subsequently, regional indexes.

D. Summary

The Bureau of Labor Statistics collected a great mass of carefully controlled data for their general surveys of wages in the radio and allied products industry.[#] Using samples of this mass, stratified by occupations, approximate measures (indexes) of the extent of diversity in regional wage rates apparent in the radio industry (universe), were computed for our analysis.

It was noted that the patterns of regional wage differences in this industry are contrary to the historical patterns of wage differentials common to all industry.

From a detailed examination of the regional wage rate averages, it was found that a myriad of plus and minus differences in averages per occupation, per region, accounted for the variance in composite regional averages.

In earlier chapters the great diversity in wage rates and some of their causes were discussed. In this Chapter, the inter-regional variances in wage rates for comparable jobs in the radio and allied products industry specifically, have been examined. It is now planned (Chapter 5) to discuss some of the reasons responsible for the existence of differentials in this industry.

[#] Wages were surveyed by the Bureau 2 times during the decade 1940-1950 and the results published in detail.

V. Factors Influencing Wage Differentials In The Radio And Allied Products Industry

In earlier chapters the emphasis has been on the causes of wage differentials common to all industry. In this chapter, however, it is intended to examine some of the factors responsible for regional differentials as they specifically apply to the radio and allied products industry.

To avoid reiteration, those factors only partially discussed or not discussed at all will be considered, but from the standpoint of the radio and allied products industry.

A. The Factor of Minimum Entrance Rates

One of the fundamental reasons for regional wage differences, true of the radio industry in common with industry in general, is the wide divergence found in payment of minimum entrance rates. Some idea of the variation in payment or non-payment of minimum entrance rates is apparent from Table 6. Minimums tended to be considerably higher in the Great Lakes than in the Middle Atlantic States, while those in the Pacific States, in 1947, were substantially above the national average. The effect of these inconsistencies on inter-regional wage differentials is obvious.

TABLE 6: DISTRIBUTION OF ESTABLISHMENTS IN THE RADIO AND ALLIED PRODUCTS INDUSTRY BY REGIONAL MINIMUM ENTRANCE RATES FOR MALE PLANT WORKERS IN THE UNITED STATES
JANUARY, 1947

Minimum Rate (In Cents)	Number of Establishments Studied in:				
	New England	Middle Atlantic	Border States	Great Lakes	Pacific
Establishments Studied	<u>17</u>	<u>57</u>	<u>7</u>	<u>62</u>	<u>17</u>
Under 65	6	5	2	5	0
65 only	5	6	2	3	0
65.1 - 69.9	1	0	0	2	0
70 only	3	9	0	8	0
70.1 - 74.9	0	3	0	5	0
75 only	1	11	0	8	0
75.1 - 79.9	1	2	0	7	0
80 only	0	3	2	4	0
80.1 - 84.9	0	2	1	6	3
85 only	0	2	0	6	0
85.1 - 89.9	0	0	0	2	1
90 only	0	0	0	4	2
90.1 - 94.9	0	0	0	0	0
95 only	0	0	0	0	1
95.1 - 99.9	0	0	0	0	0
100 only	0	0	0	1	7
over 100	0	1	0	0	3
No Established minimum	0	13	0	1	0

Source: U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, January, 1947, Series 2, No. 62.

B. The Factor of Fringe Benefits

While adequate wages constitute a powerful incentive to performance, there exists other incentives, less tangible, but forceful, nevertheless. These supplemental benefits include paid vacations, paid holidays, bonus plans, free insurance, pension plans, etc. While it is not feasible to translate these benefits directly into cents per hour, they must still be reckoned with in analyzing regional wage differentials.

Table 7 provides an indication of the extent of inter-regional nonconformity with regard to one common type of supplemental benefit, the nonproductive bonus. #

TABLE 7: NONPRODUCTIVE BONUSES PAID MALE PLANT WORKERS IN THE RADIO AND ALLIED PRODUCTS INDUSTRY IN SELECTED REGIONS
JANUARY, 1947

Type of Bonus	Number of Establishments Studied in:			
	New England	Middle Atlantic	Great Lakes	Pacific
Establishments Studied	<u>17</u>	<u>58</u>	<u>62</u>	<u>17</u>
Attendance bonus	18	17	26	2
Christmas bonus	0	0	2	0
Profit-sharing bonus	8	16	21	1
Establishments - No bonus	9	41	36	15

Source: U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, January, 1947, Series 2, No. 62.

#, A bonus not paid as part of production incentive plans.

Payments of nonproductive bonuses were not as common in 1947 as in 1945; only a third of the establishments studied made such payments to plant workers, in 1947, compared with a half in 1945.* The proportion of establishments providing formal paid vacation plans for plant workers increased from less than four-fifths in 1945 to almost nine-tenths in 1947. In both periods 9 out of 10 such plans provided for 1 week vacation after 1 year of employment. Only 10 of the 165 establishments studied granted plant workers paid sick leave. Company participation in insurance or pension plans was reported by about half the establishments studied in both 1945 and 1947. Life and health insurance plans were most frequent, although hospital and accident insurance and retirement provisions were in effect in a number of establishments.

C. The Factor of Sex Differences

In this mass production industry, women predominate in the labor force, accounting for nearly three-fifths of all plant workers. The majority are employed in occupations requiring only short periods of training. They perform such tasks as simple assembling, soldering, wiring, etc. The median entrance rate amounted to 75

* 4, p. 5-8

cents an hour for men in January 1947, and 70 cents an hour for women. At the upper end of the wage distribution, only one woman in 4 earned \$1.00 or more.

Largely because skilled operations are typically performed by men, their over-all average earnings were about one-fourth above those of women in 1947. Even in occupations in which both men and women were employed, however, earnings tended to be higher for men, averaging 9 to 14 percent above those of women.

The effect of sex differentials on regional wage differences is considered in Table 8.

The predominance of male workers, shown in Table 8, for the Border region is reflected in the high over-all average wage rate of \$1.13 per hour. By the same token, the low number of male workers employed in New England may help to explain the low over-all average wage rate of 91 cents per hour.

TABLE 8: THE EFFECT OF SEX DIFFERENCES ON REGIONAL
AVERAGE HOURLY WAGE RATES OF PLANT WORKERS
IN THE RADIO AND ALLIED PRODUCTS INDUSTRY
IN THE UNITED STATES
JANUARY, 1947

Region	<u>Men</u>		<u>Women</u>		<u>Total</u>		<u>Ave. Hourly</u>	
	No.	%	No.	%	No.	%	<u>Men</u>	<u>Women</u>
							\$	\$
New England	3,638	41.2	5,208	58.8	8,846	100	1.06	.81
Mid. Atlantic	26,058	47.5	28,743	52.5	54,801	100	1.12	.92
Border States	1,946	64.5	1,093	35.5	3,309	100	1.24	.93
Great Lakes	20,895	38.0	32,381	62.0	53,276	100	1.14	.93
Pacific	1,009	45.5	1,196	54.5	2,205	100	1.28	.99

Source: U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, January, 1947, Series 2, No. 62.

D. The Factor of Community Size

A consideration of wage differences in various regions may be approached in two ways: by comparing the average per capita wage of all employed residents, or by comparing the wages paid in the various cities within the region for identical or closely related jobs. The former is useful for comparing the economic well-being and purchasing power of people in various communities, but it does not take into account the effect on wage levels resulting from the types of industries which happen to be located in the different communities. Wage rates in a region may consequently be relatively high not because the rates are above average paid for comparable work elsewhere but because "high-wage" industries are located in many of

TABLE 9: EFFECT OF COMMUNITY SIZE ON WAGE RATES FOR
SELECTED MALE OCCUPATIONS IN THE RADIO AND
ALLIED PRODUCTS INDUSTRY, IN SELECTED
REGIONS, IN THE UNITED STATES.
JANUARY, 1947

(BASED ON STRAIGHT-TIME AVERAGE HOURLY RATES)

Occupation	<u>New England</u>		<u>Middle Atlantic</u>		<u>Great Lakes</u>	
	<u>Communities of</u> 100,000 Or More	<u>Under</u> 100,000	<u>Communities of</u> 100,000 Or More	<u>Under</u> 100,000	<u>Communities of</u> 100,000 Or More	<u>Under</u> 100,000
Assemblers, Class B	\$1.07	\$.74	\$1.17	\$1.13	\$1.11	\$1.03
Assemblers, Class C	.81	1/	.93	.94	1.01	1.05
Carpenters, Maint.	1.34	1.01	1.34	1.30	1.34	1.28
Electricians, Maint.	1.38	.96	1.31	1.39	1.43	1.29
Inspectors, Class B	1.22	.82	1.15	1.31	1.17	1.15
Inspectors, Class C	1.10	.74	.97	1/	1.00	1.02
Machinists, Maint.	1.16	1.15	1.44	1.47	1.42	1.33
Mechanics, Maint.	1.26	1/	1.44	1/	1.38	1.04
Testers, Class B	1.06	.84	1.19	1/	1.20	1.13
Testers, Class C	1.03	.75	1.10	1.04	.97	1.05
Tool & Die Makers	1.56	1.36	1.67	1.67	1.69	1.64
Working Formen	1.26	.89	1.35	1.19	1.28	1.29

1/ Insufficient number of workers to justify presentation of an average.

Source: U. S. Dept. of Labor, Bureau of Labor Statistics,
Wage Structure, Radios, January, 1947, Series 2,
 No. 62.

the larger communities of that region.*

Table 9, attempts to isolate the effect of community size on regional wage differentials.

While for industry in general, wages for similar jobs tend to be higher in larger cities than in smaller cities, no consistent pattern of gradation related to the size of the city exists. In a particular community the wages for some industries may be high in comparison to those in the same kind of plants located elsewhere, but the wages paid by other of that cities industries may be comparatively low. Other factors such as the extent of unionization, the prosperity and efficiency of management, the productivity of labor, labor market conditions, traditional regional differences and fortuitous circumstances may have more influence than mere size of city. Moreover, the location as well as the size of the city is an important factor. Wages in a small community which is contiguous to a metropolitan center reflect the wage and living standards prevailing in that area and for that reason are higher than the wages in a larger city located in a predominately larger area.**

While higher wage rate patterns for industry in general may not consistently favor larger cities, the high

* 3, p. 214-216

** 44, p. 599-604

wage pattern in the radio industry falls just short of 100% consistency. From Table 8, 95% of the comparisons in this industry between larger and smaller cities favor the former.

Five-sixths of the workers in the industry were located, during 1947, in wage areas with central cities of 100,000 or more population.* Their average wage levels were generally about 7 percent above those of workers in communities with fewer inhabitants. In New England, the wage rates for larger cities ran even higher, averaging approximately 16 percent above the averages for smaller sized communities.

E. The Factor of Company Size

The outstanding advantage of large scale production lies in the possibilities of specialization. As the scale of output is increased, the methods of production can be improved by introducing more and more mechanical equipment. With the installation of specialized equipment, the larger volume of output, (all other things being equal), tends to decrease unit costs.** Efficiency in production does not, however, vary directly with size, for eventually a point of diminishing returns is reached and unit costs begin to rise again. In any case, here we are

* 41, p. 4

** 13, p. 202

not so much concerned with the effect of company size on the point of diminishing returns as we are with the effect of company size on regional wage differentials. Our immediate objective is approached through an analysis of the data assembled in Table 10.

Because of the cumbersome nature of the data, the analysis of average hourly wage rates in large and small establishments is accomplished through the experiences of only one region, the Great Lakes. This region was selected to represent the others because of its median position in the array of regional wage averages.

TABLE 10: EFFECT OF COMPANY SIZE ON WAGE RATES FOR
SELECTED MALE OCCUPATIONS IN THE RADIO AND ALLIED
INDUSTRY IN THE GREAT LAKES REGION
JANUARY, 1947

(BASED ON STRAIGHT-TIME AVERAGE HOURLY WAGE RATES)

Occupation	501 or More Workers		Establishments With: 101 - 500 Workers		8 - 100 Workers	
	No. of Workers	Average Hourly Rates	No. of Workers	Average Hourly Rates	No. of Workers	Average Hourly Rates
Assemblers, Class B	684	\$1.09	34	\$1.19	8	\$ 1/
Assemblers, Class C	497	1.00	531	1.05	42	.89
Carpenters, Maint.	57	1.32	25	1.36	2	1/
Electricians, Maint.	158	1.42	20	1.29	1	1/
Inspectors, Class B	771	1.16	70	1.24	13	1.00
Inspectors, Class C	173	.99	78	1.06	8	1/
Machinists, Maint.	159	1.41	22	1.37	4	1/
Testers, Class B	401	1.17	9	1/	6	1/
Testers, Class C	167	1.01	45	.96	26	1.00
Tool & Die Makers	458	1.70	117	1.62	20	1.59

1/ Insufficient number of workers to justify presentation of an average.

Source: U. S. Dept. of Labor, Bureau of Labor Statistics,
Wage Structure, Radios, January, 1947, Series 2,
 No. 62.

It is estimated that the large plants in the industry employed at least three-fourths of the labor force both nationally and in all regions except the Pacific during 1947* Wage rates in these larger establishments, based on the data assembled in Table 10, were above those in smaller plants in approximately 60% of the occupations sampled. This percentage in favor of larger plants held nationally with the exception of the Middle Atlantic region. Here, the national trend was reversed, for the highest wage rates, during 1947, were frequently found in establishments employing fewer than 100 workers and in those employing 101 to 500 workers.

F. The Factor of the Mode of Payment

There are almost as many variations in wage payment plans as there are industrial plants themselves. The two major plans are the incentive plan and the time plan. The purpose of the incentive method of wage payment is to compensate workers in accordance with their output measured in terms of individual or group performance. In time plans, however, wages are not directly related to production either individually or group-wise.

* 41, p. 4

**TABLE 11: EFFECT OF MODE OF PAYMENT ON WAGE RATES
FOR SELECTED MALE OCCUPATIONS IN THE RADIO
AND ALLIED PRODUCTS INDUSTRY
IN THE MIDDLE ATLANTIC REGION
JANUARY, 1947**

(BASED ON STRAIGHT-TIME AVERAGE HOURLY WAGE RATES)

Occupation ^{1/}	Time Workers		Incentive Workers ^{2/}	
	Number of Workers	Average Hourly Rates	Number of Workers	Average Hourly Rates
Assemblers, Class B	189	\$1.15	250	\$1.17
Assemblers, Class C	2316	.93	409	.95
Inspectors, Class C	346	.96	10	1.12
Platers	71	1.24	49	1.15
Platers' Helpers	67	.95	54	1.25
Solderers	30	.98	41	1.01
Welders, Class B	22	.90	32	1.38
Winders, Coil	21	1.00	30	1.06

^{1/} Data for all occupations not available.

^{2/} Only establishments paying at least one-fourth of their plant workers under piece rate or production bonus systems.

Source: U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, January, 1947, Series 2, No. 62.

Table 11 has been assembled to help determine the part played by the mode of payment in influencing wage differentials. Slightly over one-fifth of the workers in the radio industry were working under incentive systems of wage payments during 1947, and these workers constituted 25 percent or more of the plant labor force in about a fifth of the plants. More than three-fourths of the incentive workers in the industry were women. In those somewhat limited occupations in which both time

and incentive systems were common and thus could be compared, wage levels for incentive workers on a nation-wide basis ranged from 5 to 11 percent above those of time workers in the same job. However, perfect consistency was not attained, for the relationship between incentive and time workers varied widely among the regions. In a few occupations in each region, time rates exceeded wage rates of incentive workers, reversing the national trend.

Table 11 strongly bears out the national picture, for incentive wage rates exceed time rates in approximately 87 percent of the comparisons, with incentive rates ranging from 6 to 10 percent above time wage rates.

G. The Factor of Unionization

In general, wages in organized plants are anywhere from 10 to 30 percent higher than in unorganized plants engaged in similar lines of work.* The higher wages prevailing in unionized plants, however, may be due as much to size and location of the plants as to the fact of unionization. In some industries wages may be higher in smaller-sized plants than in larger plants, regardless of unionization, because jobs are less mechanized and therefore require a higher and more varied degree of manual skill. In areas or industries in the process of

* 3, p. 297

being unionized, the nonunion plants may pay higher wages than are paid in union jobs in an effort to forestall unionization. The national ratio of union workers to non-union workers was, in 1947, approximately 4 to 1. Just how successful the economic power of collective action was, may be noted from Table 12.

For purposes of this analysis, establishments have been classified as unionized if more than half of their workers were employed under terms of union agreements. All workers in the unionized establishments, whether or not they were members of a union or worked under a union agreement, are included in the data on wage rates in union plants.

New England was selected, in Table 12, to represent all regions for the purpose of analyzing union and nonunion wage data and their effect on regional wage differentials. From Table 12, it may be noted that wage rates for two-thirds of the occupations compared, were higher for the unionized establishments. The amount of the difference is appreciable with union wage rates in New England averaging 8.5 percent above wage rates of nonunion establishments.

The advantage in wage rates for unionized radio workers in New England was consistent with the national pattern in which union wage rates for the industry

TABLE 12: EFFECT OF UNIONIZATION ON WAGE RATES
FOR SELECTED MALE OCCUPATIONS IN THE RADIO AND
ALLIED PRODUCTS INDUSTRY
IN NEW ENGLAND REGION
JANUARY, 1947

(BASED ON STRAIGHT-TIME AVERAGE HOURLY WAGE RATES)

<u>Occupation</u> ^{1/}	<u>Union</u>		<u>Nonunion</u>	
	<u>Establishments</u>	<u>Average</u>	<u>Establishments</u>	<u>Average</u>
	<u>Number</u>	<u>Hourly</u>	<u>Number</u>	<u>Hourly</u>
	<u>of</u>	<u>Rates</u>	<u>of</u>	<u>Rates</u>
	<u>Workers</u>		<u>Workers</u>	
Assembler, Class B	112	\$1.09	150	\$.77
Assembler, Class C	16	.96	77	.78
Carpenters, Maint.	28	1.17	15	1.27
Electricians, Maint.	24	1.17	11	1.26
Inspectors, Class B	24	1.11	10	1.09
Inspectors, Class C	31	.96	15	.99
Machinists, Maint.	22	1.11	14	1.23
Stock Clerks	85	.97	16	.88
Testers, Class B	28	1.03	44	.94
Tool & Die Makers	81	1.60	65	1.49
Winders, Coil	13	.91	11	.79
Janitors	81	.87	35	.80

^{1/} Data for all occupations not available.

Source: U. S. Dept. of Labor, Bureau of Labor Statistics,
Wage Structure, Radios, January, 1947, Series 2,
 No. 62

amounted to an average of 8 percent more than nonunion wage rates

H. Summary and Conclusions

(1) Based on the evidence presented in this study it is contended that regional wage differentials do exist to an appreciable extent in the radio industry and exist generally for the same reasons applicable to all industries. During 1947, a difference of 15 percent was evident between the highest wage paying region, the Border States, and the lowest paying region, New England. The average variation of all five regions from the national average hourly wage rate of \$1.222, was 6.6 cents.

(2) While there is ample evidence to prove that wage rates for comparable jobs in the radio industry differ widely among the regions, the pattern of differences in this industry is contrary to the historic pattern. The highest wage area during 1947 was not the Far-West, but the Border States. The lowest wage rate area was not the South but New England.

(3) Wage rates for unskilled labor in the radio and allied products industry vary more widely than do the wage rates of skilled workers. For

example, the Class A Assembler, a relatively unskilled worker, was paid an average of 25 percent more per hour in the Great Lakes region than in New England. On the other hand, average hourly wage rate differences for the Production Machinist, a relatively skilled worker, for all 5 regions in 1947 was only 9 percent.

(4) Women, who constitute the bulk of the labor force of the industry, are paid lower wage rates than male plant workers who are normally more skilled workers. The average wage rate for regions employing the greatest number of women workers consequently are depressed. The median entrance rates for women, during 1947, amounted to 70 cents per hour and 75 cents per hour for men.

(5) While, for purposes of this study, the various factors influencing regional wage differentials have been considered as quasi - independent, it became increasingly evident as the study progressed that wage differentials represent the summation (plus and minus factors considered) of a great number of dynamic interlocking cause and effect relationships.

(6) The absence of minimum entrance rates and

the variations which exist where minimum rates are established, are some of the fundamental causes of regional wage diversity in the radio and allied products industry. In the lowest wage paying region, New England, 6 of the 17 establishments surveyed by the Bureau of Labor Statistics maintained minimum entrance wage rates below 65 cents per hour. In the highest wage paying region, the Border States, only 2 establishments out of 7 studied maintained minimum entrance rates below 65 cents per hour.

(7) The presence or absence of fringe-benefit payments and the great variety of benefits, are also basic factors responsible for regional wage differentials in the radio and allied products industry.

(8) Community size is another factor responsible for wage differentials in the radio and allied products industry. Average wage levels for workers located in cities of 100,000 or more during 1947, was about 7 percent above those of workers in communities with fewer inhabitants.

(9) The size of radio manufacturing establishments appears to have a definite effect on wage differentials in the radio and allied products industry. The larger companies employing 501 or more workers payed higher wages than small companies, during

1947, in 60 percent of the occupations sampled.

(10) The mode of payment has definitely contributed to the continued existence of regional wage differentials in the radio and allied products industry. Workers, during 1947, were paid wage rates under incentive system 5 to 11 percent higher than under the time system.

(11) Labor unions forced wage rates up in union establishments an average of 8 percent in 1947 over nonunion wage rates for the same occupation in the radio and allied products industry, still another cause of regional wage differences in this industry.

(12) While economists agree that regional differentials do exist, seldom do they agree on the specific factor or factors responsible in any given situation.

(13) Regional wage differentials have persisted in American economy in the past, exist today, and apparently are going to continue to exist indefinitely. To select any one reason for their perenniality in the radio and allied products industry, especially after this study would be foolhardy. In any case, the New England Chamber of Commerce might consider publicizing the relatively low wage rates paid in the local radio and allied products industry and thus help attract additional investment capital into the region.

APPENDIX I

I. Statistical Analysis of Data

A. Frequency Distributions

Before it may be stated, unequivocally, that regional wage differentials do exist in the radio industry, some practical means must first be found of comparing the rates for each region. Obviously it would be a Herculean task to attempt to measure the many thousands of individual differences in the wage rate data provided by the Bureau of Labor. Some form of condensed measure or measures for comparing the rates of the five regions must be employed. Also, some method determining the "goodness" of the condensed measures, must be employed.

Therefore, in an attempt to describe and compare the "total" wage distributions for each region, the mass of data has been condensed into frequency distribution tables. Table 1 classifies the data for the regions into wage rate intervals of 5 cents and shows the number of workers, in absolute terms, at each wage level.

It may be observed, empirically, from Table 1, that the wage rate distributions for all regions follow an approximately similar pattern. The greatest numbers of workers are clustered roughly mid-way in each of the five series, between the 80 cent and \$1.15 cent rates, with the wage levels above \$1.15 somewhat more heavily represented than those rates below 80 cents.

However, a more significant comparison can be made if the absolute data of Table 1 are translated into relative terms.*

From Table 2, in percentages, it may be noted even more clearly that all five series pivot around the same general area, approximately between the 75 cent and the \$1.10 cent rates. Furthermore, all five regions show signs of skewness, positive in nature, of varying degrees.

This then, is a condensed picture of the total data provided by the Bureau, which includes 87 occupations and more than 122,000 workers.

Since it is planned to base the results of this analysis on a comparison of sample data, it behooves us to employ, as in the case of the parent distributions, a condensed form of measurement for the sample distributions. But before the differences in wage rates between the regions can be analyzed and described there exists a primary consideration. Are the sample distributions truly representative of the regional wage rates in the radio industry? If they are not representative, any further analysis of regional wage differences would be meaningless.

Our first task, begun in Tables 3 and 4 is to determine how closely the sample distributions resemble the

* 9, p. 182

parent distribution.

A more detailed discussion of sample attributes, including the reliability of the selected sample, follows in Appendix II, Page 96.

TABLE 1: DISTRIBUTION OF WORKERS IN THE RADIO AND ALLIED PRODUCTS INDUSTRY BY REGIONAL WAGE RATE INTERVALS IN THE UNITED STATES
JANUARY, 1947

Wage Rate Intervals (In Cents Per Hour)	Number of Workers				
	New England	Middle Atlantic	Border States	Great Lakes	Pacific
50.0 - 54.9	44	164	0	1/	0
55.0 - 59.9	97	110	9	1/	0
60.0 - 64.9	159	767	60	53	0
65.0 - 69.9	840	548	69	319	0
70.0 - 74.9	1120	2080	45	478	11
75.0 - 79.9	1270	2404	61	2342	17
80.0 - 84.9	920	3670	282	4150	45
85.0 - 89.9	620	6028	114	7190	118
90.0 - 94.9	750	8725	273	6804	116
95.0 - 99.9	557	4826	184	7724	314
100.0 -104.9	440	5825	242	6062	551
105.0 -109.9	361	3790	152	4896	236
110.0 -114.9	313	3340	179	2189	111
115.0 -119.9	168	2190	194	2903	143
120.0 -124.9	247	1970	103	1490	66
125.0 -129.9	141	2080	185	1490	95
130.0 -134.9	79	1205	124	790	48
135.0 -139.9	159	1205	127	790	39
140.0 -144.9	132	1040	136	1011	37
145.0 -149.9	26	658	106	692	35
150.0 -154.9	89	437	103	373	31
155.0 -159.9	71	382	61	319	26
160.0 -164.9	210	1260	203	968	154
Total	8813	54704	3012	53033	2293

1/ Less than .05 of 1 percent

Source: U. S. Dept. of Labor, Bureau of Labor Statistics,
Wage Structure, Radios, January, 1947

TABLE 2: PERCENTAGE DISTRIBUTION OF WORKERS IN THE RADIO AND ALLIED PRODUCTS INDUSTRY BY REGIONAL WAGE-RATE INTERVALS IN THE UNITED STATES
JANUARY, 1947

Wage Rate Intervals (In Cents Per Hour)	New England	Middle Atlantic	Border States	Great Lakes	Pacific
50.0 - 54.9	0.5	0.3	0	1/	0
55.0 - 59.9	1.1	0.2	0.3	1/	0
60.0 - 64.9	1.8	1.4	2.0	0.1	0
65.0 - 69.9	9.5	1.0	2.3	0.6	0
70.0 - 74.9	12.7	3.8	1.5	0.9	0.5
75.0 - 79.9	14.4	4.4	2.1	4.4	0.8
80.0 - 84.9	10.4	6.7	9.4	7.8	2.0
85.0 - 89.9	6.9	11.0	3.8	13.5	5.4
90.0 - 94.9	8.5	15.3	9.0	12.8	5.3
95.0 - 99.9	6.5	8.8	6.1	14.5	14.4
100.0 - 104.9	5.0	10.8	8.0	11.4	25.1
105.0 - 109.9	4.1	6.9	5.0	9.2	10.7
110.0 - 114.9	3.6	6.1	5.9	4.3	5.0
115.0 - 119.9	1.9	4.0	6.4	5.6	6.5
120.0 - 124.9	2.8	3.6	3.6	2.8	3.1
125.0 - 129.9	1.6	3.8	6.1	2.8	4.3
130.0 - 134.9	.9	2.2	4.1	1.5	2.2
135.0 - 139.9	1.8	2.2	4.2	1.5	1.8
140.0 - 144.9	1.5	1.9	4.5	1.9	1.7
145.0 - 149.9	0.3	1.2	3.5	1.3	1.6
150.0 - 154.9	1.0	0.8	3.4	0.7	1.4
155.0 - 159.9	0.8	0.7	2.1	0.6	1.2
160.0 - 164.9	2.4	2.3	6.7	1.8	7.0
Total	100.0	100.0	100.0	100.0	100.0

1/ Less than .05 of 1 percent

Source: Derived from Table 1.

Table 3 provides a breakdown of workers for purposes of absolute comparison, sampled by wage rate and by region. These distributions represent basic working data for this portion of the study and are hereafter referred to as the "sample distributions."

Again, for more significant analysis, the relative form of presentation has been applied in Table 4. Here, derived from the absolute data of Table 3, the workers are classified by wage rate intervals within each region, on a percentage basis.

A cursory examination of the data in Tables 3 and 4 and those of Table 1 and 2, highlights the similarities which exist between the parent and the sample series. Clustering, similar to that found in the parent series, occurs in the sample distributions, although somewhat higher up in the wage rate levels. Additional similarity is noticeable in the coexistence of lack of symmetry in sample and parent distributions. An area of slight dissimilarity in the lower wage rate levels of parent and sample distributions, is noted. Apparently, the occupations selected are not as well represented in the sample lower wage rate levels as they exist in the parent distribution. While this disparity is recognized, it is not considered serious or potentially detrimental to valid results.

TABLE 3: DISTRIBUTION OF REGIONAL AVERAGE WAGE RATES FOR SELECTED OCCUPATIONS^{1/} IN THE RADIO AND ALLIED PRODUCTS INDUSTRY IN THE UNITED STATES JANUARY, 1947

Wage Rate Intervals (In Cents Per Hour)	New England	Middle Atlantic	Border States	Great Lakes	Pacific
50.0 - 54.9	3	0	1	0	0
55.0 - 59.9	0	72	4	0	2
60.0 - 64.9	6	40	8	68	6
65.0 - 69.9	13	0	0	75	2
70.0 - 74.9	0	154	22	0	13
75.0 - 79.9	8	194	0	136	0
80.0 - 84.9	63	215	22	0	22
85.0 - 89.9	0	0	0	170	0
90.0 - 94.9	401	2050	51	0	13
95.0 - 99.9	73	0	0	0	0
100.0 - 104.9	90	352	0	1119	172
105.0 - 109.9	0	0	73	1346	0
110.0 - 114.9	126	745	24	0	0
115.0 - 119.9	99	907	88	524	45
120.0 - 124.9	168	0	0	0	52
125.0 - 129.9	0	0	0	1390	8
130.0 - 134.9	0	1040	26	84	0
135.0 - 139.9	161	16	192	0	69
140.0 - 144.9	0	403	16	1123	60
145.0 - 149.9	0	326	114	144	27
150.0 - 154.9	0	0	63	37	61
155.0 - 159.9	146	26	0	0	29
160.0 - 164.9	0	647	59	595	62
Total	1357	7187	763	6811	643

^{1/} See Appendix III for list of occupations.

Source: U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, January, 1947.

TABLE 4: PERCENTAGE DISTRIBUTION OF REGIONAL AVERAGE WAGE RATES FOR SELECTED OCCUPATIONS IN THE RADIO AND ALLIED PRODUCTS INDUSTRY IN THE UNITED STATES
JANUARY, 1947

<u>Wage Rate Intervals</u> <u>(In Cents Per Hour)</u>	<u>New</u> <u>England</u>	<u>Middle</u> <u>Atlantic</u>	<u>Border</u> <u>States</u>	<u>Great</u> <u>Lakes</u>	<u>Pacific</u>
50.0 - 54.9	0.2	0	0.1	0	0
55.0 - 59.9	0	1.0	0.5	0	0.3
60.0 - 64.9	0.4	0.5	1.0	1.0	0.9
65.0 - 69.9	1.0	0	0	1.1	0.3
70.0 - 74.9	0	2.0	3.0	0	2.0
75.0 - 79.9	0.6	2.5	0	2.0	0
80.0 - 84.9	4.6	3.0	3.0	0	3.4
85.0 - 89.9	0	0	0	2.5	0
90.0 - 94.9	22.1	29.1	6.6	0	2.0
95.0 - 99.9	12.8	0	0	0	0
100.0 - 104.9	6.5	4.9	0	16.4	26.9
105.0 - 109.9	0	0	9.6	19.8	0
110.0 - 114.9	9.3	10.4	3.2	0	0
115.0 - 119.9	7.3	12.5	11.5	7.7	7.0
120.0 - 124.9	12.4	0	0	0	8.1
125.0 - 129.9	0	0	0	20.4	1.2
130.0 - 134.9	0	14.5	3.4	1.2	0
135.0 - 139.9	11.9	0.2	25.1	0	10.7
140.0 - 144.9	0	5.6	2.1	16.5	9.3
145.0 - 149.9	0	4.5	15.0	2.1	4.2
150.0 - 154.9	0	0	8.2	0.5	9.5
155.0 - 159.9	10.9	0.3	0	0	4.5
160.0 - 164.9	0	9.0	7.7	8.8	9.7
Total	100.0	100.0	100.0	100.0	100.0

Source: Derived from Table 3.

In order to permit, at a glance, a quick grasp of the extent to which the sample distribution conform to the parent distributions the relationships are presented graphically (at the end of the Appendix) in Charts 1 through 5. The smoothed curve was used to represent the series in view of the continuous nature of the data. Although the data readily lends itself to the use of Ogives (based on cumulative frequencies) it is felt that no apparent purpose would be served here to know that, for example "X" percentage of wage rates in a specific distribution was less than, or more than, a given magnitude.

B. Measures of Central Tendency

Although tabular and graphic evidence support the contention that the sample and parent distributions are relatively similar in character, nevertheless, the evidence is only general in nature.

The frequency distribution tables have been invaluable aids in the comparison and description of the series, by organizing the data into a condensed series. Nevertheless, the task of comparing the integral characteristics of the distributions still remains unwieldy.

Therefore we shift from tabular and graphic bases of comparison to a still more condensed tool or tools, computed measures or averages. The purpose of these measures is to uncover salient characteristics of massed data in

order to facilitate comparison within or between masses.*

Since there are several different kinds of averages, each one of them with certain characteristics, certain advantages, certain disadvantages, the question as to selection arises. However, before any selection is possible, the averages must first be computed. Table 5 lists three different measures of central tendencies to help in the determination of a single characteristic value for each distribution to be used in this study.

**TABLE 5: AVERAGES OF REGIONAL WAGE DISTRIBUTION
FOR WORKERS IN THE RADIO AND ALLIED PRODUCTS
INDUSTRY IN THE UNITED STATES
JANUARY, 1947**

(In Cents Per Hour)

Region	<u>MEAN</u>		<u>MEDIAN</u>		<u>MODE</u>	
	Total-Sample	Sample	Total-Sample	Sample	Total-Sample	Sample
New England	91.0	96.2	88.2	92.5	77.8	89.4
Middle Atlantic	102.4	106.3	98.1	101.2	95.2	96.7
Border States	113.0	119.9	110.4	112.4	93.6	104.2
Great Lakes	101.0	105.2	99.6	99.3	97.2	99.3
Pacific	112.0	117.0	106.8	111.4	104.9	107.3

Source: Computed from Tables 2 and 4.

The mean for reasons described, has been selected for further utilization in this study. From Table 5 it may be noted that the means, considering both the total and sample distribution, seem to be relatively more stable than either the median or mode; secondly, since the mean is a

* 10, p. 134

computed average it can be used, in preference to either the median or mode, in further computational analysis;# and thirdly, the data provided by the Bureau is already measured in terms of the mean.

It is readily apparent, from Table 5, that the three measures, intended to represent and compare the distributions vary in value. The means appear to be consistently greater in magnitude than the medians, which in turn appear larger than the modes, in both the parent and the sample distributions. This divergency between averages stems from the asymmetrical character of the series and bears out the tabular and graphic evidence already presented. The "pulling effect" of the workers in the higher wage rate strata has apparently swung the value of the mean in the direction of the skewness. The median, basically a positive average, less responsive to magnitude of numbers and responsive only to number of items added, is less affected (i.e., pulled to the right) than the mean. The mode, also basically a position average, is responsive to neither magnitude nor to the number of items added, remains unaffected by the skewness.

The median and mode of 2 series cannot be combined since they are basically position averages and in case of combination a new mean or mode would have to be determined.

C. Dispersion, Skewness and Kurtosis of Data

In order to reduce the mass of data to manageable proportion, a single value has been selected to describe each of the distributions. While an average serves to condense the body of data, it does not by itself give a completely adequate description of the data. In fact, it has been stated, facetiously, that an average is a device used to conceal the dispersion of the data.* Although an average may be a typical magnitude of a distribution, individual items in the distribution may be far removed from that average. Our means therefore, since they do not indicate the spread of the data need to be supplemented by measures of variation for each distribution. To determine the extent of this variation, two and perhaps three additional statistical constants are needed. Of primary importance is a measure of dispersion which will indicate the distribution of the wage rates around the average. Also needed is a measure of symmetry in order to indicate whether or not an equal number of workers is represented by the wage rates on either side of the average wage rate for each distribution. Finally, to adequately round out the description of the several distributions,

* 12, p. 310

some mention of Kurtosis, the peakedness of the distributions, should be made.

Just as there are several different kinds of averages, similarly there exists several types of measures of scatter. The selection of a specific type depends on the characteristics of the data to be measured and the objective to be attained. Three measures of dispersion, the Range, the Quartiles, and Average Deviation, have been by-passed for several reasons, in favor of the Standard Deviation. To supplement this absolute measure of dispersion, its relative counterpart, the Coefficient of Standard Deviation is also employed.

Turning to a measure of symmetry for the distributions, our task is lighter for we have already computed the mean, the mode, and the median. The Pearsonian Coefficient of skewness, based upon these three averages, together with absolute and relative measures of dispersion are shown in Table 6.

The Pearsonian Coefficient of skewness is based on the fact that skewness in a perfectly symmetrical distribution will be zero, that is, the mean, the median, and the mode will be the same.

TABLE 6: MEASURES OF VARIATION IN REGIONAL WAGE RATES FOR WORKERS IN THE RADIO AND ALLIED PRODUCTS INDUSTRY IN THE UNITED STATES
JANUARY, 1947

Region	Standard Deviation ^{1/}		Coefficient of Relative Var. ^{2/}		Skewness ^{3/}	
	Total-Sample	Sample	Total-Sample	Sample	Total-Sample	Sample
New England	11.4	12.1	12.5	12.7	.26	.34
Middle Atlantic	11.8	13.8	11.6	13.0	.39	.58
Border States	9.3	14.1	8.2	11.9	.38	.44
Great Lakes	12.4	15.4	12.3	14.7	.48	.70
Pacific	11.3	13.0	10.1	11.4	.19	.29

^{1/} In cents per hour.

^{2/} In percentages.

^{3/} Coefficient of skewness - Pearsonian.

Source: Computed from Tables 2 and 4.

The absolute deviations of wage rates around the regional averages are reasonably consistent for both the parent and sample data, (columns 1 and 2). An average dispersion (Standard Deviation) of 9.3 to 15.4 cents is noted, equal to an average standard deviation within the universe data of 11 cents, and within the sample data of 14 cents.

More significant than the tight spread noted in the absolute measures of variation is the consistency apparent in the measure of relative variation shown, for both distributions in Table 6, under the caption of "Coefficient of Relative Var."

A relative measure of variation has been introduced into the analysis because of the disturbing influence

encountered in comparing the computed measures of absolute variation in two or more series, is the presence of averages of different sizes.* To remove these disturbing influences, each measure of absolute variation (standard deviation) has been divided by its respective mean. The resultant coefficient is the relative measure of variation shown in Table 6.

The Coefficient of Relative Variation was selected in preference to several other measures of relative variation because (1) it can be logically used only when two or more distributions for the same variate are compared; it is based on the arithmetic mean, which has already been computed for the above distributions in Table 5.**

The third descriptive measure of variation of the paired distributions is skewness, shown in Table 6. The range of variation in the coefficient of symmetry is apparently greater than any of the measures of the variations shown in the table. The degree of skewness varies from .19, slight skewness (Total-Pacific region) to .39, moderate (Total-Middle Atlantic region) to .70, marked skewness (sample distribution-Great Lakes region). This spread in the degree of skewness may be due to the

*10, p. 212

**7, p. 171-172

sampling method used; the selection of strata or occupations in place of other sampling techniques less practical for this study.

Both the sample and the parent distributions are consistently skewed in a positive direction, with the degree and range of skewness consistently greater in the sample distributions. This factor tends to tie in with the conditions noted earlier to the effect that the sample distributions are somewhat weakly represented in the lower wage rate levels as compared with their parent distributions. The tendency for the sample distributions, therefore, to "pull" somewhat more to the right than the parent distributions, results in higher coefficients of skewness. The nature of difference is relatively slight in nature and should not affect the reliability and validity of the survey results.

To round out the description and comparison of the variation present in the paired distributions, the element of Kurtosis is introduced. Kurtosis refers to the degree of flatness or peakedness of a frequency distribution in the region about the mode.* Computed measures of Kurtosis were not employed here for (1) they are strictly applicable to only one of the three types of averages used, namely, the mode; (2) the degree of Kurtosis, a

* 10, p. 219

broad measure, can be approximated graphically from Charts 1 through 5.

The degree of kurtosis of a distribution is measured relative to the peakedness of a normal curve. From the standpoint of kurtosis the normal curve is mesokurtic - of intermediate peakedness, flat-topped curves are called platykurtic while pronouncedly peaked curves are called leptokurtic. Hence, referring to Charts 1 through 5, the sample distribution appears leptokurtic (1), while the parent distribution appears mesokurtic, in Chart 2, both distributions appear platykurtic, in Chart 3, both distributions again are platykurtic, in Chart 4, both distributions are again platykurtic, while in Chart 5, both distributions are decidedly leptokurtic. Summing up this fourth element of variation, it may be stated that generally the degree of peakedness found in the parent distribution is repeated in the sample distribution.

Several types of measures have been computed up to this point (1) as a means of condensing the description and comparison of the distributions into a single mathematical term; and (2) as a means of determining whether or not the sample distributions are truly representative. In addition, the measures themselves have undergone evaluation to determine their applicability and efficacy.

However, these computed measures are all based on one very important underlying assumption that the wage rate distributions approximate the normal curve.[#] These measures are valid only to the extent that the basic assumption is met.

An effort has already been made to determine how closely the data do approximate the normal curve by graphic portrayal (Charts 1 through 5) of frequency distribution Tables 2 and 4. On this cursory basis it appears that the paired distributions, in every instance, do approximate the normal curve.

Rather than rely on observation alone however, the wage rate data have been subjected to a more objective test. The normality of each series has been analyzed in terms of its standard deviation, (see Table 7).

This ubiquitous statistical tool, standard deviation, has already been employed (1) as a means of comparing the variation coexistent in parent and sample distributions; and (2) to gauge the representativeness of the means of the several distributions by computing the coefficient of relative variation; (based on the standard deviation). Now, once again, it is planned to use the measure to determine the nature and extent of normality

[#] The normal curve of error is a mathematical ideal seldom realized in practice.

of the series.

In a normal curve, an exact percentage of items falls within the ranges established by the standard deviation in conjunction with the mean. Thus, in a normal distribution 68.27% of the items in the distribution fall between the range of arithmetic mean plus 1 standard deviation; 95.45% within the range of the mean plus 2 standard deviations and 99.73% between the mean and 3 standard deviations.*

From Table 7, it appears in a great majority of instances, that the test has been successfully met. In only 6 instances out of 30 has the extent of scatter failed to fit the bench marks of normality. However, in most of these 6 instances the percentage of items fall just short of the criteria established.

Therefore, the basic assumption of the normality of the data has been met and the descriptive measures are therefore tenable.

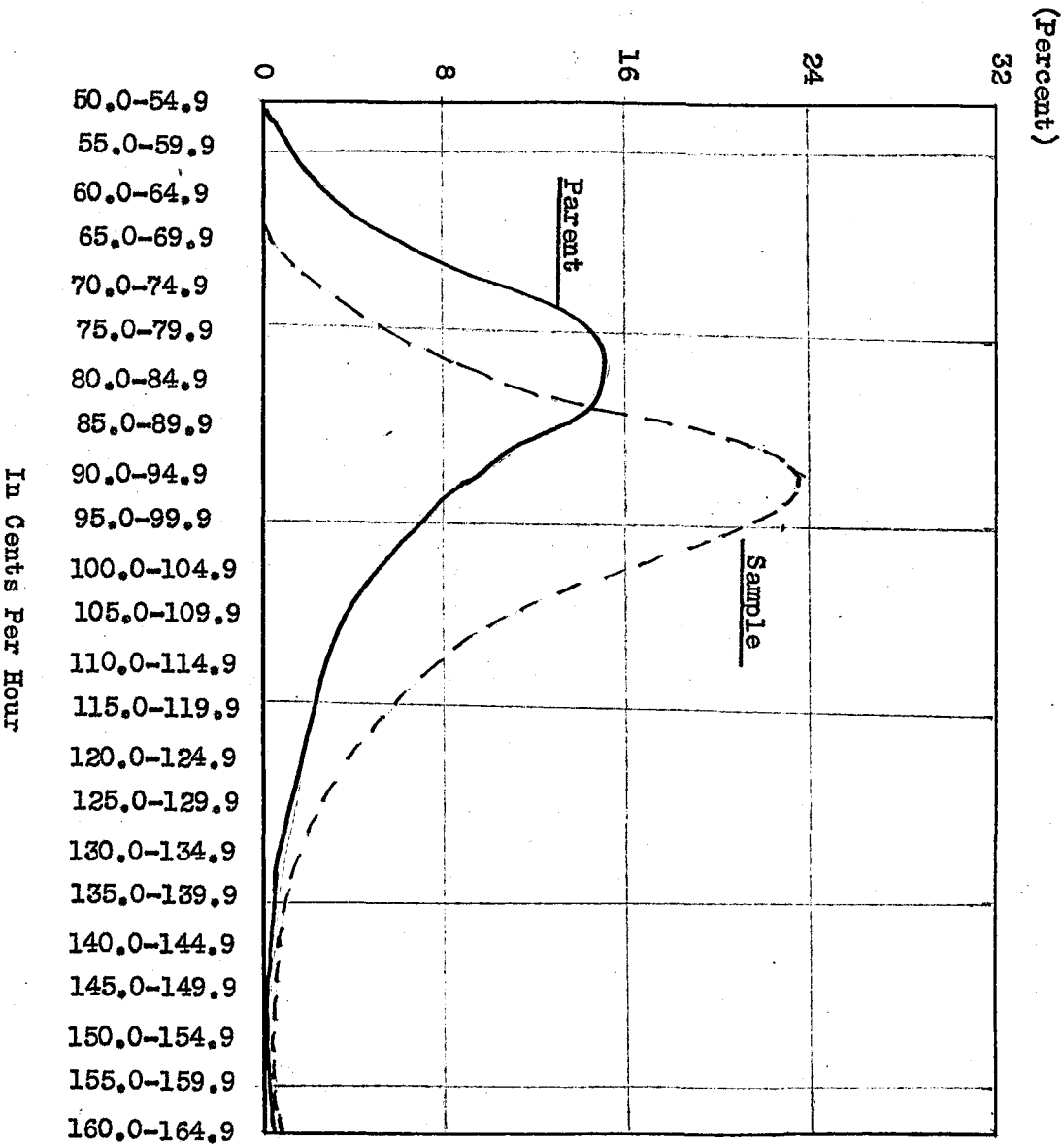
* 11, p. 103-112

TABLE 7: NORMALITY OF REGIONAL WAGE RATE
DISTRIBUTIONS IN THE RADIO AND ALLIED PRODUCTS
INDUSTRY IN THE UNITED STATES
JANUARY, 1947

<u>Region</u>	<u>Percent of Workers Included in:</u>					
	<u>1 Standard</u>		<u>2 Standard</u>		<u>3 Standard</u>	
	<u>Deviation</u>	<u>Deviation</u>	<u>Deviations</u>	<u>Deviations</u>	<u>Deviations</u>	<u>Deviations</u>
	<u>Parent-Sample</u>	<u>Parent-Sample</u>	<u>Parent-Sample</u>	<u>Parent-Sample</u>	<u>Parent-Sample</u>	<u>Parent-Sample</u>
Border States	66.7	67.0	96.7	95.7	99.6	98.5
Pacific	76.6	76.3	91.4	99.0	98.9	99.4
Great Lakes	79.4	67.5	95.9	85.7	99.0	98.2
Middle Atlantic	73.8	70.5	95.7	95.8	99.4	99.6
New England	68.5	64.8	92.3	89.0	98.7	97.9

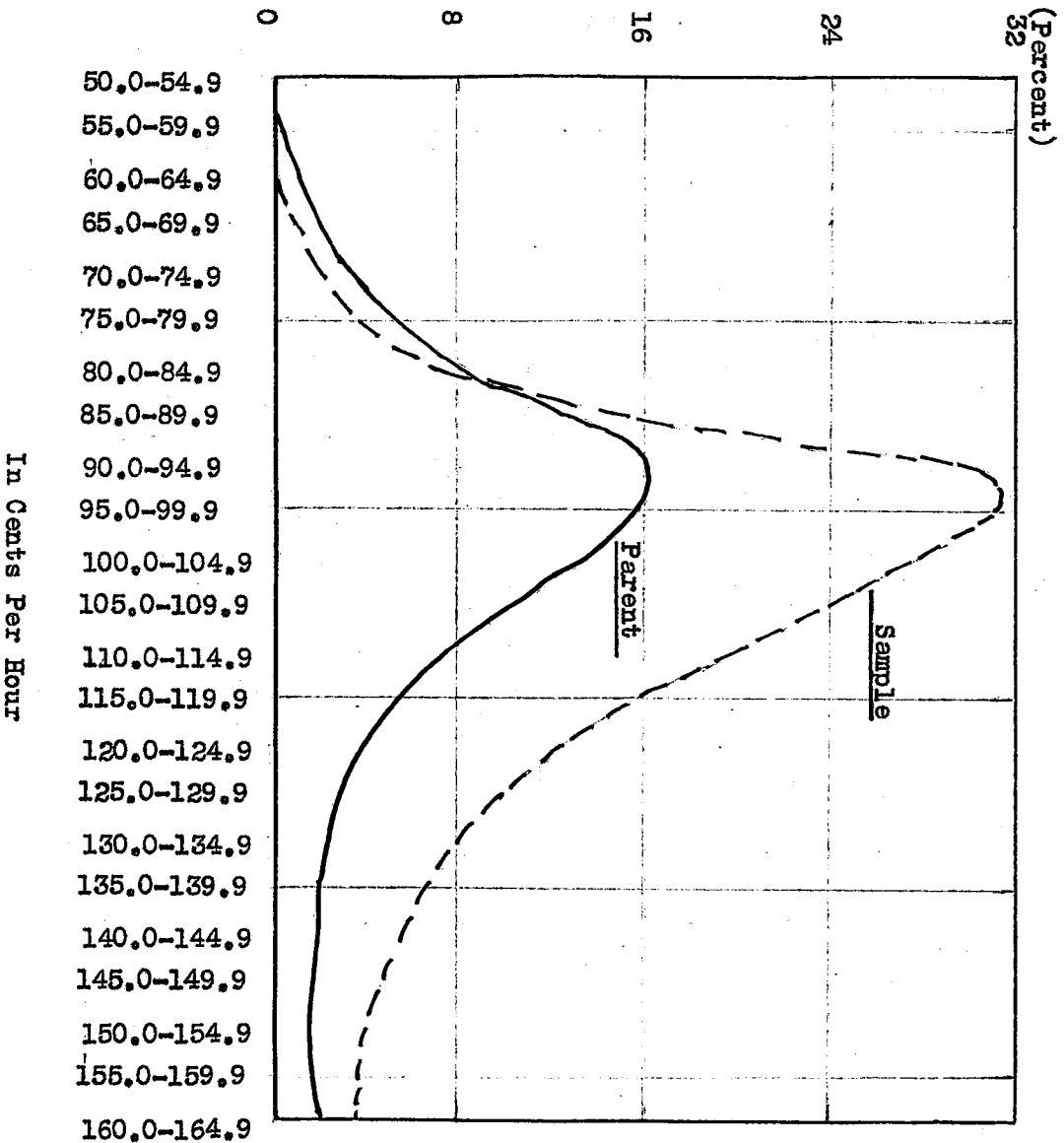
Source: Computed from Tables 1 and 3.

CHART 1: DISTRIBUTION OF WORKERS IN THE RADIO AND ALLIED PRODUCTS
INDUSTRY BY AVERAGE HOURLY WAGE RATES IN NEW ENGLAND
JANUARY, 1947



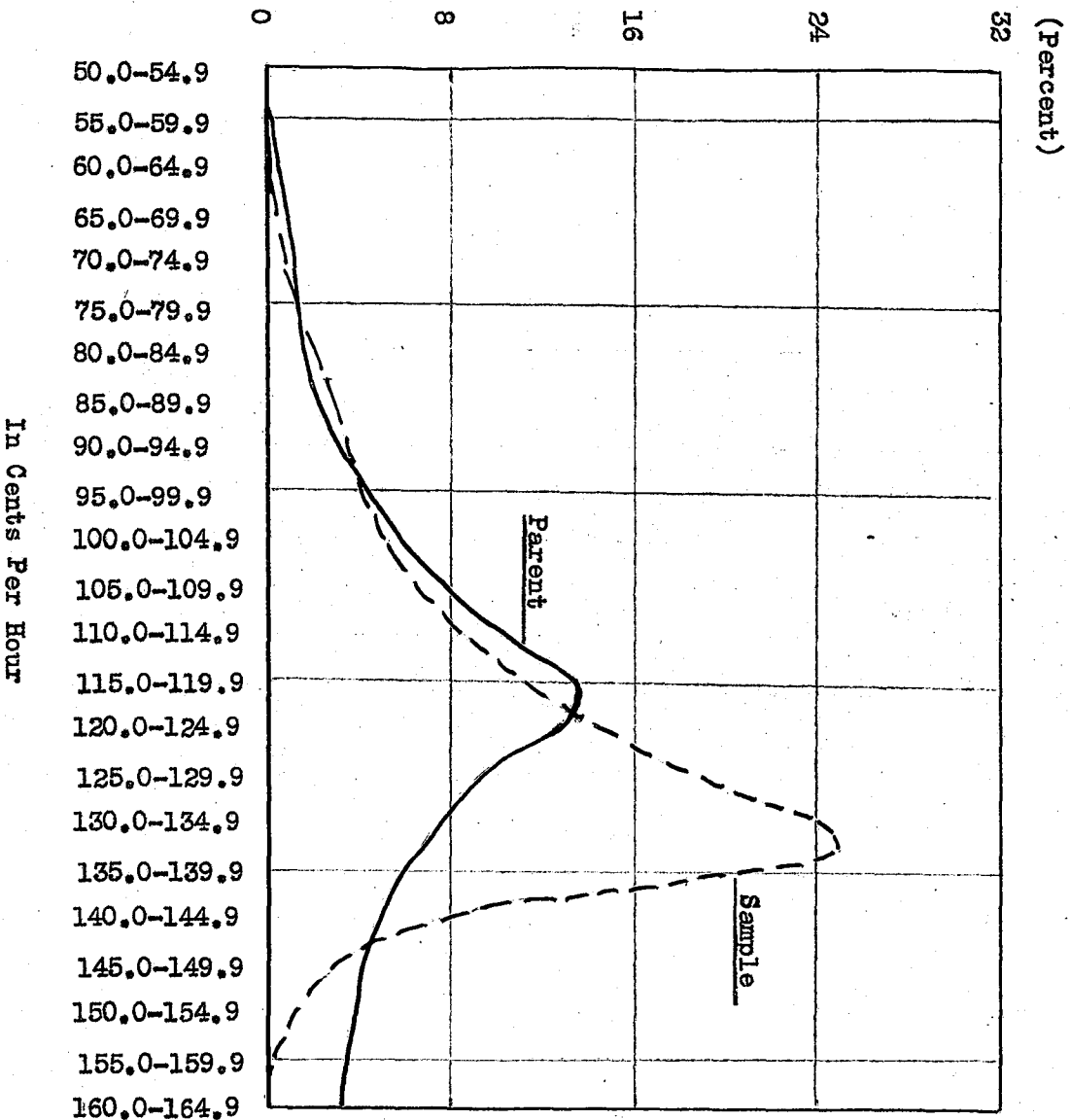
Source: Tables 2 and 4.

CHART 2: DISTRIBUTION OF WORKERS IN THE RADIO AND ALLIED PRODUCTS
INDUSTRY BY AVERAGE HOURLY WAGE RATES IN THE
MIDDLE ATLANTIC REGION
JANUARY, 1947



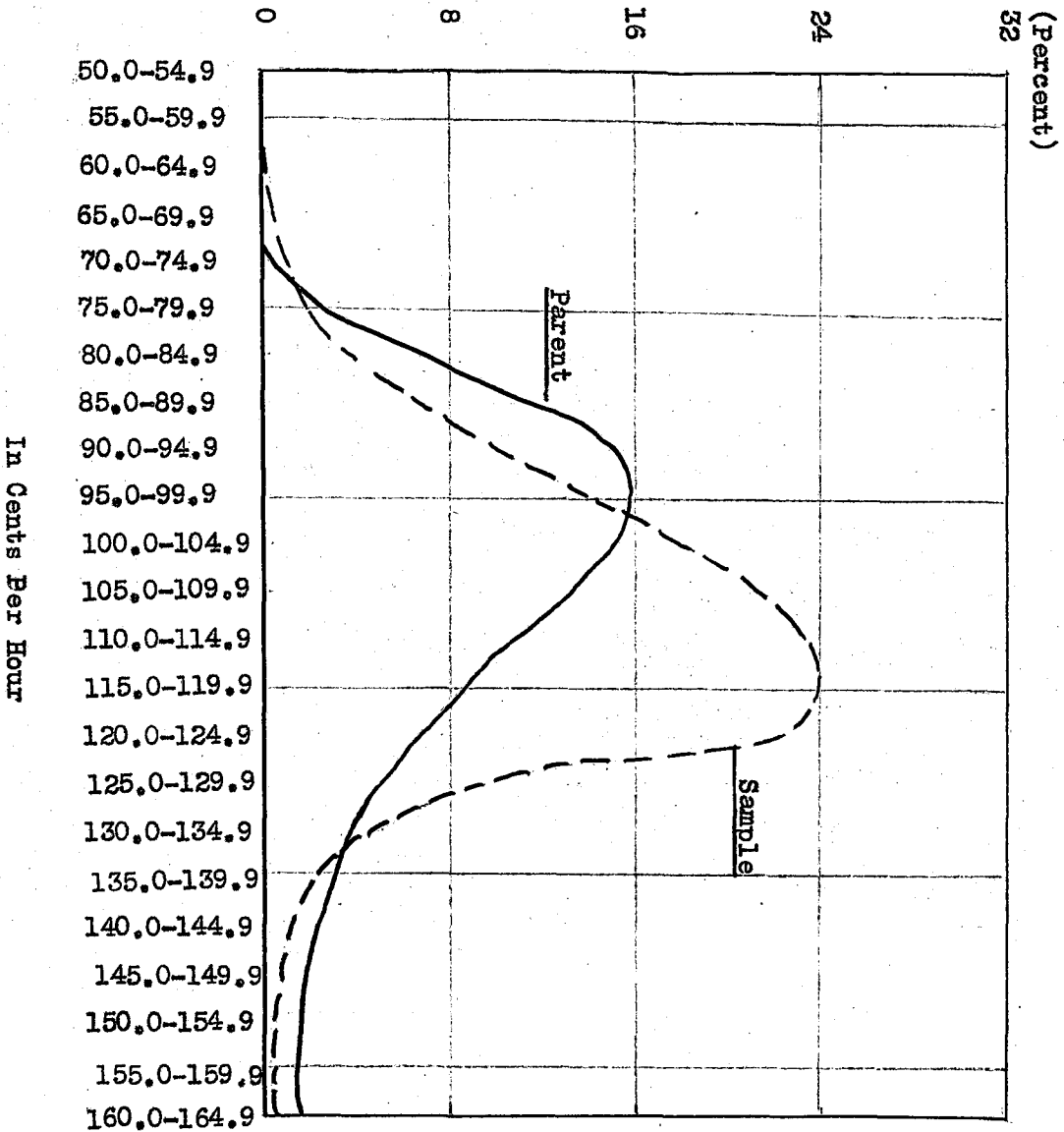
Source: Fables 2 and 4.

CHART 3: DISTRIBUTION OF WORKERS IN THE RADIO AND ALLIED PRODUCTS
INDUSTRY BY AVERAGE HOURLY WAGE RATES
BORDER STATES
JANUARY, 1947



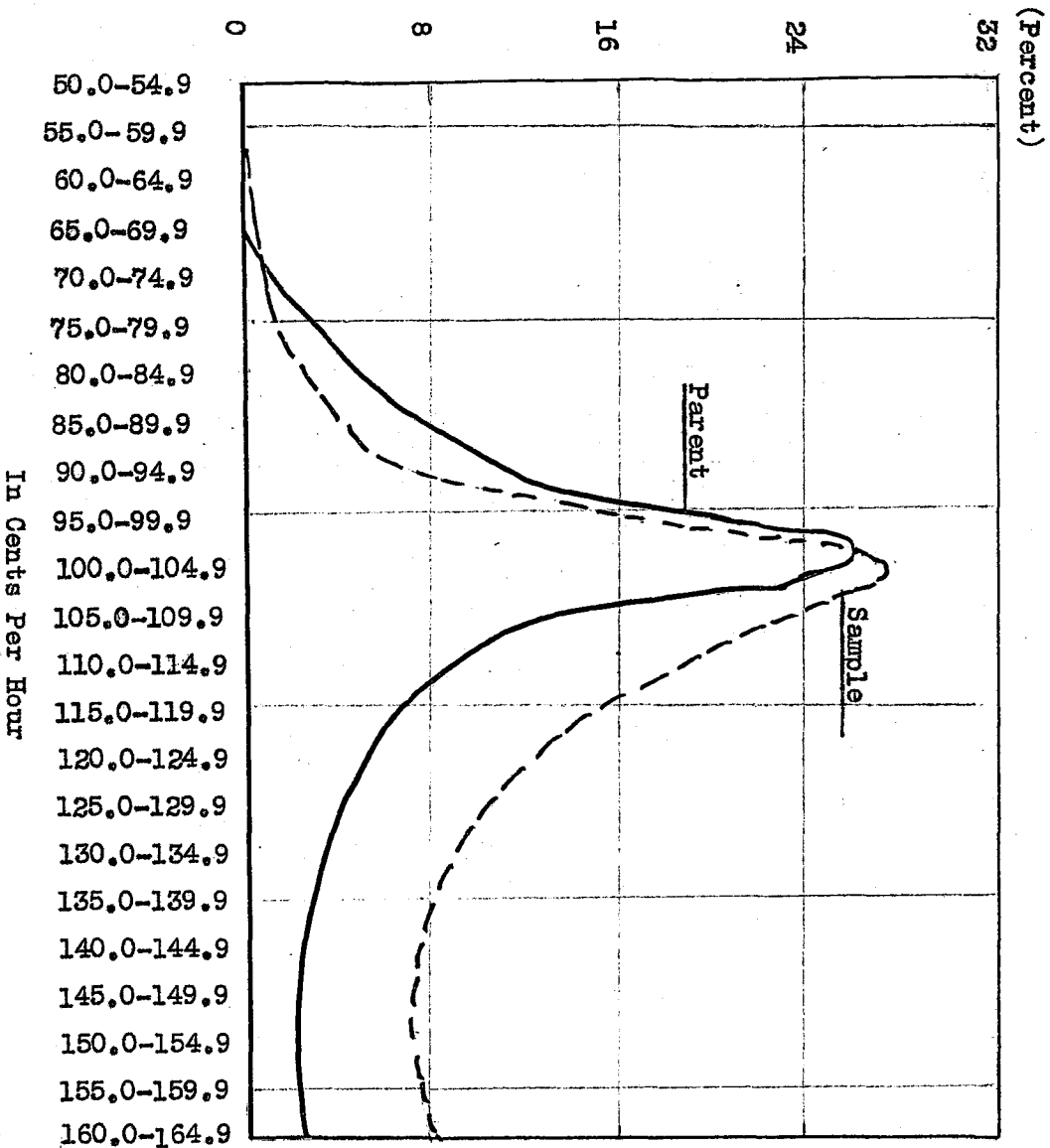
Source: Tables 2 and 4.

CHART 4: DISTRIBUTION OF WORKERS IN THE RADIO AND ALLIED PRODUCTS
 INDUSTRY BY AVERAGE HOURLY WAGE RATES
 GREAT LAKES REGION
 JANUARY, 1947



Source: Tables 2 and 4.

CHART 5: DISTRIBUTION OF WORKERS IN THE RADIO AND ALLIED PRODUCTS
INDUSTRY BY AVERAGE HOURLY WAGE RATES
PACIFIC REGION
JANUARY, 1947



Source: Tables 2 and 4.

APPENDIX II

II. Adequacy of the Sample

It would not be practical to attempt to manipulate the mass of data provided by the Bureau of Labor Statistics without resorting to the use of a sample. While the Bureau drew a generous sample, including data on three-fifths of the workers in the entire radio industry, our sample of the Bureau's sample is but a fraction of that size.

Is our sample adequate? Does it truly represent wage rate differentials in the entire industry? Can the results of this study be safely made the basis for judgement and estimates regarding similar wage rate differentials throughout the industry?

The adequacy of the sample is based on (1) its representativeness and on (2) its reliability.* In Appendix I, the question of sample representativeness, the first determinant of adequacy, was introduced. Measures of central tendency, of dispersion, of skewness, in addition to the approximate degree of kurtosis in the paired distributions, were compared. Our sample and the Bureau's sample were analyzed graphically to determine the degree of comparability between the two. Finally, the relationship between the parent (Bureau's sample) and the sample (study

* 7, p. 352-360

sample) distributions was approached using as a background the standard deviation of the ideal normal curve of error.

As a result of the measures and comparisons of measures in Appendix I, the over-all sample data (i.e., both parent and sample data for each of the five regions) was found to be, with minor exceptions, representative of wage rates in the entire radio industry. It was further concluded that any variance between parent and sample data was due to the operation of chance in the selection of items that were included in both the parent and sample distributions.

Before delving further into the matter of sample representativeness there is still the consideration of the second determinant of an adequate sample - reliability. Reliability of a sample result is evaluated in terms of the extent to which any measure derived from it agrees with the value of that measure for the universe sampled.* For example, assuming that the parent mean for New England of 91 cents is the true mean, and that in addition to the first sample whose mean is 96.2 cents, we drew a second sample whose mean is 95 cents, then the latter sample mean is a more reliable measure of New England wage rate differentials than the mean of the former sample.

* 7, p. 313-318

The reliability or precision of any statistic derived from a sample is measured in terms of the standard error[#] of that statistic.* Therefore, to determine the reliability of the sample means, it is intended, for all five regions, to measure the spread or dispersion of sample means from parent means in terms of standard deviation.

Before actually computing abstract measures of reliability, it has already been noted (Appendix I) that corresponding measures of the paired distributions differ in value. It was determined that these differences were not sufficiently serious to classify the samples as atypical. In dealing with samples, we must inevitably expect differences between parent and sample data. It is the extent of difference which is the key here. If we can prove that the existing differences are due to chance fluctuations in sample selection, we can safely state that the sample data is representative. The magnitude of chance fluctuations are limited and defined by the laws of probability which will be considered in greater detail below.

It is conceivable that in determining the reliability of the sample we shall further define its representativeness. In estimating the variability of the paired

"Error", here, is not a mistake in computation but rather accidents due to chance.

* 7, p. 313-318

means, both the magnitude of the standard deviation of the sample as it reflects the variability in the universe and also the size of the sample must be considered. The reliability of the sample mean increases ordinarily in proportion to the square root of the increase in the size of the sample.* Both factors in estimating variability are recognized in the following formula:

$$\sigma_M = \frac{\sigma_S}{\sqrt{N-1}}$$

σ_M - Symbolizes the standard error of the mean.

σ_S - Symbolizes the standard deviation of the original values in the sample.

N - Is the number of items in sample.

The standard error of the mean, computed for each of the regional parent and sample means, is listed in Table I of this Appendix. They measure the effect of chance factors in the selection and measures of our sample data. This, then, is the first step in the attempt to determine whether the means of the paired distributions are essentially equal or significantly different.

Our next step is to set up the null hypothesis that there should be no difference in the paired averages considering that both were drawn from the identical universe (wage rates of the 143,000 workers in the radio and allied products industry). If we test the null hypothesis

* 12, p. 346-363

by applying tests of significance and it proves tenable, then the means must have been computed from distributions drawn from the same universe. If, however, we disprove the null hypothesis, i.e., a significantly large difference between paired averages is discovered, then the sample may be considered unreliable and cannot be considered a true miniature of its universe. In such a contingency the analysis would have to be terminated at that point.

Since there is already listed in Table I, measures of the effect of chance variation in developing the means, it remains, to test the above hypotheses, only to compute the standard error of the differences between means.

The standard error of differences between means is a measure of the standard error of the theoretical distribution of such differences.*

The formula used for computation of the standard error of the differences in means follows:

$$\sigma_D = \sqrt{\sigma_{M_1}^2 + \sigma_{M_2}^2}$$

σ_D - Standard error of differences between means
 σ_{M_1} - Standard error of first mean
 σ_{M_2} - Standard error of second mean

The results of the computations are summarized in Table I, column 3. The final step now consists of

* 12, p. 346-363

applying tests of significance to the differences listed in column 3. The standard error of differences of the means is an essential element in the test of significance; for now we set up a ratio of the absolute difference between sample mean and parent mean related to the standard error of differences existing between these two means. This critical ratio for the paired distributions representing New England, is shown below:

$$t = \frac{M_{PNE} - M_{SNE}}{\sigma_D (P-S)}$$

M_{PNE} - Mean of parent distribution for N. E.
 M_{SNE} - Mean of sample distribution for N. E.
 $\sigma_D (P-S)$ - Standard error of difference between means

The "t" values (for this is the T test for significance) for the five ratios developed are shown in Table I. Using the "t" values it can be determined by use of specially prepared statistical tables whether or not the absolute difference between parent and sample means is of significant magnitude.[#] Using the "t" value evolved from the critical ratio shown above for New England, of 1.44, the use of the tables just mentioned above indicated that the absolute difference of 5.2 cents could have occurred strictly on the basis of chance almost

[#] Tables providing measures of "The Area of the Normal Curve from Mean to Indicated Deviations from the Mean," are customarily found in the appendixes of statistical text-books.

25 times in every 100 samples (see Table I). If such a difference could occur as frequently as already indicated then the difference is readily attributable to chance and the null hypothesis (zero difference) is proved.

Our criterion in these significance tests is the 1% level (2.576) i.e., as long as the difference in means could occur at least one time in each 100 samples drawn, then the difference will still be considered small enough to be attributable to chance factors. If the differences are due to chance, then it follows that our means, both parent and sample, may be considered reliable and representative of the universe.

Scrutinizing the last column in Table I, it will be noted that this criterion has been met; all "t" values are under 2.576 or the 1% level of significance.

Therefore, the characteristics of the sample distributions (those labeled parent, universe or total, and those labeled sample) which have been selected for this study, can be made the basis for judgement and estimates regarding similar wage rate characteristics in the radio and allied products industry of the United States.

TABLE I: SIGNIFICANCE OF DIFFERENCES BETWEEN PARENT AND SAMPLE MEANS OF WAGE RATES, BY REGIONS, IN THE UNITED STATES
JANUARY, 1947

Region	Standard Error of Means		Standard Error of Difference in Means	"t" Value	Probability of Occurrence per Hundred
	Parent	Sample			
New England	2.38	2.52	3.47	1.44	25
Mid. Atlantic	2.46	2.87	3.80	1.13	22
Border States	1.94	2.94	3.56	1.86	6
Great Lakes	2.58	3.21	4.10	1.02	31
Pacific	2.36	2.71	3.57	1.63	11

Source: Computed from Table 5 and table of areas under normal curve.

APPENDIX III

TABLE 1: WEIGHTED AVERAGE HOURLY WAGE RATES IN THE RADIO AND ALLIED PRODUCTS INDUSTRY OF NEW ENGLAND JANUARY, 1947

<u>Occupation</u>	<u>Number of Workers</u>	<u>Average Hourly Wage Rate</u>	<u>Product</u>
Assemblers, Class A	77	\$1.21	\$ 93.17
Assemblers, Class B	262	.91	238.42
Assemblers, Class C	93	.81	75.33
Carpenters, Maintenance	43	1.20	51.60
Electricians, Maintenance	35	1.20	42.00
Inspectors, Class A	63	1.18	74.34
Inspectors, Class B	34	1.10	37.40
Machinists, Maintenance	36	1.16	41.76
Machinists, Production	102	1.37	139.74
Mechanics, Maintenance	13	1.20	15.60
Stock Clerks	101	.96	96.96
Testers, Class A	59	1.35	79.65
Testers, Class B	39	.94	36.66
Testers, Class C	72	.97	69.84
Tool and Die Makers	146	1.55	226.30
Working Foremen (Processing)	126	1.10	138.60
Totals	1301		\$1,457.37
Weighted Average Hourly Earnings:		$\frac{1}{1301}$	\$1.12

Source: U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, 1947, Series 2, No. 62.

$$\frac{1}{1301}: \bar{X} = \frac{\sum WX}{\sum W} = \frac{\$1,457.37}{1,301} = \$1.12$$

TABLE 2: WEIGHTED AVERAGE HOURLY WAGE RATES IN THE RADIO AND ALLIED PRODUCTS INDUSTRY IN THE MIDDLE WEST - JANUARY, 1947

<u>Occupation</u>	<u>Number of Workers</u>	<u>Average Hourly Wage Rate</u>	<u>Product</u>
Assemblers, Class A	86	\$1.47	\$ 126.42
Assemblers, Class B	439	1.16	509.24
Assemblers, Class C	2725	.93	2534.25
Carpenters, Maintenance	209	1.34	280.06
Electricians, Maintenance	297	1.32	392.04
Inspectors, Class A	16	1.38	22.08
Inspectors, Class B	434	1.16	503.44
Machinists, Maintenance	240	1.45	348.00
Machinists, Production	26	1.56	40.56
Mechanics, Maintenance	68	1.44	97.92
Stock Clerks	706	1.03	727.18
Testers, Class A	315	1.40	441.00
Testers, Class B	468	1.19	556.92
Testers, Class C	745	1.10	819.50
Tool and Die Makers	647	1.67	1080.49
Working Foremen (Processing)	529	1.34	708.86
Totals	7950		\$9187.96

1/

Weighted Average Hourly Earnings: \$1.16

Source: U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, 1947, Series 2, No. 62.

$$\bar{X} = \frac{\sum WX}{\sum W} = \frac{\$9,187.96}{7,950} = \$1.16$$

TABLE 3: WEIGHTED AVERAGE HOURLY WAGE RATES IN THE
RADIO AND ALLIED PRODUCTS INDUSTRY IN THE
BORDER STATES - JANUARY, 1947

<u>Occupation</u>	<u>Number of Workers</u>	<u>Average Hourly Wage Rate</u>	<u>Product</u>
Assemblers, Class A	78	\$1.36	\$106.08
Assemblers, Class B	72	1.17	84.24
Assemblers, Class C	108	.90	97.20
Carpenters, Maintenance	17	1.36	23.12
Electricians, Maintenance	16	1.44	23.04
Inspectors, Class A	58	1.37	79.46
Inspectors, Class B	28	1.13	31.64
Machinists, Maintenance	8	1.48	11.84
Machinists, Production	39	1.44	54.16
Mechanics, Maintenance	5	1.30	6.50
Stock Clerks	73	1.08	78.84
Testers, Class A	63	1.54	97.02
Testers, Class B	26	1.32	34.32
Testers, Class C	16	1.17	18.72
Tool and Die Makers	59	1.62	95.58
Working Foreman (Processing)	106	1.47	155.82
Totals	772		\$997.58

Weighted Average Hourly Earnings^{1/}: \$1.29

Source: U. S. Dept. of Labor, Bureau of Labor Statistics,
Wage Structure, Radios, 1947, Series 2, No. 62.

$$\frac{1/}{\sum w} \bar{X} = \frac{\sum wX}{772} = \frac{\$997.58}{772} = \$1.29$$

TABLE 4: WEIGHTED AVERAGE HOURLY WAGE RATES IN THE RADIO AND ALLIED PRODUCTS INDUSTRY IN THE GREAT LAKES AREA - JANUARY, 1947

<u>Occupation</u>	<u>Number of Workers</u>	<u>Average Hourly Wage Rate</u>	<u>Product</u>
Assemblers, Class A	37	\$ 1.52	\$ 56.24
Assemblers, Class B	726	1.09	791.34
Assemblers, Class C	1070	1.02	1091.41
Carpenters, Maintenance	84	1.33	111.72
Electricians, Maintenance	179	1.41	252.39
Inspectors, Class A	317	1.40	443.80
Inspectors, Class B	854	1.16	990.64
Machinists, Maintenance	185	1.41	261.85
Machinists, Production	144	1.48	213.12
Mechanics, Maintenance	108	1.16	125.28
Stock Clerks	620	1.06	657.20
Testers, Class A	442	1.43	632.06
Testers, Class B	416	1.17	486.72
Testers, Class C	228	1.00	228.00
Tool and Die Makers	595	1.68	999.60
Working Foreman (Processing)	1201	1.28	1537.28
Totals	7206		\$8878.65

Weighted Average Hourly Earnings: $\frac{1}{7206} \times \$8878.65 = \1.26

Source: U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, 1947, Series 2, No. 62.

$$\frac{1}{7206} \times \bar{X} = \frac{\sum wX}{\sum w} = \frac{\$8878.65}{7,206} = \$1.26$$

TABLE 5: WEIGHTED AVERAGE HOURLY WAGE RATES IN THE RADIO AND ALLIED PRODUCTS INDUSTRY IN THE PACIFIC STATES - JANUARY, 1947

<u>Occupation</u>	<u>Number of Workers</u>	<u>Average Hourly Wage Rate</u>	<u>Product</u>
Assemblers, Class A	69	\$1.37	\$ 86.31
Assemblers, Class B	45	1.18	53.10
Assemblers, Class C	230	1.04	239.20
Carpenters, Maintenance	8	1.27	10.16
Electricians, Maintenance	1/	1/	1/
Inspectors, Class A	22	1.57	34.54
Inspectors, Class B	18	1.17	21.06
Machinists, Maintenance	7	1.58	11.06
Machinists, Production	27	1.48	37.96
Mechanics, Maintenance	6	1.21	7.26
Stock Clerks	16	1.22	19.52
Testers, Class A	61	1.50	91.50
Testers, Class B	28	1.24	34.72
Testers, Class C	1/	1/	1/
Tool and Die Makers	62	1.78	110.36
Working Foremen (Processing)	60	1.41	84.60
Totals	659		\$841.35
		Weighted Average Hourly Earnings: ^{1/} \$1.28	

1/ Insufficient number of workers presentation of an average.

Source: U. S. Dept. of Labor, Bureau of Labor Statistics, Wage Structure, Radios, 1947, Series 2, No. 62.

$$1/: \bar{x} = \frac{\sum wx}{\sum w} = \frac{\$841.35}{659} = \$1.28$$

1/
 TABLE 6: DETERMINATION OF THE GRAND AVERAGE HOURLY
WAGE RATES IN THE RADIO AND ALLIED PRODUCTS
INDUSTRY IN THE UNITED STATES
JANUARY, 1947

<u>Region</u>	<u>Average Hourly</u> <u>Wage Rates</u>
Border States	\$1.29
Pacific	1.28
Great Lakes	1.26
Middle Atlantic	1.16
New England	1.12
	<u>\$6.11</u>

Average of regional averages: \$1.222

$$\bar{x} = \frac{\sum X}{N} = \frac{\$6.11}{5} = \$1.222$$

1/: Equivalent of the Grand Mean used in Statistical Quality Control.

Source: Appendix III, Tables 1 through 5.

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