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PART II
CYCLICAL FLUCTUATIONS IN
EMPLOYMENT



CHAPTER IV

WHAT THE PRESENT STATISTICS OF EMPLOYMENT SHOW¹

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THE DATA SHOW NOT TOTAL NUMBERS UNEMPLOYED, BUT FLUCTUATIONS IN EMPLOYMENT

What do the American figures on employment and unemployment show? A general answer to this question may be given in a nutshell. The unemployment figures fail to tell us the number of the unemployed.² But these figures, in conjunction with the data representing the number employed according to pay-rolls, enable us to construct a barometer or index of employment cycles.³

Such an index has a very definite bearing on at least four important matters, relating partly to the course of employment and unemployment cycles as such and partly to the relation between employment and the business cycle. First and most directly, employment registers the *labor market*; that is, it shows relatively how "easy," or how "tight," the labor market is at any given time, much as bank reserves reflect the state of the money market. Secondly, employment shows something as to the general course of *production*, since the hiring and the firing of labor are largely resorted to by employers when they wish to increase or curtail output. A third use is to show the relation of employment to *buying power*. The total fund of purchasing power flowing into the hands of wage-earners at a given time is conditioned directly by the state of employment. A fourth and equally important feature, shown indirectly by an employment index, is the cycle of *social welfare*. Largely as a

¹ In preparing the present chapter the writer has drawn freely upon materials contributed to the Pollak Foundation for Economic Research, the Harvard University Committee on Economic Research, and the American Statistical Association; and cordially acknowledges their courtesy in authorizing him to do so.

² In this connection the reader may recall the wide variety of unemployment estimates in circulation at the time of the President's Conference on Unemployment. These estimates ranged at least from 2,000,000 to 6,000,000 persons.

³ The employment figures also yield other useful information, but in this study the question at issue is simply employment *cycles*. This leaves out of consideration the important seasonal aspect of the unemployment problem. The effects of labor disputes, sickness, old age, disability, vacations, "loafing," and the gradual decay or removal of industries are also ignored.

result of fluctuations in the economic prosperity of wage-earners, there are pronounced cycles of suicide, crime, prostitution, pauperism, marriages, migration, and other social phenomena.

In other words, the problem of cyclical employment (or unemployment) stands in a position midway between the economic and the social phases of the business cycle; it is a connecting link. Consequently a reliable index of employment may be expected to prove of more general interest than would an index for almost any purely economic or purely social phenomenon. This analysis, therefore, concerns not only the public-spirited citizen, but even more tangibly and directly the social student and worker, and likewise the business man, whether interested chiefly in employment management, in production, or in sales.

An index of employment is a series of figures so constructed that its fluctuations will reflect changes in the *relative intensity* of unemployment between two points of time, without necessarily measuring the total *volume* of unemployment—or even the number of totally unemployed.¹ In other words, the index yields a continuous curve of employment, the high points of which represent active employment, the low points severe unemployment, and intermediate points various grades of seriousness of the unemployment problem.

By adopting this simple device we avoid several difficult problems. If we were seeking to measure the absolute volume of unemployment, we should have to allow for the amount of part-time employment in depression—a problem on which we have so little data that it is virtually insoluble. For our purpose it is sufficient to assume that part-time employment becomes more prevalent during a depression, and overtime more prevalent during prosperity, so that an index based on full-time employment alone should show correctly the relative fluctuations.²

II. THE DATA AVAILABLE FOR AN INDEX OF EMPLOYMENT

Before presenting a general index of employment in the United States, it is well to consider the economic importance of the leading states for which data on employment have been or now are available, in order to judge the adequacy of our samples; then to pass in review the leading evidence upon which a general employment index may be based. This review is presented for convenience in two parts, for the periods prior to June, 1914, and since June, 1914.

¹ For the writer's view on the use of the index method for measuring unemployment, see Harvard Economic Service, *Special Letter*, Oct. 8, 1921, p. 6, and *Journal of American Statistical Association*, March, 1922, vol. XVIII, p. 55. For a somewhat different view see ERNEST S. BRADFORD, *Methods Used in Measuring Unemployment*, *Quarterly Publication of the American Statistical Association*, December, 1921, vol. XVII, especially pp. 986-9.

² The validity of this assumption is confirmed in Chap. V on Under-employment.

Table X shows the proportion of factory wage-earners in the leading states for which employment data are available, or have been available within recent years. New York, which heads the list, contains between one-sixth and one-seventh of all the wage-earners in the country employed in manufacturing industries. This is equivalent to Massachusetts and Illinois taken together. Compared with the lesser states, New York is equivalent to three New Jerseys, and five Connecticut or Wisconsin. Of all the states in the country, New York is exceeded in manufacturing only by Pennsylvania, which has had no employment data in recent years except for a short time early in the war. Further economic considerations confirm the key position of New York in a study of employment,¹—such is its industrial diversification, its ready access to the immigrant labor supply, and its central geographical position with reference to other great industrial states. In short, New York forms a large and representative sample of the country's manufacturing activity.

TABLE X.—GEOGRAPHICAL DISTRIBUTION OF WAGE-EARNERS EMPLOYED IN MANUFACTURING INDUSTRIES IN SELECTED STATES^a
(Unit: one per cent)

	1904	1909	1914	1919
New York.....	15.7	15.2	15.0	13.5
Massachusetts.....	8.9	8.8	8.6	7.9
Illinois.....	6.9	7.0	7.2	7.2
New Jersey.....	4.9	4.9	5.3	5.6
Connecticut.....	3.3	3.2	3.2	3.2
Wisconsin.....	2.8	2.8	2.8	2.9
United States.....	100.0	100.0	100.0	100.0

^a *Abstract of Census of Manufactures, 1914*, p. 272, and (for 1919) the Census reports on Manufactures in the U. S. The decennial Censuses of Occupations disclose a similar relationship among the states for the manufacturing and mechanical pursuits.

Bearing in mind the differences among the states in industrial importance and position, we may review in succession employment indexes constructed from the available data.

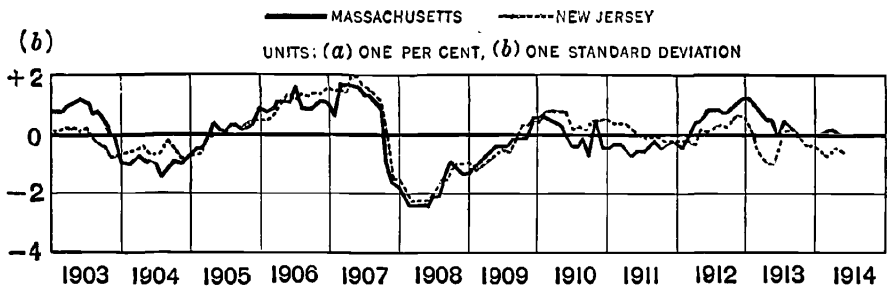
III. INDEXES OF EMPLOYMENT, 1903-1914

Employment in Massachusetts and New Jersey.—Chart 2 shows two indexes of employment derived from the pay-roll data of the manufacturing establishments in New Jersey and Massachusetts. The seasonal variation and the long-time trend have been eliminated from each of these

¹ For further consideration of the economic and statistical considerations involved, see *The Review of Economic Statistics*, January, 1922, prel. vol. 1, pp. 25, 26.

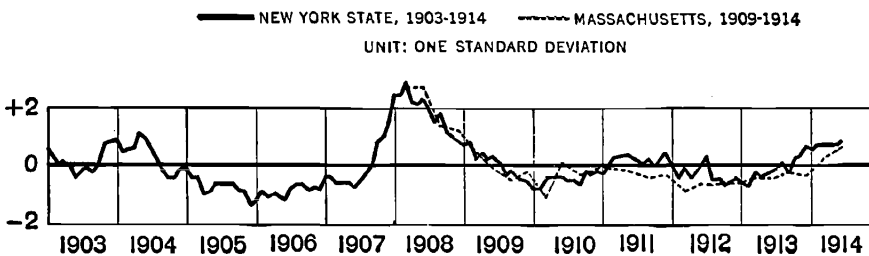
series, so that the horizontal base line measures normal employment. One may therefore read from the scale at the right the net deviation from normal attributable in any given month to the cycle of business conditions. The upper part (positive deviation) of these curves represents good employment; the lower part (negative deviation) shows the prevalence of unemployment.

CHART 2.—EMPLOYMENT IN MANUFACTURING ESTABLISHMENTS, 1903-1914.



The scale at the right is in percentages. At the left of Chart 2 one may read the fluctuations in terms of the typical percentage deviation from the base line, rather than in units of 1 per cent. The typical or "standard" deviation for both of these curves happens to be the same (3.4 per cent). By using for a vertical unit the standard deviation rather than the percentage, we gain an important advantage. Comparison is made easier between curves having unequal standard deviations,

CHART 3.—UNEMPLOYMENT IN TRADE UNIONS.



for instance, compare the curves in Chart 2 with those in Chart 3. In view of this advantage, the standard deviation is used as the vertical unit for most of the curves shown in this chapter.

The Massachusetts curve is derived from data collected early in each year since 1889 by the Massachusetts Bureau of Statistics. These data show the number of wage-earners on pay-rolls at the middle of each month during the preceding year in the most important manufacturing establish-

ments of the state.¹ The number of wage-earners covered by these reports has formed a large part of the total number employed in manufacturing within the state, having ranged from 150,000 to 800,000 or from 80 per cent upward.²

An important peculiarity of manufacturing in Massachusetts is the degree of industrial specialization. Cotton manufacturing, the boot and shoe industry, woolen and worsted goods, and foundry and machine-shop products comprise 40 to 55 per cent of all manufacturing in Massachusetts. This specialization is one factor which renders the Massachusetts returns imperfectly representative of general industrial conditions. Moreover, cotton manufacture, the most important of all, is wholly dependent upon agriculture for its raw material, and an especially large or small cotton crop seriously affects the response of the industry to the business cycle. Moreover, in several of the leading industries women and juveniles are heavily employed.³ As disconnected local censuses of manufactures, year by year, these Massachusetts data are excellent, but as a continuous record of employment fluctuation they cannot be safely accepted without reservations.

From 1895 through 1918, the New Jersey Bureau of Industrial Statistics collected data similar to those for Massachusetts. The scope of the

¹ The data have been regularly published in the Bureau's *Annual Reports on the Statistics of Manufactures*.

² Although the data are comprehensive, they have not remained equally so throughout the period; for instance, in 1899 about 360,000, or 82 per cent of the 438,000 wage-earners shown by the U. S. Census for Massachusetts, were covered by the reports of the state bureau; by 1904 the number had risen to 430,000 or 88 per cent. It is impossible to determine precisely the degree of inclusiveness after 1904, because in the subsequent census years the bureau adopted outright the federal bureau's figures for Massachusetts; but the percentage appears to have risen decisively, probably to 95 per cent or more.

³ Another important objection, statistical in its nature, lies in the discontinuity of the Massachusetts data during the past sixteen years. Prior to 1906, the data published yearly covered identical establishments over a period of twenty-four months, so that the actual degree of change between each December and the following January in these establishments can be readily ascertained. This policy of "overlapping" the yearly reports was not maintained after 1906, and consequently the problem of building up a reliable, continuous series for an extended period is not an easy one. After 1906 the data do not form a true statistical series at all, but a series of floating fragments connected with each other in a very loose and uncertain manner.

For a discussion of the method by which the fragments were welded into a continuous series, see *Journal of American Statistical Association*, June, 1922, vol. XVII, pp. 233-4. Throughout the present investigation the methods employed for elimination of seasonal variation, secular trend, etc., are based upon those devised by WARREN M. PERSONS, see *The Review of Economic Statistics*, prel. vol. 1, January and April, 1919, pp. 3-205. Variations were introduced by the writer only where necessitated by the peculiar nature of some of the employment data.

material, limited to about 50,000 wage-earners in 1895-1997,¹ was considerably enlarged in subsequent years, ranging from 140,000 in 1898 to more than 500,000 in 1918. Here as in Massachusetts the canvass did not cover a fixed proportion of establishments or even a steadily increasing proportion,² but 75 to 90 per cent were generally included. New Jersey is industrially more diversified than Massachusetts. The machinery and metal-working industries are fairly strong; wool, silk, tobacco, and several others also rank comparatively high. It is noteworthy that cotton ranks eleventh, representing only about 2 per cent of all New Jersey's manufacturing, as contrasted with 15 to 25 per cent in Massachusetts.

Unemployment in New York and Massachusetts.—One can also obtain highly valuable evidence as to employment fluctuations by examining the fluctuations in unemployment—"the other side of the shield." Before the war two useful unemployment series were available; one for Massachusetts and one for New York. Each was reported in fairly consistent form, without sudden changes from year to year as in the pay-roll data; consequently the two unemployment series have in common the advantage of continuity. They have a second advantage in greater breadth of industrial scope, comprising not only manufacturing but also building, transportation, etc. Both of the unemployment series are valuable. Each has its own advantages, but that for New York has a net advantage, being reported monthly instead of quarterly, extending over a pre-war period twice as long as that for Massachusetts, and covering a much more important, diversified and favorably situated industrial state.

It is of course impossible to utilize these figures in their original form owing to the effect of disputes, seasonal variation, and long-time trend, as well as more subtle factors such as changes in industrial composition. A suitable method of analysis has eliminated these difficulties,³ yielding the two unemployment indexes shown in Chart 3.

By comparing with each other the two curves in Chart 3, and contrasting these with the pair shown in Chart 2, one may see a high order of agreement as to the course of employment cycles in the dozen years before the war. Only minor disagreements are to be found. Thus after the depression of 1903, and again after the prolonged boom of 1905-

¹ The data for the years 1895-1916 were obtained from the Bureau's *Annual Reports*. Those for 1917 and 1918 were made available through the courtesy of J. A. T. Gribbin of the Bureau. The series was discontinued in 1918.

² Thus in 1899 an average of 175,000 wage-earners was represented, *i.e.*, 82 per cent of the number shown by the federal Census of Manufactures. In 1904 the ratio fell to 77 per cent, then rose to 87 in 1909 and 88 per cent in 1914.

³ For a detailed discussion of the methods employed, see *The Review of Economic Statistics*, prel. vol. 4, January, 1922, pp. 26-34.

1907, a turn appeared in the New York curve slightly earlier than in the others.¹

The degree of the similarity, or "excellence of fit," among these curves may be measured numerically by noting the coefficients of agreement or correlation coefficients. These coefficients are simply numbers derived from a mathematical formula, so contrived that +100 per cent represents perfect agreement and 0 per cent nonagreement.² The correlation coefficients are as follows: between the two unemployment indexes +72 per cent, between New York unemployment and New Jersey employment -73 per cent, between New York unemployment and Massachusetts employment -80 per cent, between Massachusetts employment and unemployment -88 per cent.

A General Index of Employment Cycles, 1903-1914.—We now have before us all the materials necessary for constructing a monthly general index of employment cycles for the United States from 1903 to 1914. The three states represented in Charts 2 and 3 comprise a fairly large sample, more than one-fourth of all the industrial wage-earners in the United States.³ The indexes appear to represent adequately the course of employment cycles in the respective states, and they support each other so thoroughly as to justify beyond any reasonable doubt a combination of the three.

Two such combinations are presented in Chart 4. Both are based upon the two employment indexes and the inverted unemployment index for New York.⁴ In the weighted index (full line), the three components are assigned weights of five points (New York), three (Massachusetts), and two (New Jersey) in proportion to the actual industrial

¹ The discrepancy in 1904 seems due to the peculiar effect of a "tandem revival" from the depression caused by the rich man's panic in 1903. One revival, an abortive one, took place early in 1904. It was followed by a distinct slump, then by a more pronounced recovery lasting into 1907. This "reflex action," indicated also by other industrial barometers such as pig iron production, and by notes in the trade journals of the time, stands almost unparalleled in American experience. With such sudden reversals of the industrial machine, it is not unnatural that dissimilarities should be found in different states during that year.

The slightly earlier increase of unemployment in New York in 1907 is also attributable to business conditions, not to any peculiarity in the unemployment curve as such. Upon analysis the bank clearings of cities in New York State outside the metropolis are found to follow the same course as the inverted unemployment curve.

² By nonagreement is meant complete *lack* of correspondence. This is different from *inverse* correspondence, which is represented by negative percentages, running between 0 and -100 per cent. A correspondence or correlation of -80 per cent means the same thing as an inverse correlation of +80 per cent.

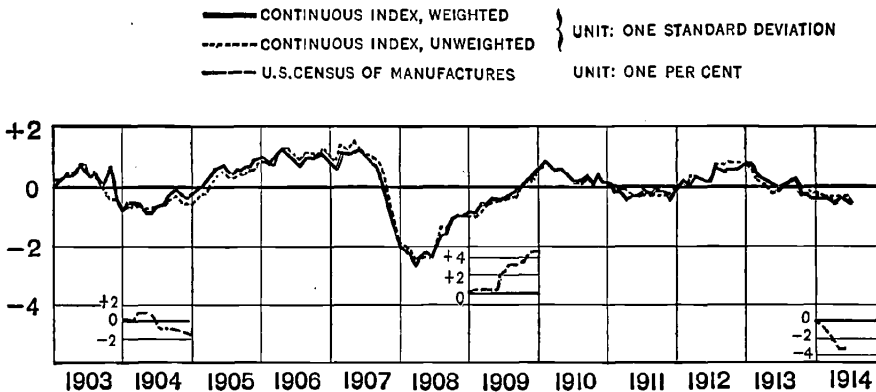
³ New York 15 per cent, Massachusetts 8 per cent, and New Jersey 5 per cent—a total of 28 per cent. Compare Table X.

⁴ The Massachusetts unemployment index, being quarterly, could not well be utilized in a monthly composite.

importance of the three states¹ on the assumption that each of the indexes properly represents employment in the corresponding state. An unweighted average was also constructed, allowing equal influence to each of the three state indexes. The result shown by the dotted line in Chart 4 nearly coincides with the weighted index.² The correlation coefficient is 99 per cent. The close agreement between the weighted and unweighted composites shows that accuracy in weighting is of only slight importance, owing to the similarity of the three components.

At this point some valuable supporting evidence from the federal Censuses of Manufactures may be introduced. These are monthly data covering practically all industrial wage-earners in the United States, in the census years 1904, 1909, and 1914.² They form by far the most comprehensive employment data we have, covering in 1904, 5,000,000

CHART 4.—GENERAL INDEXES OF EMPLOYMENT, 1903–1914.



and in 1914, 7,000,000 wage-earners. It should be noted that each of the leading manufacturing industries has maintained its quota of the total throughout the period in such a stable manner that the data may be regarded as industrially homogeneous.³

Although no similar data are available for intercensal years, it has been possible with the aid of a special technique⁴ to eliminate most of the seasonal variation and long-run trend present in these data, and get a fragmentary idea as to the course of the employment cycle during

¹ Compare Table X.

² For the 1919 data see section IV, below, especially Chart 6.

³ In not more than two or three cases (vehicles for land transportation, railroad repair shops, and the miscellaneous group) has there been any decisive increase, while in only two cases (lumber and its products, and leather and its products) has there been a decline. Compare, *Abstract of Census of Manufactures, 1914*, p. 435. In all the other groups, quotas have remained constant.

⁴ For the method utilized, see *Journal of American Statistical Association*, June, 1922, pp. 230-2.

these three years. The results are shown by the segments at the bottom of Chart 4. Inspection shows that on the whole these Census data strongly confirm the continuous index based on the three-state sample, when allowance is made for differences of scale.¹

IV. INDEXES OF EMPLOYMENT, 1914-1922

Beside the obvious economic reasons, there are statistical grounds for breaking our study into two parts, that before and that since the outbreak of the war. The best of the current employment indexes were not begun until the early part of the war. One of these is the index representing employment in manufacturing establishments of New York State, which was begun in June, 1914. Similar to this is the series of the United States Bureau of Labor Statistics, begun in October, 1915. Early in 1915 the Wisconsin Industrial Commission began to collect employment data at quarterly (later monthly) intervals, and under the stress of business depression similar series have been inaugurated, in 1921 and 1922, by several other states—notably Illinois and Connecticut. In January, 1921 the United States Employment Service also began a series collected, like that of the Bureau of Labor Statistics, from manufacturing establishments in a large number of states.

Five State and Federal Indexes.—In Chart 5 are shown three semi-adjusted indexes,² and two wholly unadjusted series. The first curve represents in semi-adjusted form the employment index of the New York State Industrial Commission. This index includes on the average about 500,000 wage-earners. Although restricted geographically, it is well planned in industrial composition. Especially significant is the fact that machinery, iron, and steel form an influential component of this index, since (as has been shown elsewhere³) employment fluctuations in the metal industries register very accurately fluctuations in other lines of industrial activity. Overweighting the metal group is therefore more advantageous than otherwise.

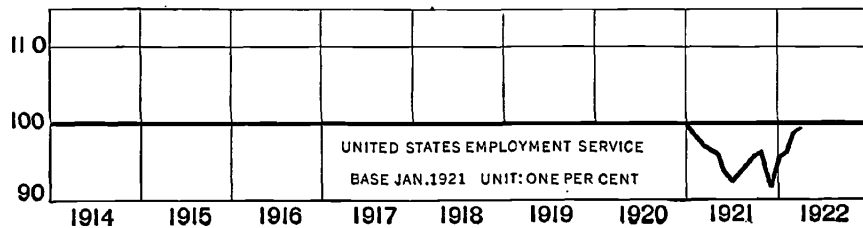
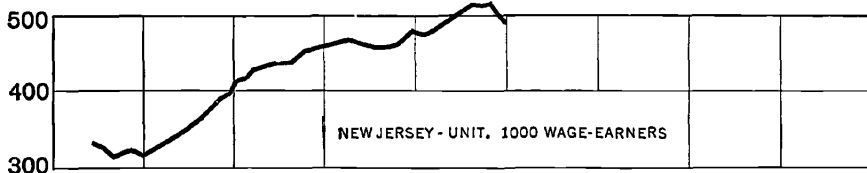
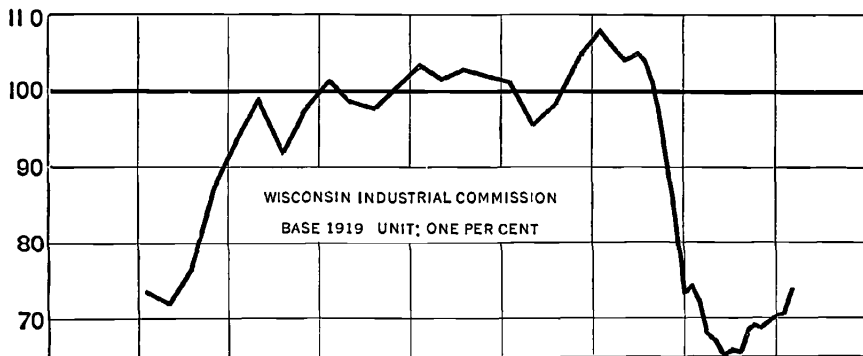
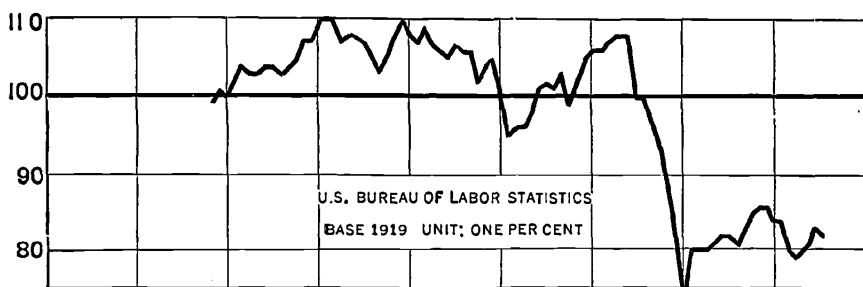
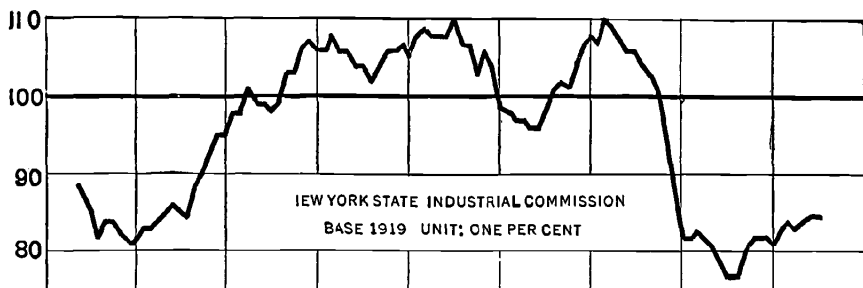
The second curve represents the semi-adjusted indexes based upon the month to month link relatives reported by the United States Bureau of Labor Statistics. These data have been compounded into chain relatives, which in turn have been combined for the several industries, using weights proportional to the importance of the industries according to the

¹ In 1904, for the reason already indicated, the agreement is much less close. The fairly decisive lag at the turning points of the Census fragment seems to represent a more sluggish response to the industrial reversal by the country as a whole than by the three states represented in the continuous index.

² Based on the average for 1919 as 100 per cent, but not corrected for seasonal variation.

³ *The Review of Economic Statistics*, prel. vol. 4, January, 1922, pp. 23, 24, 32, 33.

CHART 5.—UNADJUSTED INDEXES OF EMPLOYMENT, 1914-1922.



1914 Census of Manufactures. Finally, the weighted chain relatives¹ have been reduced to the average for the Census year 1919 as a base. The series has several points of merit. Although planned with prime reference to industries rather than states, its geographical composition is in point of fact fairly broad, covering the largest manufacturing states.

In industrial make-up the series is somewhat peculiar. In the distribution of the 600,000 to 800,000 wage-earners actually embodied in the returns, the automobile, iron, and steel industries are represented strongly, textiles and others lightly; but the process of weighting indicated by the Census of Manufactures turns the tables, greatly reducing the emphasis on metal industries and stressing the textiles. The groups have been so selected that those falling under "textiles" have a weight of about 45 per cent, and those falling under metals about 35 per cent. This selection gives a much stronger representation to the textile industry than is apparently justified by the Census of Manufactures, in which the textile industry amounts only to 21 per cent of all manufacturing. Such weighting is not well suited to the list of industries used, owing to the considerable difference between cotton-crop cycles and business cycles.

The first two curves in Chart 5 show a remarkably close agreement in both timing and amplitude. Each of the discrepancies noted is wholly attributable to differences in the industrial distribution: textiles are represented very strongly in the Bureau of Labor index, less strongly in the New York index, in which metals, machinery, etc., outweigh textiles and their products.

The employment curve for Wisconsin fluctuates in nearly the same manner as the others shown in Chart 5, except that the amplitude of its movement in the recent depression is somewhat greater. In form, the Wisconsin index more closely resembles the index for New York than that for the United States, chiefly because in Wisconsin as in New York the metal industries are heavily represented.²

¹ These figures have been kindly supplied by Ethelbert Stewart, U. S. Commissioner of Labor Statistics.

² The Wisconsin curve in Chart 5 really represents not one series but two, which though not wholly alike in nature have been grafted together by the Industrial Commission of Wisconsin. The figures reported monthly since July, 1920, are based on establishments representing one-fourth to one-third of the wage-earners engaged in manufacturing industries in Wisconsin. The quarterly figures extending from the first quarter of 1915 to the second quarter of 1920 covered a much smaller proportion, probably 15 to 20 per cent. Differences in the inclusiveness, the industrial composition, and the purpose of the two series of reports may account for the peculiarity in the form of the curve. The purpose of the earlier reports was simply to obtain data on the incidence of industrial accidents, in order to check up the rates provisionally assumed in the workmen's compensation act. Until July, 1920, reports were made to the Commission only by self-insured employers, but after July, 1921, many employers insuring with the liability companies began to report. It is especially

The two curves of original items at the foot of Chart 5 merit only passing attention. So far as may be judged by the chart, employment in New Jersey increased during the war in much the same manner as in other states, although this state was more affected relatively by the expansion of war industries—munitions, chemicals, explosives, etc.—than were most states. The New Jersey data are, of course, not continuous between calendar years, and furthermore, they were discontinued altogether in 1918,¹ so that the available fragments are not useful in setting up a current index of employment.

The index established in January, 1921 by the United States Employment Service has not yet covered a period long enough to enable us to test its merit empirically. In general it followed a course not unlike the New York and Wisconsin indexes during 1921, except at the beginning and the end of the year. Theoretically at least the series seems promising. It covers about 1,500,000 wage-earners, a larger number than any other index now being reported currently. Its industrial composition, though imperfect, is on the whole well planned, being fairly representative of manufacturing in the United States.² This series also has the advantage that current data are published earlier than those for other series, being telegraphically reported by the district directors of the Service and announced shortly afterward by the central office at Washington. It must, however, be admitted that corresponding to this advantage is a correlative disadvantage; that is, some of the basic reports seem to be gathered by the district directors from the employers by such methods, and in such haste, as to cast doubt upon the results.

Four Adjusted Indexes.—In Chart 6 are shown some fully corrected indexes of employment and unemployment available during and since the war. The first curve represents the adjusted employment cycles in Massachusetts. The second represents the employment cycles obtained by analysis and inversion of the quarterly unemployment data for Massachusetts. The third curve represents the index that is probably

probable that a standardization of the industrial weights in the two periods will make the composite series more trustworthy as a continuous record for the years since 1915.

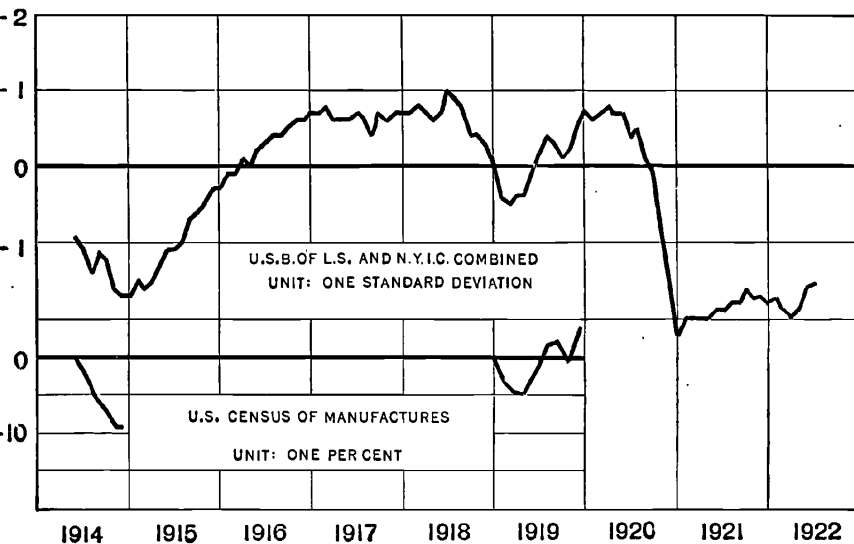
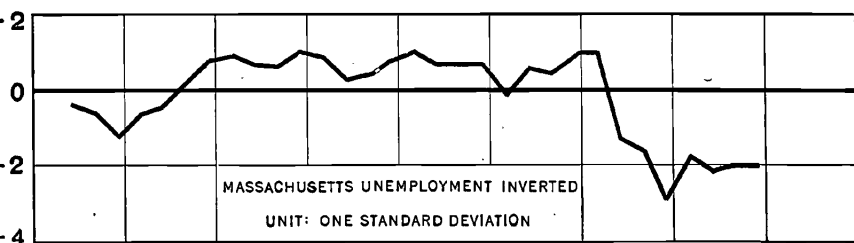
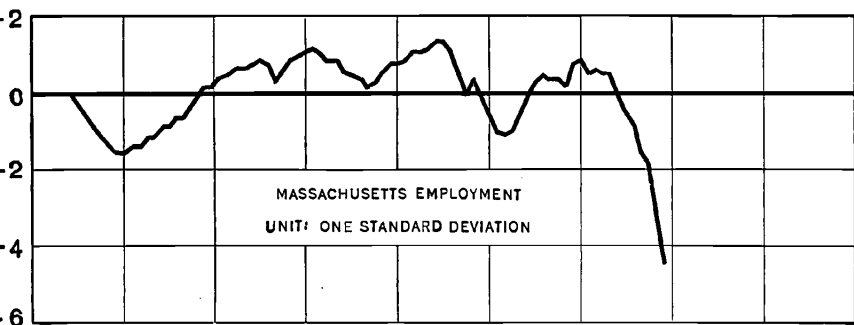
The writer's surmise on this point is confirmed by the independent study of the problem by A. J. Altmeyer, Secretary of the Commission, whose intention is now to standardize the weights.

For further facts on the nature of this series, see Industrial Commission of Wisconsin, *Biennial Report, 1918-1920*, esp. p. 81; also the Commission's monthly *Bulletins*.

¹ According to a recent communication from J. A. T. Gribbin, who also kindly placed at the writer's disposal the unpublished data for 1917 and 1918. Of course the year 1919 was covered by the U. S. Census canvass.

² The chief objections to its industrial composition are that (1) the iron and steel group is somewhat overweighted (21.3 vs. 15.8 per cent of the aggregate); (2) textiles are underweighted (16.7 vs. 21.3 per cent); vehicles are greatly overweighted (11.3 vs. 3.7 per cent); and lumber greatly underweighted (1.4 vs. 11.9 per cent).

CHART 6.—ADJUSTED INDEXES OF EMPLOYMENT, 1914-1922.



1914 1915 1916 1917 1918 1919 1920 1921 1922

the most reliable current measure of the general employment cycle in the United States which can readily be constructed in the present state of knowledge. It is an average of the employment indexes of the United States Bureau of Labor Statistics and the New York Industrial Commission corrected for seasonal variation, etc., like the other curves on Chart 6. At the foot of Chart 6 are shown the fragments representing the United States Censuses of Manufactures in 1914 and 1919, corrected for seasonal variation in the same manner as those at the foot of Chart 4.

The high order of correspondence among these curves is indicated by the following coefficients of correlation: United States Bureau of Labor Statistics with New York Industrial Commission (1915-1921) 95 per cent combination of these two, with Wisconsin series (1915-1921) 98 per cent adjusted combination, with Massachusetts employment series (1914-1920) 80 per cent; adjusted Massachusetts employment and unemployment series inverted (1914-1920) 89 per cent. Perhaps most important of all is the support indicated by the Census data, which agree with the combination of the two series with coefficients of 79 per cent for June-December 1914 and 97 per cent for the twelve months of 1919. Here as in the pre-war comparison the agreement is close in amplitude as well as in direction and form.

Why should the proposed current index be made up of the Bureau of Labor and the New York data but no others? The choice hinges on the purpose in view. The present purpose is to construct an index with the following properties; (a) its components must have been reported in a comparable form for a sufficiently long period to establish a basis for empirical test, comparison, and appraisal; (b) it must be reasonably representative, industrially and geographically; and (c) its components must be reported currently, in monthly form, with reasonable promptness and with accuracy.

Among all these series only the above-mentioned combination meets the three tests. The Massachusetts employment series lacks the third property, since the monthly figures for each year are not known until long after the end of the year. The unemployment data for Massachusetts are reported quarterly, not monthly. The New Jersey series is defunct. The Employment Service data fail to meet test (a).

Considering the indexes of the New York Industrial Commission and of the United States Bureau of Labor Statistics, we find that each meets test (a) better than do any others now being reported. The latter meets admirably the second half of test (b) concerning geographical representation, and judging by the industrial position of New York and the findings concerning employment in the pre-war period, the New York index must also be highly representative of the industrial states.

Each of these indexes fails, when taken alone, to meet the first half of test (b), since the former has been shown to overstress metals, and the

latter textiles. This failure is largely remedied by the mere process of combination; the textile and the iron industries are thereby restored more nearly to their true relationship. The groups including textiles and those including iron and steel and their products both enjoy a weight somewhat (though only moderately) in excess of their true importance.

In the light of all these facts, there is a very strong probability that the average of these two series shows the consensus of monthly employment fluctuations in the United States in recent years better than any other readily constituted index. The homogeneous and continuous nature of this combination forms an important Advantage. In support of its validity, it is worth noting that even if we did include in the average other series covering parts of the period 1914-1922, only slight differences from the average here shown would result.

Cycles of Employment since 1914.—According to the corrected index based on these two series, employment has passed through some interesting phases during the past eight years. These fluctuations may be attributed in part to the business cycle and in part to other factors, notably the changing situation as to immigration and the military demand for men. The depression of 1914-1915, the war boom of 1916-1918, the relapse during the half year after the Armistice, the boom of 1919-1920, the acute depression of 1920-1921, and the incipient recovery in recent months are in a measure reflections of the change in the demand for production, and therefore in one sense simply a passive factor in the business cycle. But during the war employment became a potent limiting factor.

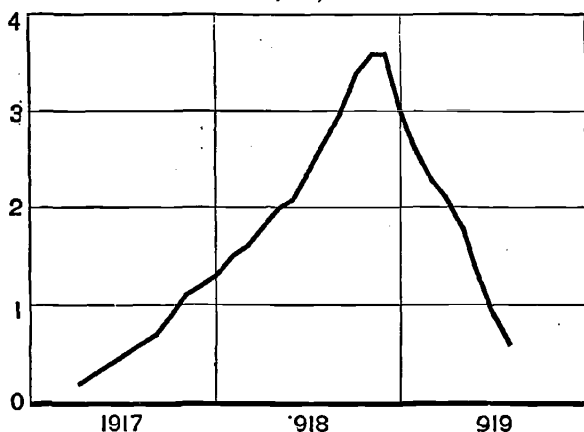
Our entry into the war introduced a tremendous new force into the industrial situation: in addition to war demands by our own government for goods, a direct call for man-power to be used in actual military operations. Military need for men affected the labor market enormously for a period of twenty months. During that time the labor supply became one of the factors which drastically limited economic activity. Enlistments, which increased immediately after our entry into the war, were supplemented by the first increment of the draft in the late summer of 1917 and in 1918 by several additional increments amounting to about 2,500,000 more men. The rapidly increasing drain of man-power from civil life is shown by Chart 7, representing the total army personnel by months.¹ The number increased from 200,000 to more than 1,000,000 before the end of 1917, and to 3,600,000 at the time of the Armistice, finally attaining a rate of increase of 400,000 men a month. These figures of course fail to tell the absolute magnitude of the loss of industrial wage-earners from civil life, partly because many were engaged in war work outside of the army and navy. They do, however, show fairly well the increasingly rapid rate of change in the supply of available man-

¹ AYRES, LEONARD P. "The War with Germany, a Statistical Summary," p. 15.

power, and consequently account for some of the dents in the employment curve. Undoubtedly, these dents would have been much deeper but for the heavy influx of women, youths, and young girls from home and school into industry, as well as that of adult male labor transferred from normal occupations in office or farm work to certain lines of manufacturing, under the double attraction of high wages and a deferred classification in the draft.

Demobilization shows an illuminating but quite different relation to the employment index. During the first six months after the Armistice, discharges took place at twice the average monthly rate of mobilization, reducing the strength of the army from 3,600,000 to 2,000,000 by April,

CHART 7.—UNITED STATES ARMY PERSONNEL,
APRIL, 1917 TO AUGUST, 1919.
UNIT: 1,000,000 MEN



and to 1,000,000 before July, 1919. The discharge of enlisted men alone averaged 400,000 a month during the first half of 1919.¹ It is evident from a comparison of Charts 6 and 7 that most of this huge labor supply was being dumped on a falling market. At the time when employers were rapidly dismissing their employees in the post-armistice slump,² soldiers were being discharged from the army. At the bottom of the slump in midsummer of 1919, 2,000,000 soldiers had been discharged, several hundred thousand of whom must have remained unemployed for months before being reabsorbed in industry.³ If the relapse of 1919 had not been fairly brief, there would have arisen still more urgently the

¹ Secretary of War, *Annual Report*, 1919, p. 17.

² This statement refers, of course, to the general index of employment. Employment had begun to improve earlier in the summer in some industries, notably textiles. See *The Review of Economic Statistics*, prel. vol. 4, January, 1922, p. 20, Chart 3.

³ The situation disclosed by the two curves probably accounts in part for the prevalent impression that the soldiers returning in 1919 "did not want to work." Apparently lack of the opportunity to work was also a potent factor.

question as to whether the demobilization policy allowed a rate of discharge so high that it hampered proper industrial reabsorption and precipitated a needless unemployment crisis.¹ In either event, the labor supply previously withdrawn from the market by military demands was restored so soon after the war that, when the recovery came in 1919-1920, industry could proceed unchecked by such potent limitations as had prevailed in the two preceding years and without need of resorting so widely to inexpert labor from other fields.

The severity of unemployment in 1920-1921 may be compared with that in earlier periods of the sort by noting the relative amounts by which employment falls off between a boom and the succeeding depression within each business cycle. The accompanying list shows that the available indexes of employment in manufacturing industries responded more violently to the recent depression than to earlier ones.

TABLE XI.—INDEXES OF EMPLOYMENT IN INDUSTRIES MOST EFFECTED BY DEPRESSION

Between the peak of the boom	And the bottom of the depression	Employment declined approximately
Middle of 1903	Middle of 1904	5%
Middle of 1907	First quarter of 1908	15
Early in 1910	Middle of 1911	5
Early in 1913	End of 1914 and early in 1915	10
Third quarter of 1918	Second quarter of 1919	15
Early in 1920	First half of 1921	25-30

It is possible, but unlikely, that much of this difference is due to differences in composition between the current and the earlier indexes. There seems good ground for believing that, in actual diminution of employment, the depression of 1921 was almost twice as acute as that of 1908 and at least twice as acute as that of 1914-1915.

V. CYCLES OF EMPLOYMENT AND PRODUCTION

One of the possible functions of an employment index mentioned at the beginning of this chapter is its use as a barometer of industrial activity. This may be demonstrated by comparing the employment index with an index of production.

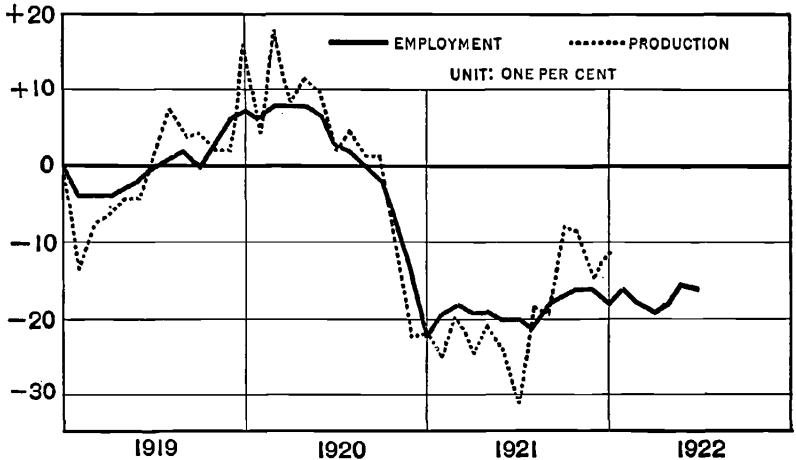
Unfortunately production data for only a few manufacturing lines were available in monthly form until recent years. One of the most comprehensive studies of these monthly production data is that of

¹ It may be observed that approximately the last million men were returned to civil life in more moderate installments, much better timed with reference to the business cycle.

Edmund E. Day. Chart 8 shows his unadjusted index for the period since January, 1919, covering production in a large number of lines of manufacture, and compared with it is the writer's employment index, likewise uncorrected for seasonal variation, etc.

Throughout the three years covered, the curves representing employment and production show change of direction at nearly the same time. Every critical movement is shown with almost equal clearness in both curves; the relapse after the Armistice, the recovery in the second, third, and fourth quarters of 1919, the culmination of the boom early in 1920, the ebb of prosperity, at first slow then precipitate, until the middle of 1921, and the gradual improvement since August. The correlation coefficient is +96 per cent, even higher than that between the two series entering the index of employment.

:CHART 8.—UNADJUSTED INDEXES OF INDUSTRIAL EMPLOYMENT AND PRODUCTION, 1919-1922.



Three significant differences between the curves appear. (1) Unlike production, the employment index was unaffected by the varying lengths of the months. For instance, in each February, production slumped owing primarily to the 10 per cent difference in the number of days included. Until corrected for seasonal variation, the production index therefore represents less well than employment the varying *intensity* of industrial activity. (2) The employment curve was much less disturbed than the production curve by the various strikes of September to December, 1919 and the winter of 1921. Partial explanation for this may be found in the fact that the supply of basic materials, which are the chief constituents of the production index, was affected much more by these disturbances than was the manufacture of semi-finished and finished goods, which could maintain itself during the interval presumably on a carry-over of raw materials. Moreover, employers doubtless hold their labor force over a

temporary shortage of raw materials incident to labor disputes in key industries; at least this is very likely at a time of prosperity such as the autumn and winter of 1919-1920. (3) The production curve, if the temporary effect of these labor disputes be smoothed out, clearly rose to a greater height in the boom of 1919-1920, and recently fell to a greater depth, than did the employment curve. Employment rose only about 8 per cent above its 1919 average, but production increased twice as much; in the recent depression, employment fell only about 20 per cent, production about 30 per cent, below the average for 1919. In other words, the production index fluctuates over a wider range than the employment index.

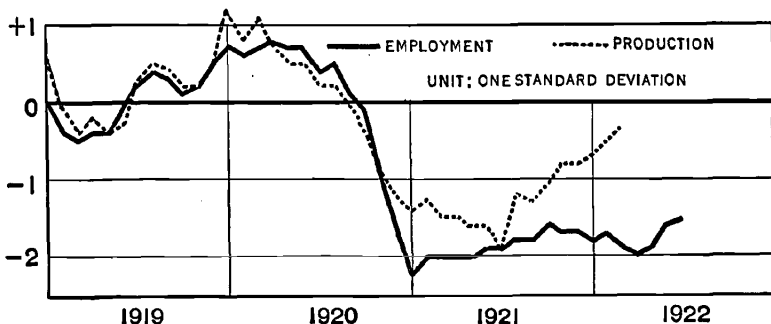
This difference in the amplitude of the two indexes is extremely important. To what is it due? It is impossible to get conclusive evidence on the point, but three considerations bear upon it. First of all, employment data are based on the number of employees on pay-rolls, and therefore *understate* the real extent of labor activity in *prosperity*, since overtime work does not increase the number reported; they also *overstate* the extent of activity in *depression*, since part-time work does not decrease the number. In other words, no distinction is made in the employment figures between workers who are engaged part time, full time and overtime. To a certain extent this tendency is counterbalanced by a second consideration—fluctuations in the efficiency of labor. During prosperity labor efficiency is likely to diminish, partly because of industrial fatigue due to speeding and working overtime, partly because of indifference to duty in the face of plentiful opportunities for work in other establishments, and partly because of the hiring of untrained or inferior workers; in a depression the reverse is the case.¹ A third consideration is the fact that the production index is necessarily derived, in large measure, from data on the production of basic materials, such as sole leather and steel ingots, more than finished goods, such as shoes and machinery. The reason is that, in more advanced stages of manufacture, units of output are so varied and complex that few reliable data on production at these stages can readily be obtained. The employment data, on the other hand, relate to industrial groups at all stages of fabrication. If, as seems probable, the production of basic materials responds more decisively to the course of the business cycle than does that of finished goods,² the production curve must swing through a greater range of variation than the employment curve.

¹There are also forces which tend to decrease rather than increase efficiency during depression—such as the greater desire of workmen to “stretch out” their work as far as possible. But in the view of the writer this group of psychological forces is subordinate to that outlined above.

²DAY, EDMUND E. The Measurement of Variations in the National Real Income, *Quarterly Publication of the American Statistical Association*, March, 1921, vol. XVII p. 559.

Changes in labor efficiency would thus lead probably to *wider* fluctuations in the employment curve than in the production curve. On the other hand the existence of overtime or part-time work, and the probably greater sensitiveness of the production of basic materials would lead to *narrower* fluctuations in the employment curve, such as Chart 8 actually shows.¹ Although little can be said as to the relative importance of

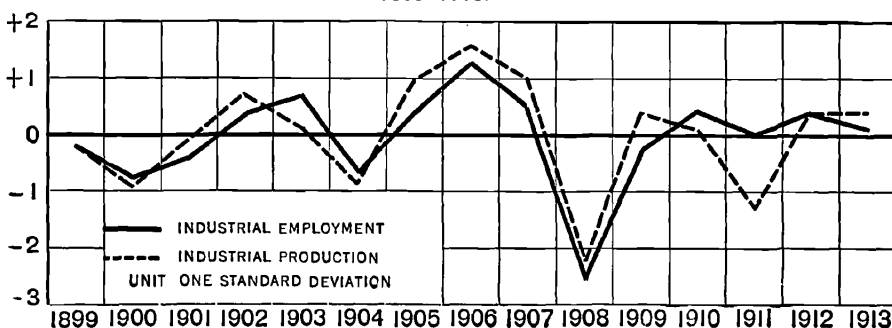
CHART 9.—ADJUSTED INDEXES OF INDUSTRIAL EMPLOYMENT AND PRODUCTION, 1919-1922.



these factors, probably the failure of employment data to take account of overtime or part time is the main reason for the narrower range of fluctuations.

Chart 9 shows the employment and production indexes fully corrected for seasonal variation, etc. Here as in certain earlier charts the inequalities in amplitude of the two curves have been lessened by using the

CHART 10.—EMPLOYMENT AND PRODUCTION OF ALL MANUFACTURES, 1899-1913.



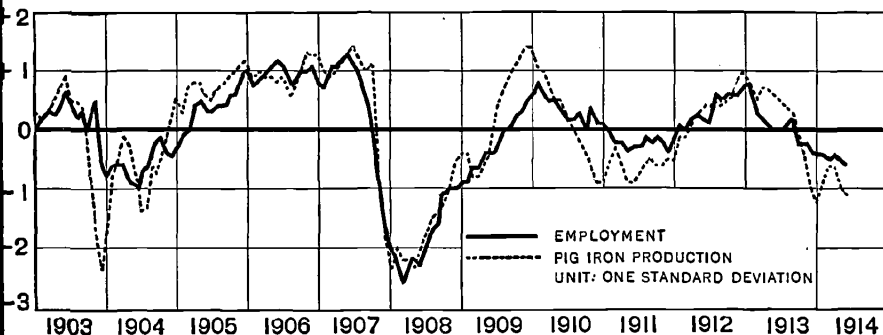
standard deviation as the vertical unit. Again the correlation coefficient is 96 per cent.

¹ Incomplete allowance for "mushroom establishments" also tends to reduce the amplitude of the employment boom. The New York Industrial Commission definitely excludes these by covering only establishments which reported in June, 1914; the U. S. Bureau of Labor Statistics does not.

Chart 10 shows the employment index thrown into annual form and extended back to 1899. It is constructed by weighting the New York, Massachusetts, and New Jersey data on the 5-3-2 basis.¹ The curve is shown for comparison with Day's annual production index for all manufacture.² The correlation is very high, being represented by a coefficient of 86 per cent.

These two agreements—in annual form before the war and monthly form since the war—are very close despite the differences in the source and nature of the two groups of data. The high order of the agreements suggests the possibility of utilizing employment as an index of monthly production cycles prior to the war. Since very few other production series than that for pig iron were available in monthly form prior to the

CHART 11.—GENERAL EMPLOYMENT AND PIG IRON PRODUCTION, 1903-1914.



war, employment provides a much more comprehensive basis for picturing the monthly pre-war cycles of industrial activity than can be obtained from evidence as to production. The employment index covers not only a much wider variety of lines, but many more advanced stages of fabrication than could be represented in an index based on monthly production data.

Chart 11 shows the monthly index of employment, compared with pig iron production. Here again the agreement is very close (89 per cent). Further substantiation of the validity of employment as an

¹ Here the Massachusetts component was obtained by taking the average of the employment and the reversed unemployment figures. To center the average of the quarterly unemployment cycles in the middle of the calendar year, a five-quarter rather than a four-quarter average was used: December 31 of the previous year, and March 31, June 30, September 30, and December 31 of the current year.

The New York unemployment data are based upon the reports of all the unions in the state, rather than the representative selection (one-fourth to one-third as great) embodied in the monthly data.

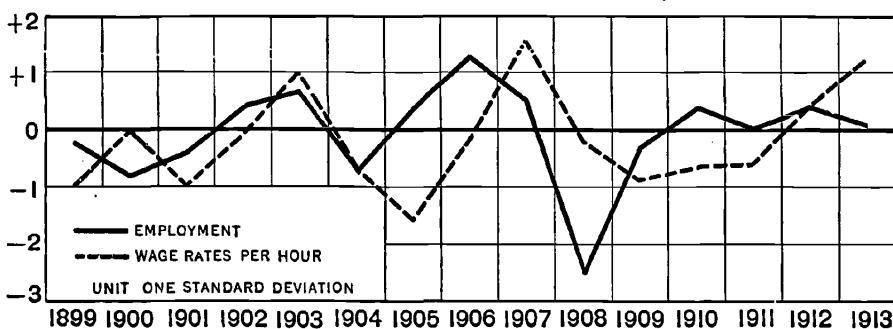
² DAY, EDMUND E., *An Index of the Physical Volume of Production*, pp. 62-3.

index of industrial activity is found in the relation¹ of employment to other series representing the volume of activity, such as bank clearings outside New York City. These relationships afford conclusive evidence that employment forms a highly satisfactory index of industrial activity both before and since the war.

VI. CYLES OF EMPLOYMENT AND BUYING POWER

The employment index is useful not only as a guide to the labor market and to the course of industrial activity, but also to fluctuations in buying power. Any shrinkage of employment tends to curtail the earnings, and therefore the effective demand, of the working group involved; this curtailment of demand may lead to further shrinkage of employment in other lines, then to further curtailment of demand, and so on. In every depression this vicious circle rapidly spreads until it involves, directly or indirectly, a very large part of the urban population.

CHART 12.—EMPLOYMENT AND WAGE RATES, 1899-1913.



Employment affects buying power not only through its direct influence on the volume of earnings, but also indirectly through its influence on the rise and fall of rates of wages. Chart 12 shows the relation between cycles of employment and of wage rates² from 1899 to 1913. At several turning-points in both depressions and booms, wage-rates lag decisively after employment. Whether this lag is a full year or not is uncertain, as no reliable data on wages were available before the war except in annual form. If the pre-war lag was only six to ten months,³

¹ Described in *The Review of Economic Statistics*, prel. vol. 4, January, 1922, pp. 36-9.

² This series represents wage rates per hour, according to the investigations of Messrs. Rubinow and Douglas and Miss Lamberson, based on U. S. Bureau of Labor data. Compare PAUL H. DOUGLAS and FRANCES LAMBERSON, *The Movement of Real Wages, 1890-1918*, *American Economic Review*, September, 1921, vol. XI, p. 417.

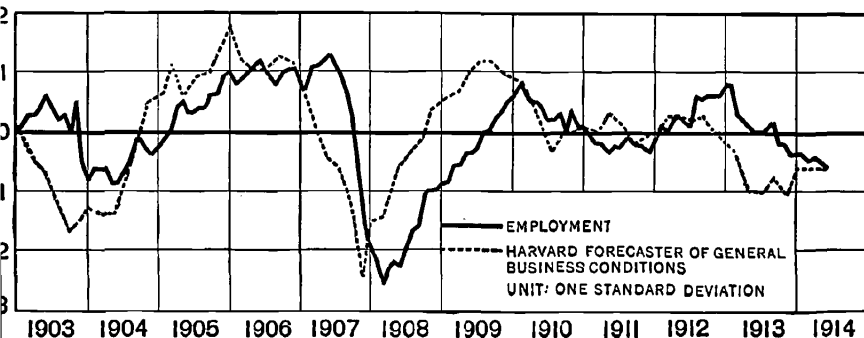
³ This is approximately the lag of recently constructed quarterly and monthly wage indexes after the employment index, for the period 1914-1922. See W. RANDOLPH BURGESS, *Index numbers for the wages of common labor*, *Journal of American Statistical Association*, vol. XVIII, p. 103.

the annual data might well appear as in Chart 12. How much the lag between employment and the composite purchasing power is still more problematical. In amplitude employment appears to be much more sensitive to the business cycle than wage rates, perhaps more than twice as sensitive.¹ This means that the composite product representing pecuniary buying power probably lags less than half as long after employment as do wage rates. It seems clear that the employment index precasts by a few months the commercial buying power of those large numbers of our people whose earnings are in the form of industrial wages. Indirectly, of course, this fact is quite as full of meaning to the social worker as to the business man.

VII. FORECASTING EMPLOYMENT CYCLES FROM OTHER STATISTICAL SERIES

This naturally raises the question whether unemployment itself can be forecasted from the fluctuations of other economic indexes. Warren M. Persons has clearly demonstrated the possibility of forecasting general business conditions on the objective basis of statistical and economic

CHART 13.—EMPLOYMENT AND A BUSINESS FORECASTER, 1903-1914.



analysis.² Although Persons gave no attention to data representing employment or unemployment in constructing his barometer and his precaster of business, the forecaster does very effectively forecast unemployment, as is shown in Chart 13. The writer's analysis of employment, though conducted as an independent research without reference to any other economic indexes, "ties in" so well with several members of

¹ As measured by the standard deviation of the employment and wage indexes, which were approximately 3.5 and 1.5 per cent, respectively, between 1899 and 1913. Since the employment index does not take into account either overtime or part time, 3.5 per cent is really a lower limit of the elasticity of employment fluctuations.

² *The Review of Economic Statistics*, prel. vol. 1, January and April, 1919, pp. 205. For a more compact and non-technical treatment see WARREN M. PERSONS *Interpretation of the Index of General Business Conditions*, 1922.

Persons' business group ("Group B") that his general business forecaster proves satisfactory for our purpose also. The problem of forecasting cyclical unemployment is essentially that of forecasting business conditions.

The close linkage shown to exist between cyclical employment and its economic correlatives should lead everyone who is interested in employment—whether for commercial or industrial or social purposes—to keep in touch with the measurements and forecasts.¹ Eventually, perhaps we shall achieve positive control over some of the more harmful phases of the business cycle, but until this is done the ability to trace current fluctuations of employment, and to forecast its future fluctuations a few months in advance, may go far to alleviate the evils due to the intimate relation of unemployment to business cycles.

¹ For a description of various business forecasting services see Chap. XX, below.