400 Memorial Drive,

Cambridge, Mass.

May 13, 1933

Prof. A. L. Merrill,
Secretary of the Faculty,
Massachusetts Institute of Technology,
Cambridge, A, Mass.

Dear Sir:

Herewith we submit our thesis entitled " An Index of Composite Productivity" in accordance with the requirements for the degree of Bachelor of Science in General Engineering.

Respectfully yours,

Signature Redacted

Robert G. Holt

Signature Redacted

William W. Laird,Jr.

Signature Redacted

Chas. F. Van de Water

AN INDEX
OF
COMPOSITE PRODUCTIVITY

BY

ROBERT GERALD HOLT

WILLIAM WINDER LAIRD

CHARLES FRANKLIN VAN DE WATER

1933

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AN INDEX OF COMPOSITE PRODUCTIVITY

INTRODUCTION :

During the present period of decline in business activity and consequent hardships, many explanations as to the cause of this depression have been presented to the public. Among others, Technocracy has played its part in causing thinking men to study the situation from all aspects and to attempt forecasts as to the probable outcome of conditions as they exist today. It is not the purpose of the writers to attempt any definite proof or refutation of statements made by the advocates of Technocracy. Statistics which substantiate the proposals of Technocrats, however, are meagre in the form in which they are presented. While the principles of Technocracy are indeed drastic and of a highly accusing nature with regard to the machine age in spite of this lack of supporting evidence, nevertheless, it is generally felt that there is a definite correlation between business conditions and the fundamental conaptions of Technocracy.

PURPOSE :

It was a desire on the part of the writers to discover the correlation mentioned above which led

to the study presented on the following pages. Supporters of Technocracy claim that the advancements in machine production have created a situation whereby great numbers of workers have been discharged with no possibility of finding other gainful occupations. Such conclusions by this school of thought have been based on a few outstanding industries which are, due to their very nature, of a rather startling character. To a certain degree, such industries affect conditions as a whole, but a true picture can be obtained only through a study of basic industries. To obtain such a picture necessitates gathering statistics as to the number of men employed in an industry, the amount produced by that industry, and finally a ratio of these two. From such a ratio, one can determine a general trend of output per employee as affected by mechanical improvements, shorter hours, and so forth. When such a procedure has been followed through for the basic industries, a final composite index can be obtained which might indicate technological causes as well as the external causes leading up to the present general conditions. At this point, the reader may ask the question, "What may be considered a basic industry ?" Of necessity, one is limited in his choice due to insufficient data. It has been the

policy of the writers, however, to consider an industry as basic when the products of that industry are considered a necessity by the buying public. As representative of the vast number of industries which might be called basic, the authors have chosen the following : wool, automobile, cotton, slaughtering and meat packing, boots and shoes. In addition to the above list, rubber and steel were included because other industries which do manufacture products demanded by the public are dependent upon them. As a matter of convenience, further reference to these industries will be made by the term "fundamental industries".

RESULTS AND CONCLUSIONS :

The results of the authors' work as above planned and as outlined in fuller detail on the following pages are given below:

1. Employment in the fundamental industries, separately and collectively, has been quite constant. In most cases over the period 1919 to 1930, when mechanical improvement was most prevalent there has been a gradual increase.

2. With regard to production, the same situation of a gradually increasing trend is to be found,

the slope being slightly greater than the corresponding trend for employment.

3. The final trend of monthly output per employee has a slope giving about a 1% increase. This is to be expected when considering results 1. and 2.

From these results, the following conclusions may be drawn :

When considering the longer period of 1919 to 1930, advocates of Technocracy have greatly overemphasized man's displacement by the machine. Although machine production increased, the number of men employed either remained constant or increased. True it is that production increased at a faster rate, but not to the extent that manufacturers found it desirable to reduce the number of employees. Also, it is the belief of the authors that the rate of increase of monthly unit output per employee was not sufficiently great to warrant any of the serious charges made by the believers of Technocracy in bringing on present conditions. At this point, the authors are desirous of making absolutely clear that they do not believe leaders of industry were wise in pushing production to the capacity reached in 1928 - 1929. Furthermore, the authors are of the opinion

that increased production was due more to increased size of plant rather than to technological improvements in methods and processes. Whatever technological improvements were made during this period did not cause the serious displacement of workers as claimed by the Technocrats.

Further study of the final figures as shown graphically ~~in Appendix~~ on p. // has led to the following conclusions of more minute detail.

1. The output per employee fluctuates, this fluctuation closely following the business cycle and business activity.

2. Production is forced nearer to capacity during the summer months. This is shown by the decidedly seasonal fluctuations which reach a maximum during this time of the year, in spite of the fact that seasonal correction was made in the compilation of the accompanying data. It is the belief of the authors that this fluctuation is due to causes now given :

a. During the warm months, wool manufacturers produce for the demand which will be made with the advent of cold weather.

b. There is increased automobile production during the summer in preparation of the new

models presented to the public in the fall. This fact is substantiated by noting a similar occurence previous to presentation of the spring models.

c. Cotton production is comparatively steady throughout the season.

d. As a large percentage of the rubber products are absorbed by the automotive industry, rubber manufacturing would necessarily resemble a similar cycle of increased production during the early spring and mid-summer.

e. Slaughtering and meat packing follows the constant demand and production cycle.

f. A study of the iron and steel industry shows that its maximum production and employment comes during the months of January and February. This situation is explained by the fact that the industry depends greatly for its outlet upon building construction and the railroads. Hence, preparation is made for the demand which comes during the summer season.

g. The boot and shoe manufacturers regulate their production in such a way that a maximum is reached during the spring and fall in anticipation of the seasonal demands.

With the exception of the iron and steel in-

dustry, which is outstandingly different in its time of maximum production and employment, all fundamental industries follow practically the same procedure, namely, preparation for seasonal demand. This fact explains in great part the seasonal fluctuations noted.

3. The cycle of output per employee takes a decided slump after the year 1930. This is probably a result of the reduced working day. Such a conclusion is all the more plausible when one considers the fact that reductions in employment were much less drastic than the decrease in unit output.

4. It is the opinion of the authors, following their research, that industries in general do not follow the policy of discharging workers unless forced into such a step. Instead, output is reduced. A comparison of data for the depression of 1921 (to) the data for 1929 only tends to strengthen such a conclusion.

5. At the end of their study, the authors reached two very definite conclusions. First, the need for complete and accurate data. At present, statistical data are difficult to obtain, and then only in a very inadequate form. For this reason, the person who would use statistical data is of necessity limited when

attempting to draw accurate conclusions. Secondly, that statistics can be made to prove anything provided assumptions are made. It has been the intentions of the authors throughout this study to make only those assumptions which were logical and in keeping with the available information. It is self-evident, however, that other individuals making other assumptions would arrive at conclusions far different from those herein presented.

GENERAL NOTES ON EMPLOYEE PRODUCTIVITY SERIES

Sources. The employment figures available represent only a small fraction of the total number of employees in any of the fundamental industries included in this study. The percentage of the total varies radically in most of the series for the years 1919 through 1924. After this the proportion of reported to total becomes nearly constant, so that whatever the fraction reported in 1924 be, regardless of how far it is from the total, it is assumed to be perfect, or 100% reported. Corrections made in several of the series are based on this fact. For explanation of the method of correction see Appendix C-2. Reference to this section of the Appendix, and further explanation of the corrections applied to each series will be given in the discussion attatched to each of the separate Employee productivity curves.

Some of the Production figures are in reality the consumption by the mills of the raw materials, such as crude rubber, raw wool, or the like. This fact may introduce a slight lag in the series as buying on price-falls and subsequent storage may indicate a slightly larger figure for the month than the true output of finished product. However, in the long run, over a period of two or three years this raw material is bound to be turned into manufactured goods, as the industries under this head are not in the habit of keeping on hand a large inventory of relatively perishable goods. The trend of productivity will therefore be a true representation for any year or so, even if any two consecutive months might lead to a diametrically opposite conclusion.

Base Years. In most cases where the authors had to assume a base year for their indices the average monthly figure for the years 1923 through 1925 was assumed to be normal and equal to 100. This was done firstly because that period was free from wild booms or depressions, secondly because it comes near to the middle of the period studied, and thirdly because the indices which were already computed were either to this base or to Jan. 1923 equals 100 .

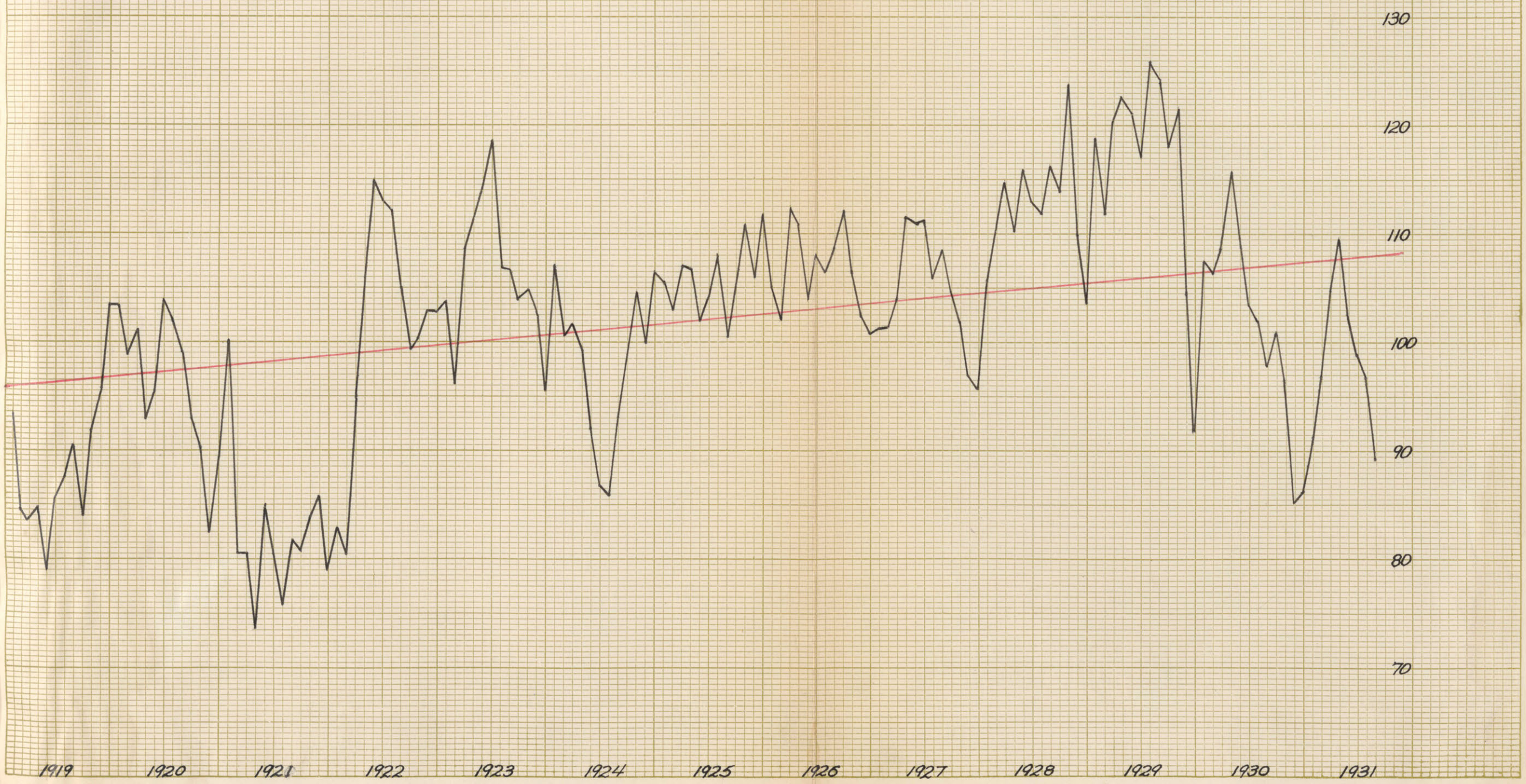
Secular Trend and Seasonal . The period chosen for the computation of these factors was 1919 through 1926. In order to be able to use the few seasonally corrected series and the few seasonal factors furnished by the Times Annalyst Service, it was necessary to be consistent in the choice of a period for computation. Most of the Annalyst seasonals are based on 1919 through 1926

It should be noted by the reader that in the tabulation of the various series there is a column headed % Actual/Secular. In some cases this column contains the true percent of the secular, either more or less than 100%. In other series the percent is expressed in terms of the difference between Actual/Secular and 100%. If the ratio is greater than 100% there is a plus sign, if less than 100%, a minus sign.

Duration of Series.

Since the object of this study is to obtain a general long time trend of the efficiency of employees in the basic industries of the country, it would be obviously misrepresenting the case to base any conclusions on figures carried over into the heart of the depression. The series start in 1919 in order to get the benefit of the immediate post war impetus received by manufacturing technical advance. It is extended to the end of 1931, mainly to be as near up-to-date as possible without including the odd-hour work, the six-hour day and the five day week which began to take hold in industry early in 1932. Such reduction of hours when not accompanied by a corresponding reduction in employees will naturally make the employee productivity fall off far beyond any representative value, consistent with the long time trend which is undoubtedly upwards.

Composite Ratio of Production to Employment



COMPOSITE INDEX NUMBERS

	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931
January	93.47	103.24	99.91	82.83	103.59	106.64	105.23	104.88	101.15	105.45	118.57	107.42	91.28
February	84.43	98.55	80.48	80.40	95.99	100.30	102.80	101.89	101.18	110.02	111.73	106.18	96.85
March	83.55	100.79	80.49	94.83	108.44	101.56	106.74	112.43	103.85	114.83	120.49	108.41	104.44
April	84.58	92.57	73.85	105.74	111.37	98.98	106.65	110.63	111.31	110.05	122.49	115.49	109.60
May	78.66	95.37	84.58	114.52	113.51	91.36	101.78	103.54	110.85	115.64	120.97	108.73	102.53
June	85.28	103.41	80.55	112.82	118.33	86.67	103.92	107.97	110.82	112.62	116.91	103.41	98.63
July	87.41	101.89	75.91	112.00	106.72	85.85	107.69	106.10	105.58	111.89	125.72	101.79	96.78
August	90.45	98.89	81.55	104.69	106.34	92.67	100.32	108.58	108.25	116.25	124.00	97.75	89.17
September	83.83	92.78	80.54	99.22	103.74	98.50	104.86	111.85	104.28	113.70	117.91	100.67	
October	91.54	90.08	83.73	100.24	104.62	104.53	101.51	107.33	101.85	123.43	121.67	96.47	
November	95.46	82.22	85.85	103.68	102.13	99.57	105.72	102.32	96.83	109.45	104.25	85.00	
December	103.12	89.04	78.88	103.51	95.36	106.35	111.51	100.78	95.60	103.47	91.50	86.01	
Total	1061.78	1148.83	986.32	1214.28	1270.14	1172.98	1267.73	1277.30	1251.55	1346.80	1396.21	1217.33	
Average	88.48	95.74	82.20	101.9	105.85	97.75	105.64	106.44	104.30	112.23	116.35	101.44	

FINAL INDEX FIGURES

1919-Weights	Jan.		Feb.		March		April		May		June		July		August		Sept.		Oct.		Nov.		Dec.	
Automobiles	1270																							
Boots & Shoes																								
Cotton	2650																							
Iron	5040																							
Rubber																								
Slaughtering																								
Woolen Goods	1040																							
Weighted Ratios																								
Automobiles	50.4	6.41	46.2	5.87	57.7	7.33	54.3	6.90	57.0	7.28	57.3	7.28	51.5	6.54	56.7	7.20	60.1	7.68	64.0	8.13	66.0	8.39	72.7	9.24
Boots & Shoes																								
Cotton	127.6	33.82	98.2	26.15	88.2	23.41	114.0	30.25	108.5	27.39	103.3	27.39	99.6	26.45	89.4	23.71	105.8	28.05	105.5	27.99	99.9	26.49	139.5	37.00
Iron	88.0	44.35	84.2	42.43	82.8	41.81	74.3	37.46	62.1	40.13	79.6	40.13	84.3	42.50	96.5	48.62	74.6	37.59	89.2	44.95	101.4	51.10	91.8	46.29
Rubber																								
Slaughtering																								
Woolen Goods	85.5	8.89	96.0	9.98	105.8	11.00	95.9	9.97	109.0	10.48	100.9	10.48	114.6	11.92	105.0	10.92	101.0	10.51	100.7	10.47	91.2	9.48	101.9	10.59
Total		93.47		84.43		83.55		84.58		78.66		85.28		87.41		90.45		83.83		91.54		95.46		103.12
1920-Weights																								
Automobiles	1270																							
Boots & Shoes																								
Cotton	2650																							
Iron	5040																							
Rubber																								
Slaughtering																								
Woolen Goods	1040																							
Weighted Ratios																								
Automobiles	74.7	9.50	56.0	7.12	67.4	8.55	46.1	5.86	56.5	7.18	69.5	8.83	61.3	7.80	72.1	9.17	71.7	9.12	68.3	8.69	70.2	8.92	76.4	9.71
Boots & Shoes																								
Cotton																								
Iron	131.5	54.90	103.0	27.22	112.0	29.72	114.7	30.43	107.5	28.52	139.0	36.88	105.3	27.92	89.1	23.62	95.9	25.43	87.8	23.30	83.8	23.23	108.1	16.93
Rubber	93.4	47.09	106.5	53.68	102.0	51.42	90.4	46.58	99.3	50.02	97.2	49.00	98.5	49.64	104.4	52.60	97.8	49.30	98.2	49.50	87.2	43.95	108.1	54.51
Slaughtering																								
Woolen Goods	113.0	11.75	101.2	10.53	106.7	11.10	102.9	10.70	92.8	9.65	83.6	8.70	159.0	16.53	129.8	13.50	85.9	8.93	82.6	8.59	68.5	7.12	75.9	7.89
Total		103.24		98.55		100.79		92.57		95.37		103.41		101.89		98.89		92.78		90.68		82.22		89.04

FINAL INDEX FIGURES

1921-Weights	Jan.		Feb.		March		April		May		June		July		August		Sept.		Oct.		Nov.		Dec.	
Automobiles	1128																						1476	
Boots & Shoes	1111																						1454	
Cotton	2356																							
Iron	4481																						5860	
Rubber																								
Slaughtering																								
Woolen Goods	924																						1210	
Weighted Ratios																								
Automobiles	72.4	8.16	55.0	6.21	72.1	8.13	69.5	7.84	66.5	7.58	94.0	10.60	83.0	9.36	94.7	10.67	84.7	9.57	76.0	8.57	69.5	7.84	58.1	8.57
Boots & Shoes	105.0	11.66	101.5	11.29	90.7	10.06	90.4	10.05	91.7	10.19	98.9	10.98	115.8	12.87	100.0	11.11	100.5	11.17	90.9	10.10	96.8	10.75	95.4	13.86
Cotton	84.0	19.80	100.3	23.63	104.5	24.61	86.9	20.48	113.5	26.74	98.6	23.25	90.2	21.24	99.5	23.45	98.1	23.11	101.2	23.85	109.6	25.82		
Iron	119.6	51.40	71.4	32.02	62.9	28.21	58.7	26.32	66.9	30.00	57.6	25.82	52.1	23.48	59.5	26.70	60.7	27.32	70.9	31.80	71.4	32.01	71.0	41.60
Rubber																								
Slaughtering																								
Woolen Goods	96.2	8.89	79.3	7.33	102.7	9.48	99.1	9.16	109.8	10.15	107.1	9.90	97.0	8.96	103.9	9.60	101.5	9.37	101.9	9.41	102.1	9.43	122.7	14.85
Total		99.91		80.48		80.49		73.85		84.58		80.50		75.91		81.55		80.54		83.73		85.85		78.88
1922-Weights																								
Automobiles					1680										1128		1041							
Boots & Shoes					1654										1111		1025							
Cotton															2356		2173							
Iron					6666										4481		4134							
Rubber																								
Slaughtering																	775							
Woolen Goods															924		852							
Weighted Ratios																								
Automobiles	67.6	9.98	63.1	9.32	85.4	14.34	89.3	15.00	91.8	15.42	104.9	17.62	86.1	14.46	107.9	12.16	80.6	8.40	84.4	8.80	99.1	10.33	118.4	12.34
Boots & Shoes	91.4	13.28	97.5	14.17	85.3	14.10	107.2	17.74	108.2	17.90	102.7	17.00	107.5	17.78	108.5	12.05	106.5	10.91	111.7	11.45	120.5	12.35	114.2	11.71
Cotton															123.4	29.06	114.7	24.94	100.7	21.91	115.3	22.90	109.0	23.74
Iron	80.3	47.03	76.8	45.00	99.6	66.39	109.5	73.00	121.9	81.20	117.3	78.20	119.6	79.76	84.6	37.90	88.0	36.40	100.9	41.75	97.5	40.32	95.1	39.32
Rubber																								
Slaughtering																	101.8	7.92	95.5	7.40	100.6	7.83	100.8	7.84
Woolen Goods	103.6	12.54	98.4	11.91											146.5	13.52	125.0	10.65	104.9	8.93	116.7	9.95	101.0	8.60
Total		82.83		80.40		94.83		105.74		114.52		112.82		112.00		104.69		99.22		100.24		103.68		103.51

FINAL INDEX FIGURES

1923-Weights	Jan.		Feb.		March		April		May		June		July		August		Sept.		Oct.		Nov.		Dec.	
Automobiles	976																							
Boots & Shoes	962																							
Cotton	2039																							
Iron	3874		(same weights continue																					
Rubber	622		from here on)																					
Slaughtering	727																							
Woolen Goods	800																							
Weighted Ratios																								
Automobiles	112.2	10.95	88.2	8.61	109.3	10.66	97.5	10.51	98.4	9.60	106.0	10.35	91.0	8.88	108.4	10.57	102.5	10.00	108.0	10.55	103.7	10.11	128.6	12.55
Boots & Shoes	98.2	9.44	108.3	10.41	100.4	10.61	97.8	9.40	101.0	9.72	120.7	11.61	99.4	9.55	105.2	10.12	87.5	8.41	102.5	9.87	97.9	9.41	86.9	8.35
Cotton	97.2	19.81	95.8	19.55	121.1	24.71	115.1	23.48	121.5	24.78	123.4	25.15	109.3	22.29	123.0	25.09	126.0	25.69	127.8	26.04	115.0	23.46	99.9	20.36
Iron	103.9	40.27	94.0	36.40	97.7	37.83	118.1	45.80	117.6	45.60	125.0	48.42	118.6	46.00	103.5	40.10	104.7	40.59	95.4	36.88	98.0	37.98	84.0	32.53
Rubber	91.2	5.67	92.4	5.74	102.5	6.37	82.5	5.13	101.5	6.31	77.5	4.82	63.6	3.95	73.5	4.57	73.7	4.58	90.3	5.61	89.6	5.57	98.6	6.13
Slaughtering	97.1	7.06	108.5	7.89	123.9	9.01	124.5	9.05	123.2	8.96	128.8	9.36	112.6	8.19	110.3	8.02	95.8	6.96	103.1	7.50	106.0	7.71	109.2	7.94
Woolen Goods	129.9	10.39	92.4	7.39	116.6	9.25	99.9	8.00	106.7	8.54	107.7	8.62	98.2	7.86	98.3	7.87	93.9	7.51	102.0	8.16	98.6	7.89	93.7	7.50
Total		103.59		95.99		108.44		111.37		113.51		118.33		106.72		106.34		103.74		104.62		102.13		95.36
1924-Weighted Ratios																								
Automobiles	118.2	11.54	102.0	9.86	103.6	10.11	93.7	9.14	85.3	8.32	85.1	8.31	91.0	8.88	106.6	10.40	111.9	10.92	105.1	10.26	96.2	9.38	104.3	10.17
Boots & Shoes	91.8	8.83	100.5	9.67	99.7	9.58	98.6	9.48	97.9	9.41	115.6	11.11	100.0	9.62	96.0	9.23	97.0	9.32	105.9	10.18	105.5	10.15	98.4	9.46
Cotton	116.9	23.82	105.0	21.40	103.2	21.04	102.7	20.94	89.5	18.25	77.0	15.70	87.7	17.89	85.6	17.46	103.9	21.19	121.0	24.68	111.8	22.80	111.3	22.70
Iron	99.9	38.71	98.4	38.12	100.7	39.04	96.8	37.50	86.9	33.68	81.3	31.50	71.2	27.60	83.2	32.22	84.8	32.86	91.0	35.24	90.0	34.88	98.9	38.31
Rubber	105.4	6.55	97.0	6.03	99.2	6.13	97.9	6.08	94.2	5.86	91.8	5.71	102.0	6.34	112.0	6.96	123.4	7.67	122.4	7.61	108.1	6.72	113.9	7.08
Slaughtering	107.5	7.82	112.1	8.16	108.5	7.89	110.5	8.04	124.5	9.05	111.6	8.12	119.0	8.65	113.4	8.24	114.4	8.31	109.1	7.94	112.3	8.17	124.5	9.09
Woolen Goods	117.1	9.37	88.2	7.06	97.1	7.77	97.5	7.80	84.8	6.79	77.7	6.32	85.8	6.87	102.1	8.17	102.9	8.23	107.8	8.62	93.4	7.47	121.0	9.68
Total		106.64		100.30		101.56		98.98		91.36		86.67		85.85		92.67		98.50		104.53		99.57		106.35
1925-Weighted Ratios																								
Automobiles	77.7	7.50	94.6	9.23	116.4	11.35	110.3	10.87	99.1	9.67	110.0	10.73	105.0	10.25	76.1	7.43	92.5	9.02	113.8	11.10	108.0	10.54	102.0	11.90
Boots & Shoes	97.4	9.36	102.7	9.88	103.5	9.96	101.4	9.76	95.3	9.27	119.1	11.45	106.0	10.19	97.4	9.36	102.7	9.88	103.1	9.92	93.2	8.96	95.2	9.15
Cotton	112.8	23.00	118.0	24.08	111.8	22.80	115.4	23.52	104.3	21.27	99.2	20.05	113.0	23.03	100.2	20.43	112.4	22.90	115.7	23.66	113.5	23.12	120.1	24.50
Iron	109.7	42.52	98.3	38.09	105.2	40.79	103.6	40.18	102.9	39.89	99.7	38.61	102.2	39.61	102.7	39.30	103.4	40.08	110.2	42.71	107.2	41.55	109.9	42.60
Rubber	99.0	6.15	102.1	6.35	105.0	6.52	107.9	6.72	108.3	6.74	116.6	7.26	120.4	7.49	106.7	6.64	105.7	6.57	102.3	6.36	108.7	6.76	111.4	6.93
Slaughtering	116.9	8.50	109.7	7.98	100.6	7.32	108.1	7.86	103.9	7.55	111.6	8.12	115.4	8.39	111.2	8.09	113.7	8.27	116.3	8.46	102.3	7.44	111.7	8.56
Woolen Goods	101.5	8.12	89.9	7.19	100.0	8.00	97.0	7.76	92.4	7.39	96.3	7.70	109.1	8.73	107.1	8.57	101.7	8.14	104.5	8.36	91.9	7.35	98.3	7.87
Total		105.23		102.80		106.74		106.65		101.78		103.92		107.69		100.32		104.86		110.51		105.72		111.51

Final Index Figures

1926-Weighted Rat.	Weights	Jan.		Feb.		March		April		May		June		July		August		Sept.		Oct.		Nov.		Dec.	
Automobiles	976	110.3	10.76	96.5	9.41	112.6	10.98	104.2	10.16	103.1	10.06	106.6	10.40	97.0	9.46	126.8	12.36	121.1	11.82	101.3	9.89	95.6	9.33	84.3	8.23
Boots & Shoes	962	91.2	8.77	92.8	9.40	106.9	10.28	97.6	9.38	91.6	8.80	123.2	11.35	102.8	9.89	103.4	9.94	111.2	10.70	103.3	9.93	100.0	9.62	98.0	7.42
Cotton	2039	109.0	22.22	119.9	24.43	121.5	24.77	110.7	22.59	89.0	18.15	93.1	18.98	89.3	18.20	95.7	19.51	111.2	22.67	101.7	20.73	102.4	20.88	103.3	21.06
Iron	3874	108.0	41.89	97.4	37.72	108.7	42.15	114.3	44.30	115.2	44.68	113.9	44.12	116.5	45.18	110.4	42.80	109.7	42.52	112.9	43.76	104.5	40.50	102.4	39.69
Rubber	622	107.2	6.67	101.1	6.29	99.2	6.16	101.1	6.29	93.4	5.81	99.0	6.16	104.0	6.47	108.5	6.75	111.2	6.92	101.3	6.30	107.3	6.67	108.2	6.73
Slaughtering	727	106.8	7.77	107.8	7.84	122.8	8.93	123.3	8.96	108.6	7.91	110.6	8.05	110.3	8.02	110.0	8.00	101.3	8.02	92.8	6.75	94.1	6.84	94.2	6.85
Woolen Goods	800	85.0	6.80	86.0	6.86	114.5	9.16	112.0	8.95	10[illegible]	8.13	105.2	8.41	111.0	8.88	116.2	9.22	115.0	9.20	112.1	8.95	106.0	8.48	110.0	8.80
Total			104.88		101.89		112.43		110.63		103.54		107.97		106.10		108.58		111.85		106.33		102.32		100.78
1927																									
Automobiles		111.4	10.86	95.4	9.31	118.4	11.55	107.1	10.46	102.0	9.95	99.4	9.70	84.6	8.26	105.0	10.25	93.0	9.08	75.9	7.41	57.8	5.64	69.5	6.79
Boots & Shoes		91.9	8.84	107.2	10.32	105.8	10.18	100.7	9.69	96.0	9.23	106.5	10.25	112.4	10.80	114.5	11.01	113.8	10.95	103.7	9.97	99.1	9.53	95.8	9.32
Cotton		94.8	19.32	103.4	21.09	110.0	22.62	100.2	20.43	102.1	20.82	106.4	21.69	94.5	19.26	104.4	21.28	105.1	21.42	108.7	22.18	105.2	21.44	92.8	18.91
Iron		104.9	40.62	101.5	39.32	114.4	34.32	120.8	46.80	121.2	47.00	114.3	44.30	112.0	43.40	107.4	41.62	103.7	40.20	104.3	40.41	98.4	38.09	102.6	39.79
Rubber		104.5	6.50	104.5	6.50	114.4	7.11	111.3	6.92	104.1	6.48	110.9	6.89	102.0	6.35	105.0	6.53	95.1	5.91	94.8	5.89	103.9	6.46	102.9	6.40
Slaughtering		98.2	7.14	98.7	7.17	109.7	7.97	104.8	7.62	106.8	7.77	110.4	8.02	112.3	8.16	107.7	7.83	98.9	7.19	92.4	6.72	94.1	6.84	93.1	6.77
Woolen Goods		98.3	7.87	93.4	7.47	126.2	10.10	117.2	9.39	120.0	9.60	124.4	9.97	116.7	9.35	121.5	9.73	118.9	9.53	115.7	9.27	110.2	8.83	96.6	7.72
Total			101.15		101.18		103.85		111.31		110.85		110.82		105.58		108.20		104.28		101.85		96.83		95.60
1928																									
Automobiles		103.0	10.05	99.6	9.70	121.6	11.86	104.1	10.16	100.3	9.74	104.0	10.15	97.8	9.54	121.8	11.89	108.3	10.58	100.5	9.81	80.3	7.83	93.6	9.14
Boots & Shoes		98.3	9.45	108.5	10.44	115.6	11.12	105.9	10.19	107.1	10.31	110.0	10.59	122.0	11.74	129.0	12.41	113.9	10.95	121.9	11.72	102.0	9.82	85.0	8.17
Cotton		93.8	19.12	109.7	22.38	104.6	21.32	94.7	19.31	110.5	22.52	98.3	20.03	91.7	18.69	107.5	21.91	103.4	21.09	128.2	26.13	118.3	24.11	85.7	17.47
Iron		115.2	44.67	110.6	42.89	117.2	45.43	124.9	48.39	126.0	48.82	122.4	47.43	125.9	48.80	120.2	46.60	121.0	46.90	131.5	50.97	119.0	46.12	117.7	45.62
Rubber		109.2	6.79	110.5	6.87	109.5	6.81	103.1	6.41	111.7	7.32	127.0	7.90	124.0	7.71	125.8	7.83	128.0	7.96	130.1	8.09	96.3	5.99	117.4	7.30
Slaughtering		107.0	7.56	132.0	9.59	121.4	8.82	96.7	7.03	101.2	7.36	101.5	7.37	92.8	6.75	79.7	5.79	95.0	6.91	98.1	7.13	98.1	7.13	99.9	7.26
Woolen Goods		97.7	7.81	101.7	8.15	118.3	9.47	106.8	8.56	118.9	9.52	114.3	9.15	108.1	8.66	122.6	9.82	116.2	9.31	119.6	9.58	110.5	8.85	106.2	8.51
Total			105.75		110.02		114.83		110.65		115.64		112.62		111.89		116.25		113.70		123.43		109.85		103.47
1929																									
Automobiles		135.2	13.20	108.7	10.61	134.6	13.15	126.2	12.32	122.0	11.91	132.1	12.90	118.0	11.51	135.3	13.21	116.5	11.36	113.8	11.11	88.6	8.65	64.6	6.30
Boots & Shoes		97.8	9.41	102.9	9.90	105.9	10.18	92.7	8.92	94.8	9.12	92.0	8.85	102.5	9.86	105.1	10.11	102.3	9.84	102.5	9.86	89.6	8.62	78.1	7.51
Cotton		121.8	24.82	115.6	23.59	113.3	23.10	115.3	23.50	122.5	24.98	105.0	21.40	107.9	21.99	110.8	22.60	106.9	21.79	123.3	25.12	107.7	21.97	95.0	19.36
Iron		119.5	46.30	113.5	44.00	125.0	48.42	132.8	51.45	125.8	48.73	125.6	48.69	144.1	55.83	133.3	51.64	127.8	49.53	127.8	49.53	106.0	41.10	95.8	36.81
Rubber		128.0	7.96	130.8	8.13	130.3	8.11	138.0	8.58	141.5	8.80	133.7	8.32	133.1	8.28	113.1	7.04	116.9	7.60	122.1	7.60	116.9	7.27	108.6	7.76
Slaughtering		103.1	7.50	102.0	7.42	96.1	7.99	104.9	7.63	96.7	7.03	97.2	7.07	107.0	7.78	108.6	7.91	115.3	7.43	102.1	7.43	105.7	7.69	89.2	6.48
Woolen Goods		117.2	9.38	101.0	8.08	119.2	9.54	126.0	10.09	130.0	10.40	121.0	9.68	131.0	10.47	143.9	11.50	121.7	11.02	137.7	11.02	111.9	8.95	103.5	8.28
Total			118.57		111.73		120.49		122.49		120.97		116.91		125.72		124.00		121.67		121.67		104.25		91.50

FINAL INDEX FIGURES

Weighted Ratios 1930	Jan.	Feb.		March		April		May		June		June		July		August		Sept.		Oct.		Nov.		Dec.	
Automobiles	976	127.0	12.40	111.4	10.88	131.7	12.86	126.2	12.32	115.4	11.26	110.0	10.74	91.0	8.88	91.7	8.95	95.5	9.32	67.2	6.56	68.6	6.70	97.0	9.47
Boots & Shoes	962	85.7	8.21	90.7	8.72	88.4	8.51	87.6	8.43	76.9	7.40	79.0	7.60	84.9	8.17	82.7	7.96	92.2	8.87	79.9	7.69	65.3	6.29	67.2	6.48
Cotton	2039	110.2	22.47	110.2	22.47	100.2	20.92	110.4	22.50	101.7	20.73	90.8	18.51	96.4	19.65	89.7	18.28	104.3	21.27	112.1	22.84	105.0	21.40	102.2	20.83
Iron	3847	104.3	40.41	105.5	40.90	111.1	43.08	119.1	46.17	117.0	45.34	113.5	44.00	105.5	40.90	99.1	38.38	95.6	37.03	89.4	34.62	75.7	29.32	71.0	27.50
Rubber	622	134.8	8.38	133.8	8.32	132.7	8.25	148.7	9.25	148.1	9.21	136.7	8.50	130.9	8.14	124.8	7.76	120.1	7.47	132.0	8.21	125.5	7.80	122.1	5.79
Slaughtering	727	94.3	6.85	103.7	7.54	90.3	6.57	97.7	7.10	94.0	6.84	91.7	6.67	100.5	7.30	101.7	7.39	110.5	8.03	104.6	7.61	88.2	6.42	92.4	6.72
Woolen Goods	800	108.2	8.66	91.9	7.35	109.0	8.72	121.5	9.70	99.4	7.95	92.4	7.39	109.4	8.75	112.9	9.03	108.5	8.86	111.7	8.94	88.4	7.07	93.9	7.50
Total			107.42		106.18		108.41		115.49		108.73		103.41		101.79		97.75		100.67		96.47		85.00		86.01
1931																									
Automobiles		100.1	9.75	95.2	9.29	113.6	11.10	119.6	11.68	107.5	10.50	100.8	9.84	90.2	8.80	89.2	8.71	69.8	6.82	47.6	4.65	47.0	4.59	87.0	8.50
Boots & Shoes		77.3	7.43	90.4	8.70	97.6	9.39	93.8	9.03	96.8	9.31	95.0	9.14	102.5	9.86	99.7	9.59	98.2	9.45	79.9	7.69	77.6	7.47	77.3	7.43
Cotton		104.7	21.34	118.4	24.12	118.0	24.07	119.1	24.29	95.4	19.44	97.2	19.81	92.6	18.87	96.2	19.60	104.8	24.36						
Iron		95.9	29.40	76.6	29.70	86.5	33.50	91.9	35.60	91.0	35.25	80.7	31.27	76.7	29.71	63.4	24.57	60.8	23.56	61.9	23.98	60.3	23.35	51.7	20.03
Rubber		128.5	7.79	114.2	8.78	154.5	9.60	155.5	9.67	168.9	10.50	178.8	11.12	158.0	9.82	126.2	7.85	120.0	7.47	114.5	7.13	125.1	7.79	126.5	7.87
Slaughtering		102.6	7.47	105.4	7.67	94.8	6.89	105.5	7.67	95.3	6.93	95.9	6.97	102.8	7.47	105.2	7.65								
Woolen Goods		98.8	7.90	107.4	8.59	123.6	9.89	145.9	11.66	123.5	10.60	131.0	10.48	153.2	12.25	140.0	11.20	129.8	10.38	133.1	10.85				
Total			91.28		96.85		104.44		109.60		102.53		98.63		96.78		89.17				54.30		43.20		43.83

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Employee Productivity series Notes.

Sources.

Data for the Employment series were obtained from the U.S. Bureau of Labor Statistics Bulletin. They represent the actual number of workers in the combined passenger car and truck industries. Since the object of the series is to obtain an index, the employment figures were only taken to the first four places.

Data for production were obtained from the same bulletin. They represent the actual output of passenger cars and trucks combined, expressed in hundreds of units.

Seasonals.

The seasonal factors for the employment were computed by the authors. The method used was the Reverse First Difference Process. It is explained in detail under Appendix B-1 .

Seasonals for the production of autos and trucks ~~was~~ were obtained from the Times Analyst Service. They used Persons' Method of computation.

Index Bases.

The base for the index of both the employment and production series was taken as the monthly average figure for the years 1923 through 1925. These were:-

Av. Mo. Employment 1923-25 -(2856)- 100
Av. Mo. Production 1923-25 -(3224)- 100

Adjustment of Employment Index.

Using the first-computed Index of Employment as a divisor the authors found that the curve of Employee-productivity (Index Prod./Index Emp.) was a very wild and erratic line. It varied more than 200% from month to month in several cases. Moreover the trend was downwards with 7% slope. This was evidently very wrong, and in a search for the causes it was found that the Employment series index figures were to blame. They were far from consistent with any of the annual employment indices computed by various statistical services. Corrections therefore had to be applied. The method described under Appendix C-2 was tried first as it taked care of a situation where the total reported employment is a varying fraction of the total employed in the industry(as recorded in the Biennial labor figures of the Department of Commerce) This method of correction would not work in this case as it was found that the total annual employment for any one year as found from the sum of the monthlys was far in excess of

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the total supposed employment for the whole industry as recorded in the biennial figure.

Therefore the following method of correction was used:

A yearly index of employment was obtained from the Federal Reserve Factory Labor Bulletin giving the yearly index for the automotive industries. When reduced to an annual index, the actual data as originally recorded, was found to be consistent with this index for the years 1924 et seq. Prior to 1924 there was little or no consistency. On the basis of this Federal Reserve Index, it was felt wise to reduce the actuals to some values such that the sum of the monthly actuals for any one year would be a total whose index was consistent with the Fed. Res. Index for that year.

A reduction factor(Q) for each year was computed as follows:-

Fed. Res. Index of Total Annual Emp.(base = av. yearly emp. for 1923-25) divided by Total annual actual reduced to an index(base= av. yearly emp. 1923-25) = (Q)

The monthly indices were then multiplied by the (Q) for their year to give the Adjusted Index of Employment. Results on the Employee- Productivity curve were satisfactory when this Adjusted Index was used.

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	Employment						Production				
	Seasonal	Actual	Secular	% A/S	Cor. Act.	Index	Adj. Index	Seasonal	Actual	Cor. Act.	Index	Ratio P/E
1919-January	96.5	1130	1307	-13.6	1171	41.0	77.0	75.0	938	1251	38.8	50.4
February	99.4	1105	1323	-16.5	1110	38.9	75.5	102	1146	1124	34.9	46.2
March	101.3	1112	1338	-16.8	1098	38.4	75.7	104	1461	1405	43.7	57.7
April	103.2	1071	1354	-20.8	1038	36.4	77.2	120	1652	1376	42.9	54.3
May	101.3	1067	1369	-21.3	1054	36.9	80.2	120	1765	1471	45.7	57.0
June	100.7	1030	1385	-25.6	1023	35.8	84.3	107	1666	1558	48.3	57.3
July	93.9	993	1400	-29.1	1057	37.0	94.4	105	1648	1570	48.6	51.5
August	100.6	1277	1416	-9.9	1270	44.5	90.5	100	1654	1654	51.3	56.7
September	103.2	1192	1431	-16.7	1155	40.4	92.4	101	1808	1790	55.5	60.1
October	102.6	1595	1447	10.2	1555	54.4	95.5	105	2072	1974	61.1	64.0
November	99.9	1577	1462	7.9	1578	55.2	98.2	91	1903	2092	64.8	66.0
December	97.1	1291	1478	-12.7	1330	46.6	98.7	70	1623	2319	71.8	72.7
1920		1076	1494	-27.9	1116	39.1	104.0		1879	2507	77.7	74.7
		1261	1510	-16.5	1269	44.4	102.4		1880	1845	57.3	56.0
		1264	1525	-17.1	1248	43.7	101.0		2292	2204	68.2	67.4
		1364	1541	-11.6	1321	46.3	97.4		1734	1445	44.9	46.1
		798	1556	-48.7	788	27.6	96.1		2100	1750	54.3	56.5
		1334	1572	-15.2	1325	46.4	94.1		2251	2109	65.4	69.5
		1114	1588	-29.8	1186	41.6	101.2		2097	1996	62.0	61.3
		1363	1603	-15.0	1355	47.5	88.4		2052	2052	63.7	72.1
		1290	1619	-20.3	1550	43.8	80.7		1885	1866	57.9	71.7
		1243	1634	-24.0	1212	42.4	71.6		1653	1575	48.9	68.3
		963	1650	-41.6	964	33.8	65.5		1350	1484	46.0	70.2
		914	1666	-45.1	941	32.9	63.4		1094	1562	48.4	76.4
1921		772	1682	-54.1	800	28.0	33.1		532	710	24.1	72.4
		923	1698	-45.7	927	32.5	39.1		706	692	21.5	55.0
		710	1713	-58.6	701	24.6	46.6		1125	1082	33.6	72.1
		858	1729	-50.4	831	29.1	56.7		1522	1268	39.4	69.5
		852	1744	-51.2	841	29.5	61.1		1568	1306	40.6	66.5
		963	1760	-45.3	956	33.5	58.7		1905	1781	55.2	94.0
		802	1776	-54.8	854	29.9	63.0		1769	1685	52.3	83.0
		830	1791	-53.7	825	28.9	59.3		1813	1813	56.2	94.7
		985	1807	-45.8	954	33.4	57.7		1588	1572	48.7	84.7
		894	1822	-51.0	872	30.5	57.5		1480	1410	43.7	76.0
		969	1838	-47.3	970	34.0	57.1		1166	1282	39.7	69.5
		880	1853	-52.5	906	31.7	55.2		795	1035	32.1	58.1

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	Employment						Production				
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Index	Adj.Index	Seasonal	Actual	Cor.Act.	Index	Ratio P/E
1922	96.5	862	1869	-53.9	894	31.3	54.7	75.0	894	1191	37.0	67.6
	99.4	928	1885	-50.8	934	32.7	56.9	102	1179	1156	35.9	63.1
	101.3	975	1900	-48.7	963	33.6	59.8	104	1715	1649	51.1	85.4
	103.2	879	1916	-54.4	852	29.8	63.5	120	2194	1829	56.7	89.3
	101.3	1101	1931	-48.5	990	34.6	71.9	120	2556	2130	66.0	91.8
	100.7	1148	1947	-41.0	1140	39.9	77.0	107	2789	2606	80.8	104.9
	93.9	1090	1963	-44.5	1161	40.7	84.3	105	2458	2340	72.6	86.1
	100.6	1528	1978	-22.8	1519	53.2	77.9	100	2708	2708	84.0	107.9
	103.2	1621	1994	-18.6	1572	55.1	77.7	101	2039	2019	62.6	80.6
	102.6	1719	2009	-14.5	1675	58.7	76.8	105	2328	2217	68.7	84.4
	99.9	1679	2025	-17.1	1680	58.8	80.1	91	2329	2560	79.4	99.1
	97.1	1702	2041	-16.6	1752	61.3	84.3	70	2253	3220	98.8	118.4
1923		2330	2056	13.2	2418	84.6	90.6		2459	3279	101.6	112.2
		2256	2072	8.8	2270	79.5	96.0		2781	2730	84.7	88.2
		2635	2087	26.3	2602	91.1	98.2		3539	3459	107.3	109.3
		2534	2103	20.5	2458	86.0	100.5		3791	3160	98.0	92.5
		2590	2118	22.2	2559	89.6	103.8		3956	3297	102.2	98.4
		2620	2134	22.7	2602	91.1	103.9		3801	3552	110.2	106.0
		2657	2150	23.5	2829	99.0	107.7		3318	3160	98.0	91.0
		2618	2165	20.8	2600	91.0	99.6		3482	3482	108.0	108.4
		2753	2181	26.1	2668	93.4	98.2		3277	3242	100.6	102.5
		2745	2196	25.0	2676	93.6	100.2		3665	3490	108.3	108.0
		2815	2212	27.1	2817	98.6	103.4		3145	3457	107.2	103.7
		2876	2228	29.0	2916	103.7	105.7		3070	4388	136.0	128.6
1924		3141	2244	40.0	3260	96.1	111.5		3186	4248	131.8	118.2
		3344	2260	48.0	3367	94.5	110.5		3706	3634	112.7	102.0
		3386	2275	48.8	3342	99.9	110.4		3834	3688	114.4	103.5
		3248	2291	41.7	3148	103.9	103.8		3759	3132	97.3	93.7
		2952	2306	28.0	2913	114.5	95.6		3152	2628	81.6	85.3
		2481	2322	6.9	2464	111.4	85.8		2518	2352	73.0	85.1
		2496	2338	6.7	2658	109.4	87.5		2698	2569	79.6	91.0
		2479	2353	5.2	2462	107.0	82.8		2847	2847	88.3	106.6
		2520	2369	6.2	2741	113.6	81.3		2967	2934	91.0	111.9
		2562	2384	7.5	2494	121.4	82.9		2946	2808	87.1	105.1
		2473	2400	3.1	2475	125.9	83.2		2346	2579	80.0	92.2
		2516	2416	4.1	2590	119.5	88.0		2071	2961	91.8	104.3

AUTOMOBILES

	Employment						Production				
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Index	Adj.Index	Seasonal	Actual	Cor.Act.	Index	Ratio P/E
1925	96.5	2648	2431	8.7	2746	96.1	92.7	75.0	2406	2309	71.7	77.7
	99.4	2689	2447	9.8	2706	94.7	91.2	102	2836	2781	86.3	94.6
	101.3	2886	2462	17.1	2850	99.9	95.9	104	3744	3600	111.6	116.4
	103.2	3090	2478	24.7	2995	103.9	101.6	120	4338	3613	112.1	110.3
	101.3	3314	2493	32.8	3271	114.5	109.4	120	4191	3492	108.4	99.1
	100.7	3203	2509	27.7	3181	111.4	105.6	107	3985	3724	115.5	110.0
	93.9	2933	2525	16.2	3125	109.4	112.0	105	3988	3798	117.7	105.0
	100.6	3181	2540	25.2	3162	110.7	106.2	100	2602	2602	80.8	76.1
	103.2	3358	2556	31.0	3245	113.6	108.0	101	3257	3222	99.9	92.7
	102.6	3556	2571	38.2	3465	121.4	115.6	105	4420	4210	130.6	113.8
	99.9	3591	2587	38.8	3595	125.9	117.5	91	3723	4095	127.0	108.0
	97.1	3116	2602	27.3	3413	119.5	115.0	70	3167	4523	140.4	122.0
1926		3353	2618	28.1	3478	121.6	115.9		3090	4121	127.9	110.3
		3423	2634	30.0	3445	120.6	114.7		3637	3568	110.7	96.5
		3665	2649	38.3	3618	126.6	114.8		4335	4170	129.4	112.6
		3517	2665	32.0	3410	119.4	109.0		4393	3662	113.6	104.2
		3383	2680	26.3	3340	117.0	106.5		4253	3542	109.8	103.1
		3349	2696	24.2	3324	116.4	105.0		3863	3611	112.6	106.6
		3121	2711	15.1	3323	116.4	109.5		3596	3423	106.1	97.0
		3529	2727	19.6	3240	113.5	104.4		4269	4269	132.4	126.8
		3355	2742	22.2	3250	113.7	101.1		3989	3948	122.5	121.1
		3232	2758	17.3	3152	110.4	97.5		3344	3185	98.8	101.3
		2760	2774	- 0.6	2764	96.8	91.5		2563	2819	87.4	95.6
		2751	2790	- 1.4	2833	99.2	88.2		1679	2398	74.4	84.3
1927		2627	2806	- 6.4	2723	95.4	85.6		2389	3185	98.8	111.4
		3167	2823	12.0	3187	111.5	97.1		3047	2988	92.7	95.4
		3220	2838	14.2	3180	111.4	99.4		3945	3792	117.6	118.4
		3281	2854	14.9	3180	111.4	98.0		4064	3388	105.0	107.1
		3388	2869	18.0	3343	117.1	99.8		4056	3280	101.7	102.0
		3092	2885	7.1	3071	117.0	94.4		3238	3026	93.8	99.4
		2945	2900	1.5	3138	109.9	94.2		2694	2568	79.7	84.6
		3106	2916	6.4	3088	108.1	91.5		3100	3100	96.2	105.0
		3041	2931	3.8	2948	103.2	86.1		2603	2578	80.0	93.0
		3018	2947	2.2	2941	103.1	85.5		2197	2092	64.9	75.9
		2757	2962	- 7.0	2759	96.5	79.3		1334	1476	45.8	57.8
		2865	2978	- 3.6	2950	103.2	85.2		1336	1909	59.2	69.5

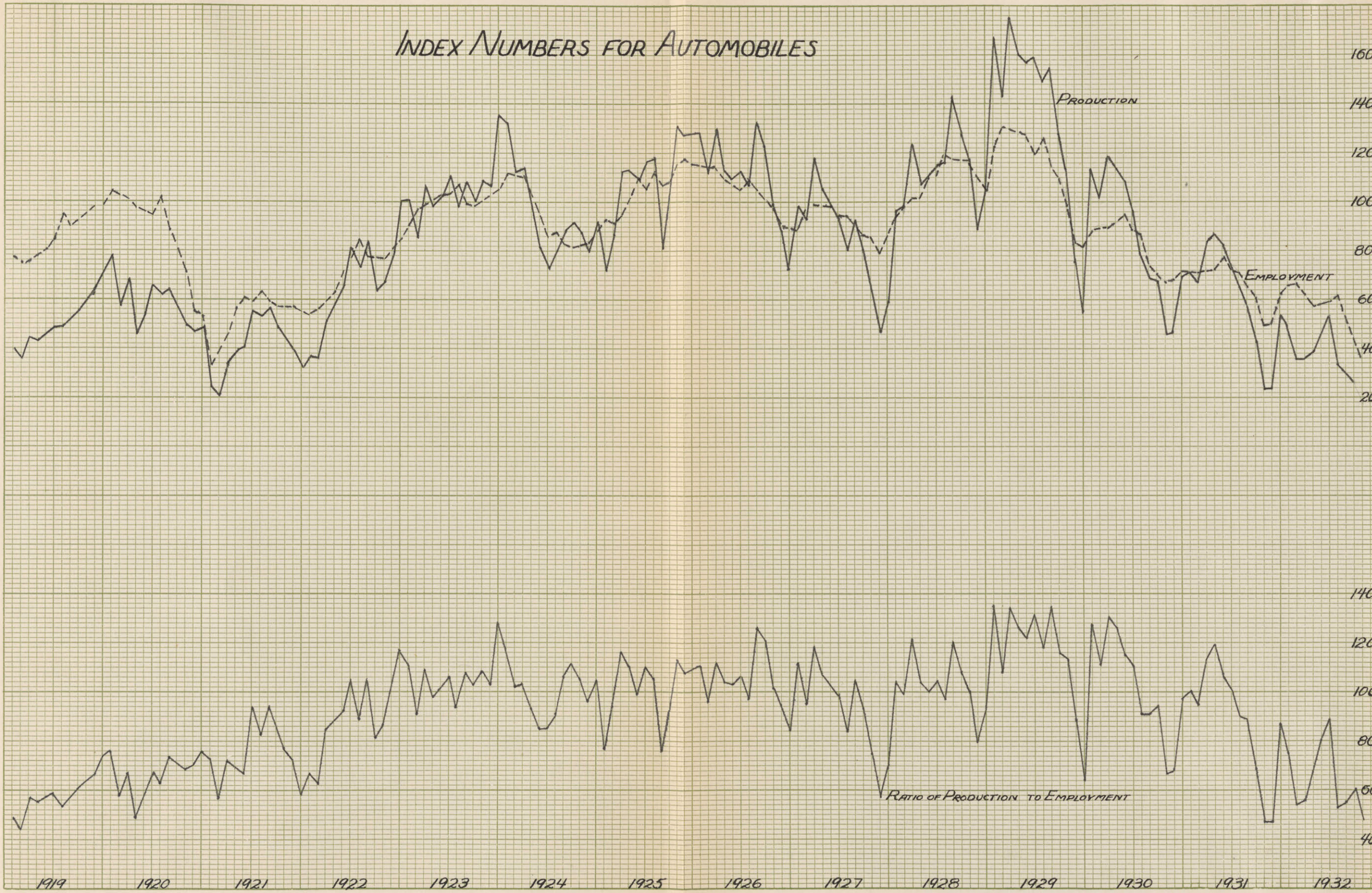
AUTOMOBILES

	Employment						Production				
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Index	Adj.Index	Seasonal	Actual	Cor.Act.	Index	Ratio P/E
1928	96.5	3142	2993	5.0	3260	114.1	93.0	75.0	2317	3088	95.8	103.0
	99.4	3435	3010	14.1	3458	121.0	98.9	102	3238	3175	98.5	99.6
	101.3	3611	3025	19.3	3567	124.8	101.4	104	4133	3975	123.3	121.6
	103.2	3644	3041	19.8	3552	124.4	101.9	120	4101	3419	106.0	104.1
	101.3	3888	3056	27.3	3338	134.3	109.8	120	4258	3550	110.1	100.3
	100.7	4071	3072	32.4	4042	141.5	110.5	107	3968	3709	115.0	104.0
	93.9	4094	3088	32.4	4360	152.6	118.4	105	3921	3734	115.8	97.8
	100.6	4358	3103	40.5	4330	151.6	117.4	100	4613	4613	143.1	121.8
	103.2	4296	3119	37.9	4161	145.6	117.7	101	4153	4112	127.5	108.3
	102.6	4440	3134	41.6	4330	151.6	116.7	105	3937	3785	117.4	100.5
	99.9	3990	3150	26.7	3993	139.8	109.2	91	2571	2828	87.7	80.3
	97.1	3978	3166	25.4	4096	143.4	110.9	70	2341	3345	103.7	93.6
1929		4363	3182	37.1	4525	158.4	122.6		4010	5345	165.8	135.2
		4671	3198	46.0	4700	164.5	130.4		4644	4575	141.9	108.7
		4796	3213	49.3	4735	155.7	129.5		5855	5627	174.5	134.6
		5002	3279	52.3	4850	169.8	127.2		6219	5180	1606	126.2
		4782	3244	47.5	4721	165.4	128.3		6047	5045	156.5	122.0
		4666	3260	43.1	4634	162.2	119.7		5459	5100	158.2	132.1
		4557	3276	43.7	4852	170.0	125.4		5088	4770	148.0	118.0
		4372	3291	32.8	4348	152.2	114.3		4986	4986	154.6	135.3
		4359	3307	31.7	4221	147.9	109.6		4159	4118	127.7	116.5
		3933	3322	18.3	3833	134.3	98.7		3800	3620	112.3	113.8
		3245	3338	- 2.7	3248	113.7	83.8		2176	2391	74.2	88.6
		3024	3353	- 9.8	3112	109.0	81.9		1200	1704	52.9	64.6
1930		3228	3369	- 4.1	3348	117.1	88.9		2732	3642	112.9	127.0
		3352	3385	- 1.1	3337	118.1	90.3		3304	3241	110.5	111.4
		3488	3400	2.6	3442	120.5	89.8		3964	3811	118.2	131.7
		3598	3416	5.2	3487	122.0	91.0		4440	3701	114.8	126.2
		3699	3431	7.8	3650	127.8	94.1		4200	3501	108.6	115.4
		3384	3447	-2.0	3360	117.6	88.2		3345	3127	97.0	110.0
		3110	3463	-10.0	3312	116.0	86.2		2655	2529	78.4	91.0
		2965	3478	-14.7	2948	103.2	75.9		2244	2244	69.6	91.7
		2973	3494	-14.9	2880	100.8	70.9		2206	2183	67.7	95.5
		2854	3509	-19.0	2782	97.4	67.8		1544	1471	45.7	67.4
		2708	3525	-23.1	2710	94.9	68.0		1368	1504	46.6	68.6
		2545	3541	-28.1	2620	91.7	71.0		1557	2223	69.0	97.0

AUTOMOBILES

	Employment							Production				
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Index	Adj.Index	Seasonal	Actual	Cor.Act.	Index	Ratio P/E
1931	96.5	2690	3555	-24.2	2790	97.7	70.9	75.0	1718	2291	71.0	100.1
	99.4	2652	3572	-25.7	2670	93.5	70.3	102	2199	2157	66.9	95.2
	101.3	2710	3587	-24.6	2675	93.6	72.5	104	2764	2659	82.4	113.6
	103.2	2954	3603	-18.0	2863	100.3	72.7	120	3369	2808	87.0	119.6
	101.3	2994	3618	-17.4	2958	103.5	76.3	120	3172	2643	82.0	107.5
	100.7	2850	3634	-21.5	2830	99.1	72.1	107	2506	2341	72.7	100.8
	93.9	2624	3650	-28.1	2795	97.9	71.6	105	2185	2081	64.6	90.2
	100.6	2569	3665	-29.9	2553	89.5	65.0	100	1872	1872	58.0	89.2
	103.2	2509	3681	-31.7	2430	95.1	61.9	101	1406	1392	43.2	69.8
	102.6	1982	3696	-46.4	1932	67.7	49.2	105	801	753	23.4	47.6
	99.2	1940	3712	-47.7	1941	68 0	50.0	91	689	757	23.5	47.0
	97.1	2228	3728	-40.2	2293	80.3	62.0	70	1215	1736	53.9	87.0

INDEX NUMBERS FOR AUTOMOBILES



BOOTS AND SHOES

Employee Productivity Series Notes .

SOURCES. Employment data from Bureau of Labor Statistics Bulletin, expressing actual employment in hundreds of men.
Production expressed as an index of the output of boots and shoes, as given in Standard Statistics Annual Supplement for 1932.

SEASONALS. Employment seasonal computed by the authors by the Reverse First Difference Process.
Index of Production already corrected for seasonal.

Index Bases. The Employment index is based on a normal value of Employment for Jan.1923 (920000) = 100
The average monthly production for the years 1923 through 1925 is the base used by Standard Statistics for the output index.

The data for the years 1919 and 1920 were unavailable, and so could not be included in the make-up of the Composite Index. The employment figures for the years 1921 through 1924 were so varying in the number of mills reporting that a correation had to be applied. Description of the method of correction may be found under Appendix C-2. In the case of the boot and shoe industry the estimates of the total annual employment figures for the years between those reported by the biennial data of the Department of Commerce were based on the total production for those years, relative to the total production for the reported years. The largest percent of the total which was reported consistently after 1924 was 44.2%. This is assumed to be perfect reporting. Data for the adjustment of the employment series is given below.

Year	Total Reported	Total for Industry	Ratio(K) Rep./Tot.	%(K) of 44.2	Adjusted Actual
1921	58,836	183,502	32.1%	72.6	81,100
1922	67,371	#			92,700
1923	83,536	225,216	37.1%	83.8	99,600
1924	85,722	(200,000)*	42.9%	97.0	88,400
1925	91,395	206,992	44.2%	100.0	91,395

*Estimated
Change in number of mills reporting occurred in July 1922. Correction for 1921 used Jan-June, correction for 1923 used Jul.-Dec.

BOOTS AND SHOES

	Seasonal	Employment Actual	Employment Secular	% A/S	Cor.Act.	Adj.Act.	Index	Production Index	Production Ratio P/E
1921-January	100.8	4659	6815	-31.7	4620	6360	69.2	72.7	105.0
February	106.8	5432	6841	-21.6	5088	7010	76.2	77.3	101.5
March	106.0	5553	6867	-19.2	5238	7212	78.4	71.1	90.7
April	102.9	5617	6892	-18.5	5460	7522	81.8	73.9	90.4
May	98.8	5679	6918	-17.9	5750	7920	86.1	88.1	91.7
June	90.3	6023	6944	-13.3	6675	9200	100.0	98.9	98.9
July	95.3	5925	6970	-15.0	6220	8573	93.2	107.9	115.8
August	98.9	6117	6995	-12.5	6187	8522	92.7	92.8	100.2
September	103.0	6332	7021	-9.8	6147	8466	92.1	92.5	100.5
October	102.5	6494	7047	-7.9	6335	8722	94.8	86.2	90.9
November	99.1	6274	7072	-11.2	6326	8715	94.7	91.7	96.8
December	95.8	6498	7098	-8.5	6780	9335	101.5	96.8	95.4
1922		6865	7124	-3.9	6808	9380	102.0	93.2	91.4
		6700	7150	-4.8	6275	8640	93.9	91.5	97.5
		6778	7176	-5.5	6395	8808	95.7	81.6	85.3
		6363	7201	-11.9	6155	7975	86.7	93.4	107.2
		6059	7227	-16.3	6137	8452	91.9	99.5	108.2
		5992	7253	-17.3	6640	9148	99.5	102.1	102.7
		5853	7278	-19.6	6140	8460	92.0	98.9	107.5
		6945	7304	-5.0	7025	8382	91.2	99.0	108.5
		7527	7330	+2.7	7309	8720	94.8	101.0	106.5
		7290	7355	-0.8	7115	8485	92.3	103.1	111.7
		7354	7381	-0.4	7420	8850	96.2	116.0	120.5
		7146	7407	-3.5	7460	8900	96.8	110.5	114.2
1923		9065	7432	+22.0	8988	10735	116.5	114.4	98.2
		8591	7458	+15.2	8046	9600	104.3	113.0	108.3
		9212	7484	+23.0	8687	10385	112.6	124.4	110.4
		9209	7509	+22.6	8948	10690	115.9	112.1	97.8
		8845	7535	+17.5	8957	10695	116.0	117.1	101.0
		6630	7561	-12.3	7342	8760	95.2	115.1	120.7
		8045	7581	+6.0	8440	10070	109.4	108.7	99.4
		7815	7612	+2.7	7907	9425	102.4	107.7	105.2
		8897	7638	+16.5	8637	10395	112.0	98.2	87.7
		8043	7663	+5.0	7845	9360	101.7	104.3	102.5
		8141	7689	+5.9	8216	9808	106.5	104.2	97.9
		7750	7715	+0.5	8085	9640	104.8	91.1	86.9

BOOTS AND SHOES

	Seasonal	Employment: Actual	Employment: Secular	Employment: % A/S	Employment: Cor.Act.	Production: Adj.Act.	Production: Index	Ratio: Index	Ratio: P/E
1924	100.8	8322	7741	7.5	8256	9848	107.0	98.3	91.8
	106.8	9492	7767	22.2	8886	9165	99.6	100.0	100.5
	106.0	9327	7793	19.7	8808	9080	98.7	98.4	99.7
	102.9	9099	7818	16.4	8841	9115	99.1	97.7	98.6
	98.8	8604	7844	9.8	8715	8987	97.7	95.6	97.9
	90.3	6430	7870	-18.3	7122	7348	79.8	92.3	115.6
	95.3	8038	7895	1.9	8432	8690	94.3	94.3	100.0
	98.9	8340	7921	5.2	8439	8696	94.4	90.7	96.2
	103.0	9376	7947	18.0	9100	9385	101.9	98.8	97.2
	102.5	9036	7972	13.4	8815	9090	98.7	104.5	105.9
	99.1	8248	7998	3.1	8320	8580	93.2	98.3	105.5
	95.8	8554	8024	6.6	8920	9208	100.1	98.5	98.4
1925		9242	8050	14.8	9160		99.5	96.8	97.4
		9425	8076	16.6	8825		95.9	98.5	102.7
		9619	8102	18.6	9072		98.5	101.9	103.5
		9410	8127	15.7	9343		101.5	103.0	101.4
		9102	8153	11.7	9219		100.1	95.2	95.3
		6768	8179	-17.2	7498		81.4	97.0	119.1
		8842	8204	7.8	9278		100.8	106.9	106.0
		9514	8230	15.6	9625		104.5	101.7	97.4
		9760	8256	18.2	9478		103.0	105.9	102.7
		9627	8281	16.2	9390		102.0	10 .3	103.1
		9320	8307	12.3	9402		102.2	95.3	93.2
		9045	8333	8.5	9440		102.5	97.6	95.2
1926		8995	8358	7.7	8920		96.9	88.3	91.2
		9610	8384	14.6	9010		97.8	95.5	97.8
		9312	8410	10.8	8785		95.5	102.1	106.9
		8907	8435	5.7	8658		94.4	92.1	97.6
		8718	8461	3.0	8826		95.9	87.8	91.6
		8712	8487	2.6	7654		83.2	102.5	123.2
		9227	8512	8.4	9860		105.2	108.2	102.8
		9329	8537	9.3	9440		102.5	106.1	103.4
		9656	8563	12.7	9370		101.8	113.2	111.2
		9821	8589	14.3	9580		104.1	107.6	103.3
		9469	8515	11.2	9548		103.7	103.7	100.0
		9140	8641	5.8	9538		103.6	101.6	98.0

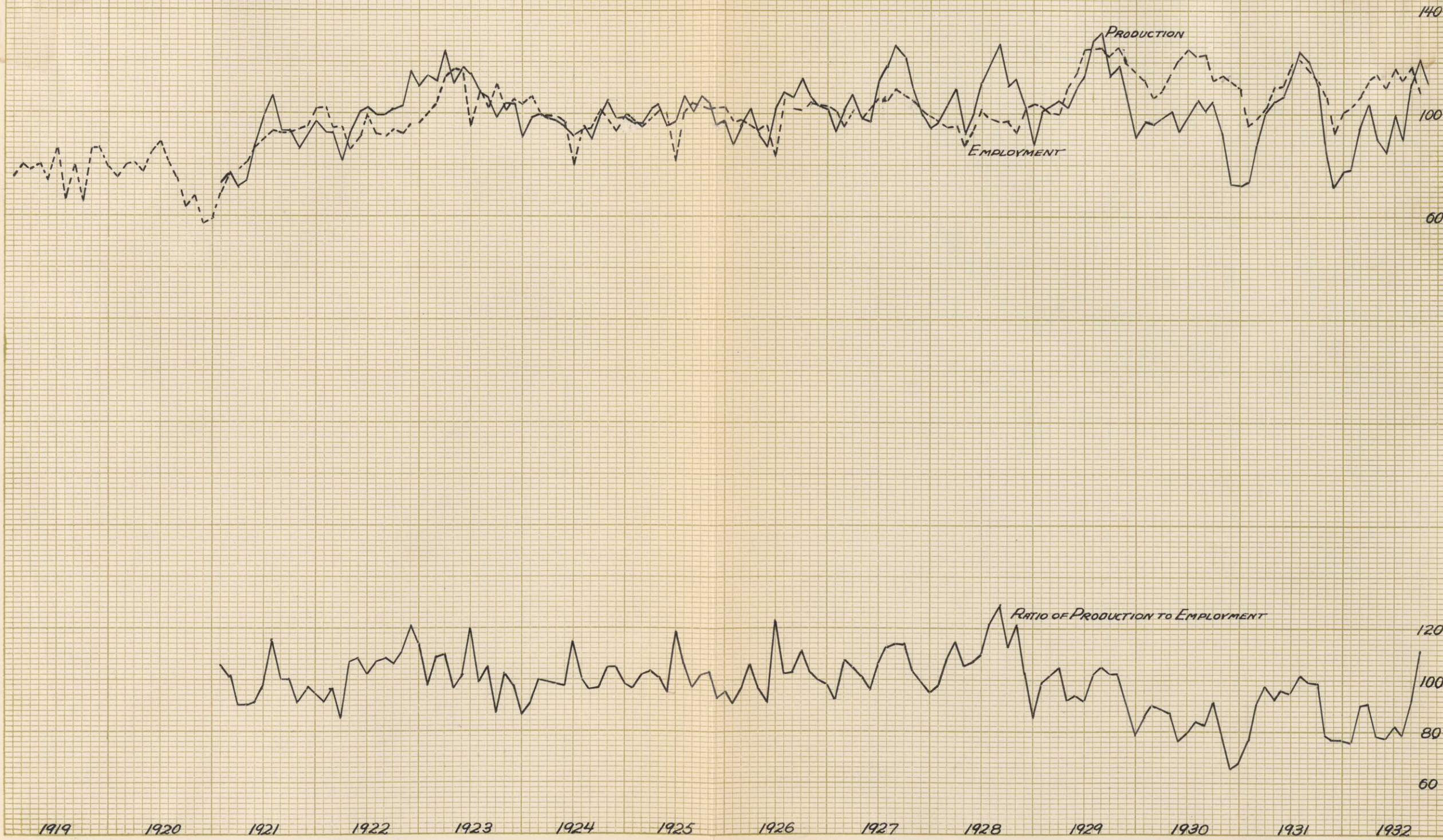
BOOTS AND SHOES

	Employment				Production		
	Seasonal	Actual	Secular	% A/S	Cor. Act.	Index	Index	Ratio P/E
1927	100.8	9363	8667	7.9	9286	100.9	92.7	91.9
	106.8	9335	8692	7.4	8760	95.0	101.9	107.2
	106.0	9873	8718	13.1	9312	101.1	107.0	105.8
	102.9	9291	8744	6.2	9028	98.1	98.8	100.7
	98.8	9203	8770	4.9	9320	101.2	97.2	96.0
	90.3	9325	8795	6.0	9723	105.6	112.5	106.5
	95.3	9266	8821	5.1	9725	105.6	108.8	112.4
	98.9	10060	8847	13.8	10190	110.6	126.7	114.5
	103.0	10160	8872	14.6	9875	107.3	122.1	113.8
	102.5	9995	8898	12.2	9746	105.9	109.8	103.7
	99.1	9184	8924	3.0	9266	100.7	98.8	99.1
	95.8	8720	8950	-2.6	9100	98.9	94.7	95.8
1928		9195	8976	2.3	9126	99.2	97.4	98.3
		9344	9001	3.7	8755	95.5	103.3	108.5
		9344	9027	3.3	8818	95.8	110.8	115.6
		8242	9053	-8.9	8012	87.2	92.3	105.9
		8502	9078	-6.4	8613	93.6	100.3	107.1
		8444	9104	-7.2	9355	101.6	111.9	110.0
		8671	9130	-5.3	9068	98.5	120.1	122.0
		8895	9155	-2.8	8998	97.8	126.3	129.0
		9238	9181	0.6	8967	97.5	110.0	113.9
		8812	9207	-4.3	8600	93.5	114.0	121.9
		9196	9232	-0.4	9277	100.8	102.8	102.0
		9198	9258	-0.7	9598	104.2	88.7	85.6
1929		9617	9284	3.7	9530	103.5	101.1	97.8
		9883	9309	6.1	9255	100.5	103.4	102.9
		9737	9335	4.3	9182	99.8	105.6	105.9
		10500	9361	12.1	10200	110.6	102.6	92.7
		10610	9386	13.0	10750	116.6	110.6	94.8
		10360	9412	10.6	11518	125.0	115.0	92.0
		10970	9438	16.2	11515	125.0	128.1	102.5
		11420	9463	20.8	11550	125.4	131.9	105.1
		11630	9489	22.8	11293	122.5	125.4	102.3
		11810	9515	24.2	11520	125.0	128.1	102.5
		10980	9541	15.1	11070	120.2	107.6	89.6
		10290	9567	7.4	10740	116.5	91.0	78.1

BOOTS AND SHOES

	Employment				Production		
	Seasonal	Actual	Secular	% A/S	Cor. Act.	Index	Index	Ratio P/E
1930	100.8	10570	9593	10.1	10490	113.9	97.6	85.7
	106.8	10450	9618	8.8	9800	106.5	96.6	90.7
	106.0	10710	9644	11.2	10110	109.7	97.0	88.4
	102.9	10930	9670	13.1	10618	115.2	100.9	87.6
	98.8	11020	9695	13.7	11155	121.1	93.2	76.9
	90.3	10430	9721	7.3	11580	125.8	99.3	79.0
	95.3	10740	9747	10.1	11261	122.4	105.5	84.9
	98.9	11190	9772	14.6	11310	122.9	101.5	82.7
	103.0	10740	9798	9.8	10430	113.4	104.5	92.2
	102.5	10930	9824	11.4	10660	115.9	92.6	79.9
	99.1	10240	9850	4.0	10324	112.1	73.2	65.3
	95.8	9530	9876	- 3.4	9942	108.0	73.6	67.2
1931		8870	9902	-10.5	8792	95.5	73.8	77.3
		9629	9927	- 3.0	9018	98.0	88.6	90.4
		10020	9953	0.7	9457	102.8	100.3	97.6
		10540	9979	5.7	10240	111.2	104.3	93.8
		10120	10004	1.2	10250	111.3	107.8	96.8
		10010	10030	- 0.1	11115	120.7	114.7	95.0
		10670	10056	6.0	11200	121.6	124.7	102.5
		10980	10081	8.9	11110	120.6	120.3	99.7
		10780	10107	6.6	10460	113.7	111.8	98.2
		10140	10133	0.1	9895	107.5	85.9	79.9
		8470	10158	-16.9	8520	92.6	71.9	77.6
		8929	10184	-12.3	9318	101.3	78.3	77.3

INDEX NUMBERS FOR BOOTS AND SHOES



COTTON

Employee-Productivity Series Notes.

SOURCES. Data for employment were obtained from the U.S. Bureau of Labor Statistics Bulletin. The figures express the actual number of workers in hundreds.

The figures indicated as cotton production are those for the consumption of cotton by the mills. They are given in index form as compiled by Standard Statistics, and found in its annual 1932 supplement, page 161.

SEASONALS. Employment seasonal computed by the authors by the Reverse First Difference Process.

The index of consumption had already been corrected for seasonal.

INDEX BASES. In the Employment series the normal monthly value for Jan. 1923 adjusted to conform to the totals for the industry - 2050= 100 was assumed as a base.

In the Production series the base used by Standard Statistics was the average monthly consumption for the years 1923-25 inclusive.

ADJUSTMENT OF EMPLOYMENT ACTUALS. The figures for the employment during the years 1919-24 due to the variation in the numbers of mills reporting were obviously not consistent with the later years' figures. Correction was therefore made according to the method described under Appendix C-2, using the biennial figures for the whole consumption of the industry (published by the Dep't. of Commerce) as the guide variable. The maximum percentage of the whole industry which reported was 43.2%. This was considered to be perfect reporting, and correction was made using this as the adjustment criterion. The tabulation of data used in the computation of the Adjusted Actual is given below.

Year	Total Reported	Total for Industry.	Ratio(K) Rep./Tot.	%(K) of 43.2	Adjusted Actual
1919	50,546	445,423	11.33%	26.25	192,500
1920	51,087	(445,423)*	11.41%	26.25	194,650
1921	57,228	425,319	13.45%	31.15	183,750
1922	100,290	(465,000)*	21.50 %	49.50	207,900
1923	181,465	485,784	37.40%	86.50	209,200
1924	173,708	(415,000) *	41.90%	97.15	179,000
1925	192,258	445,184	43.20%	100.00	192,583

*Estimated on basis of Total domestic consumption(annual).

COTTON

It should be noted that these correction-multipliers as found in the next to last column of the above table are not applied to one whole year's figures each. The multiplier is changed when the original data gave evidence that the number of mills reporting changed. The factors applied for the periods were as follows:-

Period	%(K) Of 43.2	Multiplier *
Jan 1919- Dec. 1920	26.25	3.81
Jan.1921- Jul. 1922	31.15	3.21
Aug.1933- Feb. 1923	49.50	2.02
Mar.1923- Feb. 1924	86.50	1.16
Mar.1924- Dec. 1924	97.10	1.05
Jan.1925---------	100.00	1.00

* The multiplier is the reciprocal of %(K) of 43.2. It is found merely as a means of convenience in making further calculations.

COMPOSITE PRODUCTIVITY SERIES NOTES.

The months Dec.1921 through July 1922 were omitted from the computation of the composite curve. It was felt that these figures were a bit unrepresentative in spite of the corrections applied as stated above, and inasmuch as the cotton series had a large weight in the final curve compilation, it was deemed wiser to omit this series and the consequent erroneous value which it might lend to the composite curve if it were included.

COTTON

	Seasonal	Employment Actual	Employment Secular	% A/S	Cor. Act.	Adj. A	Index	Production Index	Production Ratio P/E
January	101.0	468	673	69.5	433	1651	80.6	102.9	127.6
February	104.2	505	684	73.9	485	1848	90.1	88.8	98.7
March	102.5	501	695	72.2	489	1862	90.7	80.1	88.2
April	100.7	435	706	61.7	432	1648	80.4	91.6	114.0
May	101.3	476	718	66.3	470	1780	86.9	94.3	108.5
June	98.7	488	927	67.0	492	1885	92.0	95.0	103.3
July	96.2	568	740	76.9	581	2212	108.0	107.5	99.6
August	96.7	591	751	78.8	612	2330	113.6	101.6	89.4
September	96.6	514	763	67.4	532	2028	98.4	104.1	105.8
October	102.4	578	774	74.7	564	2150	104.9	110.7	105.5
November	102.0	539	785	68.7	528	2001	98.1	98.0	99.9
December	97.7	396	797	49.8	406	1546	75.4	105.3	139.5
January		453	809	56.0	449	1710	83.5	109.8	131.5
February		573	820	70.0	556	2092	102.1	105.3	103.0
March		533	831	64.1	520	1980	96.7	108.3	112.0
April		517	842	61.5	514	1959	95.7	109.7	114.7
May		531	854	62.2	524	1995	97.5	104.8	107.5
June		424	865	49.0	429	1635	79.8	111.0	139.0
July		543	876	62.0	565	2152	105.0	110.5	105.3
August		577	887	65.1	597	2275	111.0	98.9	89.1
September		529	899	58.9	548	2089	101.8	97.6	95.9
October		580	910	55.0	488	1861	90.7	79.8	87.8
November		433	921	47.1	426	1619	79.2	66.4	83.8
December		512	933	55.0	524	1996	97.5	62.2	63.8
January		496	945	52.6	492	1579	77.0	77.0	84.0
February		539	956	56.4	517	1660	81.0	81.0	100.3
March		594	967	61.5	579	1585	77.3	77.3	104.5
April		579	978	59.2	575	1847	90.1	90.1	86.9
May		483	990	48.9	472	1532	74.7	74.7	113.5
June		592	1001	59.3	601	1930	94.1	94.1	98.6
July		595	1012	58.5	619	1989	97.0	97.0	90.2
August		593	1024	58.0	614	1972	96.1	96.1	99.5
September		625	1035	60.4	647	2155	105.0	105.0	98.1
October		636	1046	60.8	621	1944	97.3	97.3	101.2
November		627	1057	59.4	615	1975	96.2	96.2	109.6
December		502	1068	47.1	574	1652	80.6	80.6	130.6

COTTON

	Seasonal	Employment Actual	Secular	% A/S	Cor. Act.	Adj.A	Index	Production Index	Ratio P/E
1922	101.0	614	1080	56.9	608	1954	95.3	96.6	101.4
	104.2	615	1091	56.4	590	1895	92.4	96.8	104.8
	102.5	434	1102	39.1	423	1358	66.2	97.1	107.1
	100.7	435	1113	39.2	433	1391	67.8	85.2	125.6
	101.3	454	1124	40.4	447	1473	70.1	95.5	136.3
	98.7	452	1131	39.7	457	1469	71.6	102.0	142.5
	96.2	448	1147	39.1	466	1496	73.0	97.2	133.0
	96.7	855	1158	73.9	885	1788	87.2	107.6	123.4
	96.6	899	1170	76.9	931	1880	91.7	105.1	114.7
	102.4	1097	1181	92.9	1071	2164	105.5	106.3	100.7
	102.0	1135	1192	95.2	1113	2249	109.6	115.5	105.3
	97.7	990	1203	82.3	1013	2042	99.8	108.8	109.0
1923		1193	1215	98.1	1181	2385	116.3	113.0	97.2
		1275	1226	103.9	1224	2471	120.5	115.4	95.8
		1771	1237	143.1	1729	1999	97.1	117.6	121.1
		1714	1248	137.3	1702	1968	96.0	111.2	115.1
		1775	1260	140.8	1752	2028	98.9	120.2	121.5
		1523	1271	119.8	1543	1785	87.1	107.5	123.4
		1522	1282	118.8	1583	1831	89.3	97.6	109.3
		1398	1293	108.1	1446	1673	81.6	100.2	123.0
		1393	1305	106.7	1442	1668	81.4	102.6	126.0
		1523	1316	114.7	1488	1720	83.9	107.3	127.8
		1654	1327	124.5	1621	1875	91.5	105.3	115.0
		1646	1339	123.0	1685	1948	95.0	94.9	99.9
1924		1618	1351	119.6	1603	1853	90.4	105.6	116.9
		1812	1362	133.0	1740	2011	98.0	102.9	105.0
		1759	1373	128.1	1715	1768	86.3	89.1	103.2
		1737	1384	128.1	1761	1815	88.5	90.9	102.7
		1761	1395	126.3	1739	1792	87.5	78.3	89.5
		1769	1406	125.7	1792	1848	90.1	69.3	77.6
		1614	1418	113.8	1678	1730	84.5	74.1	87.7
		1635	1429	114.4	1792	1745	85.1	72.8	85.6
		1688	1440	117.2	1748	1802	88.9	92.4	103.9
		1771	1452	121.9	1720	1774	86.5	104.6	121.0
		1762	1463	120.5	1728	1781	86.8	97.1	111.8
		1883	1475	127.6	1926	1985	86.9	107.8	111.3

COTTON

	Seasonal	Employment Actual	Secular	% A/S	Cor. Act.	Production Index	Index	Ratio P/E
1925	101.0	1975	1487	133.0	1955	95.4	107.6	112.8
	104.2	1991	1498	132.9	1911	93.3	110.1	118.0
	102.5	2036	1509	134.9	1968	96.0	107.2	111.8
	100.7	2042	1521	134.1	2009	97.9	113.0	111.5
	101.3	2003	1532	130.6	1975	96.4	100.5	104.3
	98.7	1975	1543	128.0	2001	97.6	96.7	99.2
	96.2	1746	1554	112.2	1816	88.6	100.1	113.0
	96.7	1786	1566	114.0	1849	90.2	90.3	100.2
	96.6	1767	1577	112.0	1830	89.3	100.4	112.0
	102.4	1918	1588	120.8	1874	91.3	105.6	115.7
	102.0	1946	1599	121.7	1908	93.1	105.6	113.5
	97.7	1925	1611	119.6	1970	96.0	115.3	120.1
1926		1979	1623	121.9	1960	95.6	104.3	109.0
		1997	1634	122.0	1916	93.4	112.0	111.9
		2026	1645	123.1	1964	95.8	116.4	121.5
		2040	1657	123.1	2008	97.9	108.4	100.7
		2259	1668	135.3	2230	108.7	96.8	89.0
		2188	1680	130.2	2218	108.2	100.7	93.1
		2095	1691	123.9	2180	106.4	95.4	89.3
		2051	1702	120.5	2122	103.5	99.1	95.7
		2156	1714	125.7	2241	104.5	116.4	111.2
		2257	1725	130.9	2206	107.5	109.4	101.7
		2294	1736	132.2	2250	109.7	112.4	102.4
		2315	1747	132.4	2370	115.6	119.5	103.3
1927		2324	1759	132.1	2300	112.1	107.4	94.8
		2395	1770	135.2	2298	112.0	115.9	103.4
		2392	1781	134.3	2333	113.8	126.4	111.0
		2379	1792	132.6	2361	115.1	115.4	100.2
		2393	1803	132.8	2362	115.2	117.6	102.1
		2415	1815	133.1	2447	119.3	126.9	106.4
		2399	1826	131.5	2494	121.6	115.0	95.4
		2354	1837	128.2	2437	118.8	124.0	104.5
		2382	1848	128.9	2467	120.3	126.5	105.1
		2262	1860	121.6	2210	107.9	117.2	108.7
		2386	1871	127.7	2339	114.0	119.9	105.2
		2297	1882	122.0	2350	114.5	116.3	92.8

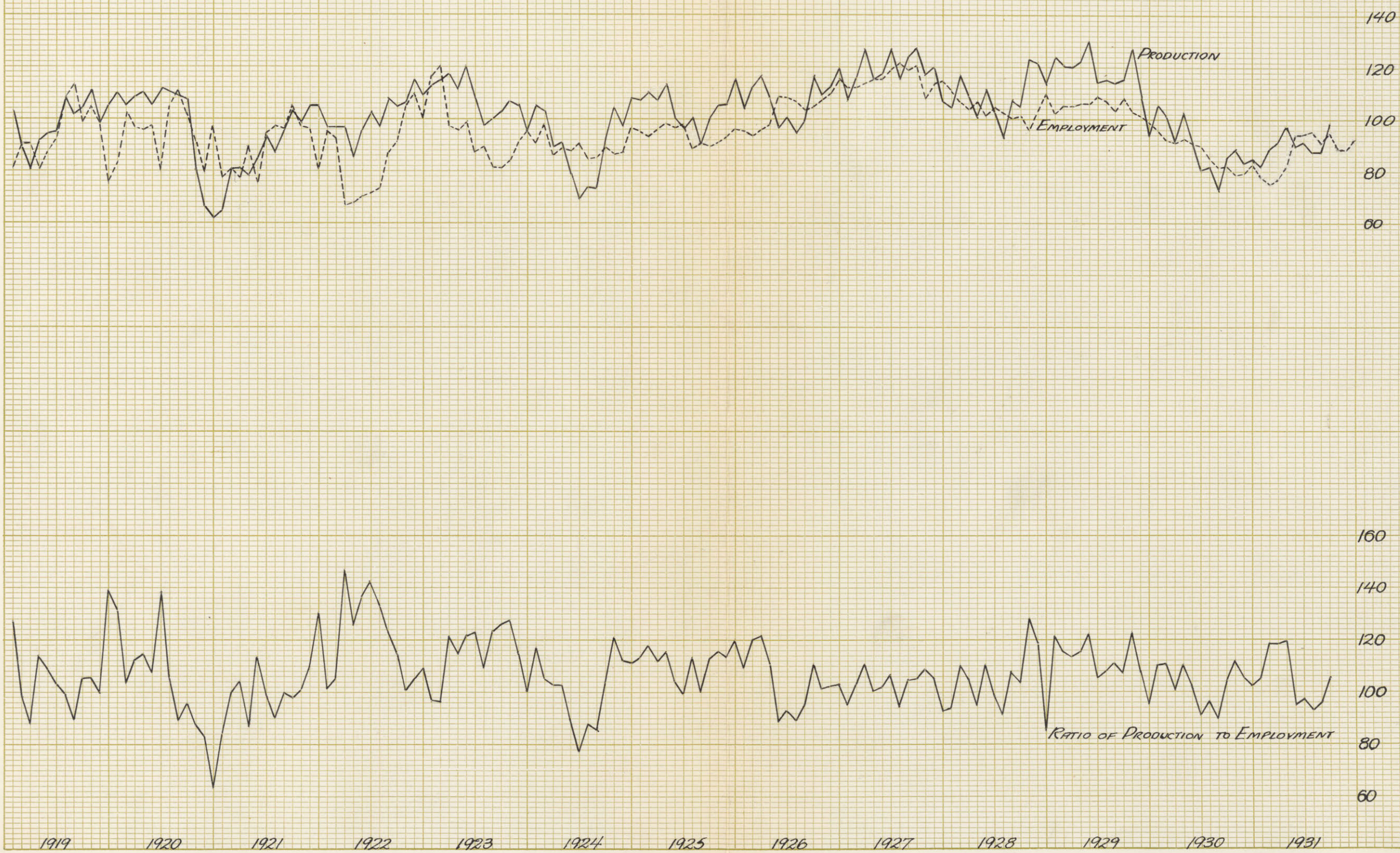
COTTON

	Seasonal	Employment Actual	Secular	% A/S	Cor. Act	Index	Prod. Index	Ratio P/E
1928	101.a	2300	1893	121.4	2279	111.1	104.3	93.8
	104.2	2271	1905	119.1	2181	106.5	116.9	109.7
	102.5	2188	1916	114.2	2133	104.0	108.8	104.6
	100.7	2197	1927	114.0	2181	106.9	101.1	94.7
	101.3	2100	1939	108.2	2072	101.1	111.8	101.5
	98.7	2105	1951	107.9	2132	104.1	102.4	98.3
	96.2	2020	1963	102.9	2100	102.4	93.8	91.7
	96.7	1985	1973	100.5	2052	100.2	107.7	107.5
	96.6	2009	1984	101.2	2080	101.5	104.9	103.4
	102.4	2010	1995	100.8	1964	95.8	122.9	128.2
	102.0	2152	2006	107.1	2112	103.0	121.8	118.3
	97.7	2200	2018	109.0	2251	109.8	94.1	85.7
1929		2110	2029	104.0	2090	102.0	124.2	121.8
		2246	2040	110.1	2155	105.1	121.3	115.6
		2206	2052	109.8	2152	105.0	118.9	113.3
		2189	2063	106.1	2172	106.0	122.4	115.3
		2202	2075	106.1	2173	106.1	130.0	122.5
		2195	2087	105.1	2224	108.5	114.0	105.0
		2106	2098	100.5	2190	106.9	115.3	107.9
		2042	2109	96.8	2112	103.0	114.2	110.8
		2141	2121	100.9	2219	108.1	115.6	106.9
		2169	2132	101.8	2118	103.3	127.4	123.3
		2109	2143	98.5	2068	100.9	108.6	107.7
		1979	2155	91.8	2024	98.7	93.8	95.0
1930		1990	2166	91.9	1970	96.0	105.8	110.2
		1964	2177	90.4	1885	92.0	101.4	110.2
		1919	2188	87.7	1872	91.3	91.4	100.2
		1915	2199	87.1	1901	92.7	102.4	110.4
		1864	2211	84.4	1839	89.7	91.2	101.7
		1814	2223	81.7	1838	89.6	81.3	90.8
		1672	2234	74.9	1740	84.9	81.8	96.4
		1612	2245	71.8	1668	81.4	73.0	89.7
		1625	2256	72.2	1683	82.1	85.6	104.3
		1654	2268	72.9	1615	78.7	88.2	112.1
		1655	2280	72.6	1618	78.8	82.8	105.0
		1656	2291	72.3	1695	82.7	84.5	102.2

COTTON

	Employment				Production	
	Seasonal	Actual	Secular	% A/S	Cor. Act.	Index	Index	Ratio P/E
1931	101.0	1613	2302	70.2	1596	77.9	81.6	104.7
	104.2	1608	2313	69.6	1543	75.3	89.2	118.4
	102.5	1619	2324	69.6	1588	77.0	90.8	118.0
	100.7	1691	2336	72.4	1680	82.0	97.8	119.1
	101.3	1952	2347	83.2	1927	94.0	89.6	95.4
	98.7	1906	2358	80.6	1925	93.9	91.3	97.2
	96.2	1869	2370	78.8	1943	94.7	87.7	92.6
	96.7	1803	2381	75.8	1865	91.0	87.6	96.2
	96.6	1875	2392	78.5	1941	94.6	99.2	104.8
	102.4	1859	2403	77.4	1815	88.5		
	102.0	1845	2415	76.5	1809	88.3		
	97.7	1848	2426	76.2	1890	92.3		

INDEX NUMBERS FOR COTTON



IRON AND STEEL

Employee Productivity Notes.

SOURCES. Employment figures were obtained from the U.S. Bureau of Labor Statistics Bulletin. They express the actual number of men(one place omitted) engaged in the pig iron trade and the steel mills combined which reported to the Bureau.

Production figures represent the actual number of gross tons output, expressed in thousands, from the pig iron and steel mills combined. Data for these series were obtained from Standard Statistics,1932 Annual supplement.

SEASONALS. Employment seasonals were computed by the authors using the Reverse First Difference Process.

Seasonals for the two production series, pig iron and steel ingot, were obtained from the Times Analyst service. They were computed by Persons' Method.

INDEX BASES. Employment series base- average monthly employment for years 1923-25 = 100 (-28120 men)

Production base - average monthly combined output in gross tons for years 1923-25 = 100 (-6469000)

Adjustment of the employment actuals was felt to be necessary for the years 1919 through 1924 because of the variations in the number of mills turning in reports. These corrections were made following the method outlined in Appendix C-2. Estimates of the totals for output (yearly) to fit between the biennial figures published by the Department of Commerce were based on the total number of blast furnaces in blast for those years. The maximum percentage of total output which was included in the reported figures was 32.7%. This percent was practically constant from the year 1924 on, and was assumed to be perfect reporting.Data for adjustment of Actuals is given below.

Year	Total Reported	Total for Industry	Ratio(K) Rep./Tot.	%(K) of 32.7	Adjusted Actual
1919	157,142	858,871	18.3%	56.0	280,800
1920	172,325	(870,000)*	19.8%	60.5	285.000
1921	117,210	571,798	20.5%	62.7	187,000
1922	148,775	(676,000)*	22.0%	67.3	221,000
1923	229,685	892,660	25.7%	78.6	292,250
1924	256,350	(830,000)*	30.8%	94.1	272,700
1925	278,533	851,270	32.7%	100.0	278,533

*estimated

IRON AND STEEL

The number of mills reporting evidently did not change with the end of the calendar year. The period over which corrections were applied, and the correcting multipliers are as follows:

Period	%(K) of 32.7	Multiplier
Jan 1919- Dec 1919	56.0	1.787
Jan 1920- Dec 1920	60.5	1.652
Jan 1921-Apr. 1922	62.7	1595
May 1922- Dec 1922	67.3	1.487
Jan 1923 -Dec 1923	78.6	1.273
Jan 1924- Dec 1924	94,1	1.062
Jan 1925---------	100.0	1.000

IRON AND STEEL

	Employment						Iron		Steel		Production		
	Seasonal	Actual	Secular	% A/S	Cor. Act.	Adj. Act.	Index	Seas. Act.	Seas. Act.	Cor. Act.	Index	Ratio P/E
1919-January	102.5	1834	1610	14.0	1789	3182	113.1	104 3303	111 3651	6463	99.5	188.0
February	104.2	1682	1619	4.0	1615	2885	102.6	106 2940	112 3178	5603	86.4	84.2
March	103.9	1669	1629	2.3	1606	2870	102.0	112 3090	116 3128	5473	84.4	82.8
April	102.2	1706	1638	4.1	1670	2982	106.1	105 2748	98 2631	5044	77.8	74.3
May	101.5	1760	1678	6.8	1735	3100	110.3	102 2108	96 2226	4442	68.5	62.1
June	98.7	1544	1657	-6.7	1565	2796	99.4	95 2115	89 2607	5123	79.0	79.6
July	96.9	1693	1667	1.7	1747	3120	110.9	91 2429	87 2947	6064	93.5	84.3
August	93.5	1557	1676	-6.6	1663	2970	102.0	92 2743	93 3226	6385	98.4	95.6
September	97.4	1741	1686	3.2	1789	3192	113.5	94 2448	96 2718	5496	84.7	74.6
October	99.9	1090	1695	-35.6	1092	1950	68.3	97 1864	100 2046	3951	60.9	89.2
November	99.4	1156	1705	-32.3	1163	2077	73.9	100 2392	102 2513	4872	75.1	101.4
December	99.9	1428	1714	-16.7	1431	2544	90.8	103 2633	98 2784	5409	83.4	91.8
1920		1748	1724	1.2	1706	2819	100.2	3015	3524	6072	93.6	93.4
		1499	1733	-13.6	1440	2380	84.6	2979	3402	5842	90.1	106.5
		1710	1743	- 2.0	1646	2721	96.7	3376	3917	6411	98.7	102.0
		1725	1752	- 1.6	1688	2790	99.2	2739	3132	5804	89.6	90.4
		1749	1762	- 0.2	1724	2847	101.2	2986	3423	6519	100.6	99.3
		1901	1771	7.2	1928	3182	113.1	3044	3539	7141	110.0	97.2
		1858	1781	4.1	1917	3168	112.6	3067	3328	7206	111.0	98.5
		1683	1790	-6.0	1801	2978	105.9	3147	3562	7178	110.5	104.4
		1844	1800	2.2	1894	3130	111.3	3129	3561	7061	108.8	97.8
		1843	1809	2.0	1846	3052	108.6	3293	3581	6953	107.1	98.2
		1795	1819	- 1.3	1807	2985	106.1	2935	3133	6024	92.8	87.2
		1324	1828	-27.5	1326	2191	78.0	2704	2779	6472	84.4	108.9
1921		1067	1838	-42.0	1042	1662	59.1	2416	2517	4588	70.7	119.6
		1432	1848	-22.4	1375	2192	78.0	1937	1999	3609	55.6	71.4
		1337	1857	-28.1	1287	2053	73.1	1596	1795	2984	46.0	62.9
		1206	1867	-35.4	1108	1882	66.9	1193	1387	2553	39.1	58.7
		1111	1876	-40.7	1095	1746	62.5	1221	1446	2715	41.8	66.9
		1115	1886	-40.9	1130	1802	64.1	1065	1146	2394	36.9	57.6
		1016	1895	-46.4	1048	1672	59.5	865	918	2008	31.0	52.1
		1028	1905	-46.1	1100	1755	62.4	954	1300	2408	37.1	59.5
		1067	1914	-44.3	1096	1749	62.3	986	1342	2455	37.8	60.7
		1193	1924	-38.0	1195	1906	67.8	1247	1847	3120	48.1	70.9
		1241	1933	-35.7	1249	1992	70.9	1415	1897	3283	50.6	71.4
		1252	1943	-35.6	1254	2000	71.2	1649	1630	3272	50.5	71.0

IRON AND STEEL

	Employment						Iron		Steel		Production		
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Adj.Act.	Index	Seas. Act.		Seas.Act.		Cor.Act.	Index	Ratio P/E
1922	102.5	1137	1953	-41.8	1110	1771	63.0	104	1645	111	1893	3287	50.6	80.3
	107.2	1249	1963	-36.5	1198	1911	68.0	106	1630	112	2017	3384	52.2	76.8
	103.9	1207	1972	-38.9	1162	1854	65.9	112	2036	116	2814	4256	65.6	99.6
	102.2	1251	1982	-36.9	1224	1952	69.5	105	2072	98	2902	4936	76.1	109.5
	101.5	1366	1991	-31.5	1346	2002	71.2	102	2306	96	3219	5637	86.8	121.9
	98.7	1461	2001	-27.0	1482	2202	78.3	95	2361	89	3128	5962	91.8	117.3
	96.9	1427	2010	-29.0	1473	2198	77.9	91	2405	87	2953	6051	93.2	119.6
	93.5	1533	2020	-24.1	1640	2437	86.6	92	1816	95	2629	4746	73.2	84.6
	97.4	1647	2029	-18.9	1692	2515	89.5	93	2034	96	2818	5115	78.8	88.0
	99.9	1764	2039	-13.5	1767	2627	93.4	97	2639	100	3410	6108	94.2	100.9
	94.4	1855	2048	- 9.5	1866	2772	98.6	99	2849	102	3430	6227	96.0	97.5
	99.9	1956	2057	- 5.0	1958	2910	103.5	103	3087	98	3301	6380	98.4	95.1
1923		2200	2067	6.1	2148	2733	97.3		3229		3841	6532	101.0	103.9
		2236	2076	7.9	2144	2730	97.3		2994		3472	5929	91.4	94.0
		2411	2086	20.1	2321	2955	105.1		3524		4067	6673	102.8	97.7
		2186	2095	4.5	2139	2722	96.8		3550		3964	7426	114.4	118.1
		2414	2104	14.7	2380	3029	107.6		3868		4216	8215	126.6	117.6
		2163	2114	2.6	2193	2792	99.3		3676		3767	8053	124.0	125.0
		2255	2123	6.0	2327	2960	105.2		3678		3531	8112	124.9	118.6
		2356	2133	10.4	2580	3209	114.0		3450		3696	7649	117.9	103.5
		2168	2142	0.9	2227	2833	100.8		3126		3357	6845	106.5	104.7
		2422	2152	12.7	2425	3087	109.7		3149		3577	6796	104.7	95.4
		2415	2161	11.5	2430	3091	109.8		3894		3134	6987	107.6	98.0
		2337	2171	7.6	2340	2980	106.0		2921		2863	5773	89.0	84.0
1924		2585	2182	18.6	2522	2682	95.5		3019		3650	6191	95.4	99.9
		2764	2192	26.0	2653	2822	100.4		3075		3826	6410	98.8	98.4
		2839	2201	28.8	2731	2903	103.3		3466		4207	6743	104.0	100.7
		2789	2211	26.1	2730	2903	103.3		3233		3348	6494	100.0	96.8
		2540	2220	14.5	2502	2661	94.6		2615		2640	5334	82.2	86.9
		2520	2230	13.0	2555	2717	96.6		2126		2066	5093	78.5	81.3
		2399	2239	7.1	2472	2630	93.5		1785		1878	4129	63.6	71.2
		2761	2248	- 3.5	2328	2473	88.0		1887		2553	4745	73.2	83.2
		2410	2258	6.1	2473	2630	93.5		2053		2828	5147	79.3	84.8
		2529	2267	11.5	2532	2692	95.7		2477		3125	5656	87.1	91.0
		2515	2277	10.5	2530	2692	95.7		2510		3121	5884	86.1	90.0
		2694	2287	17.6	2698	2867	101.9		2962		3569	6533	100.7	98.9

IRON AND STEEL

	Employment						Iron	Steel	Production		
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Adj.Act.	Index	Seas. Act.	Seas. Act.	Cor.Act.	Index	Ratio P/E
1925	102.5	2838	2297	23.6	2770		98.5	104 3370	111 4193	7016	108.1	109.7
	104.2	2925	2307	26.7	2810		99.9	106 3214	112 3752	6375	98.2	98.3
	103.9	2917	2316	26.1	2808		99.8	112 3564	116 4194	6820	105.1	105.2
	102.2	2894	2326	24.2	2832		100.7	105 3259	98 3584	6763	104.4	103.6
	101.5	2822	2335	21.0	2782		99.0	102 2931	96 3455	6603	101.8	102.9
	98.7	2732	2345	16.4	2770		98.5	95 2674	89 3205	6379	98.2	99.7
	96.9	2661	2354	13.1	2748		97.7	91 2664	87 3084	6487	99.9	102.2
	93.5	2585	2363	9.3	2765		98.3	92 2705	95 3421	6548	101.0	102.7
	97.4	2675	2373	12.8	2748		97.7	94 2726	96 3490	6555	101.0	103.4
	99.9	2746	2382	15.1	2750		97.8	97 3023	100 3889	6974	107.5	110.2
	99.4	2769	2392	15.8	2785		99.1	99 3023	102 3903	6869	106.3	107.2
	99.9	2860	2401	18.9	2864		101.8	103 3250	98 3971	7224	111.9	109.9
1926		2848	2411	18.2	2780		99.0	3316	4132	6910	107.0	108.0
		2843	2421	17.5	2730		97.1	2936	3782	6132	94.5	97.4
		2884	2430	18.8	2778		98.9	3442	4469	6948	107.5	108.7
		2904	2440	19.0	2841		101.1	3450	4106	7476	111.6	114.3
		2887	2449	18.0	2844		101.2	3482	3928	7537	116.6	115.2
		2850	2459	16.0	2890		102.8	3235	3734	7552	117.0	113.9
		2797	2468	13.3	2887		102.7	3223	3635	7735	119.7	116.5
		2837	2478	14.3	3034		107.9	3201	3987	7686	119.1	110.4
		2875	2487	15.3	2953		105.0	3136	3913	7439	115.1	109.7
		2880	2497	15.2	2885		102.6	3334	4074	7488	115.9	112.9
		2852	2506	13.8	2870		102.0	3237	3706	6887	106.6	104.5
		2779	2516	10.7	2783		99.0	3091	3467	6553	101.4	102.4
1927		2730	2526		2663		94.5	3104	3823	6430	99.1	104.9
		2767	2536		2652		94.3	2941	3845	6202	95.7	110.5
		2792	2545		2690		95.7	3483	4575	7077	109.5	114.4
		2763	2555		2704		96.2	3422	4163	7507	116.2	120.8
		2771	2564		2732		97.2	3391	4083	7610	117.8	121.2
		2692	2574		2730		97.2	3090	3526	7170	111.0	114.3
		2622	2583		2708		96.3	2951	3232	6973	107.9	112.0
		2627	2593		2810		99.9	2947	3529	6927	107.3	107.4
		2608	2503		2679		95.3	2775	3298	6409	98.8	103.7
		2568	2512		2571		91.5	2784	3345	6193	95.4	104.3
		2523	2621		2540		90.3	2648	3155	5756	88.8	98.4
		2436	2631		2489		88.5	2696	3203	5898	90.8	102.6

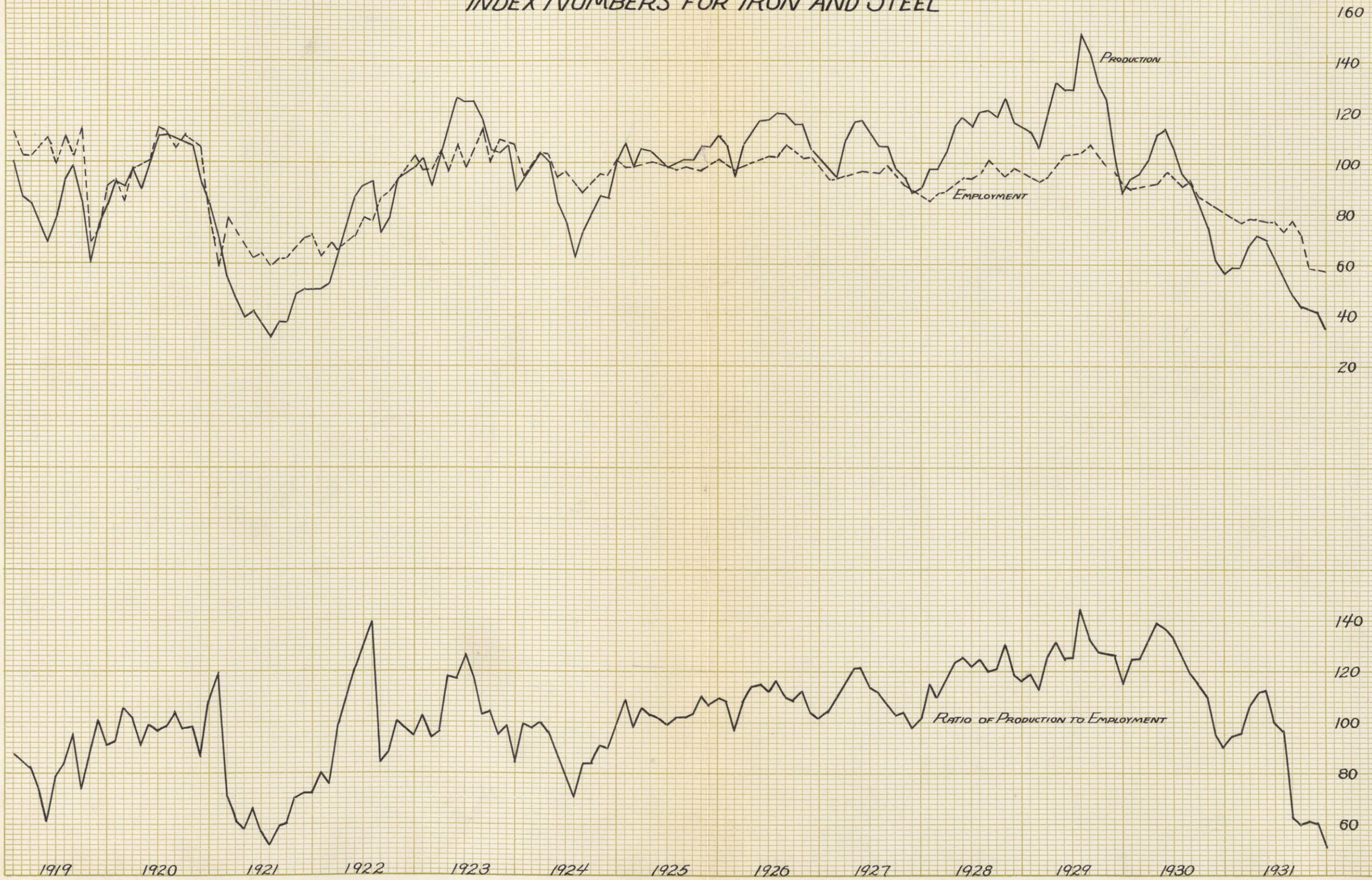
IRON AND STEEL

	Employment						Iron		Steel		Production		
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Adj.Act.	Index	Seas. Act.	Seas. Act.	Cor.Act.	Index	Ratio P/E
1928	102.5	2461	2641		2401		85.4	104 2870	111 4028	6384	98.4	115.2
	104.2	2606	2651		2500		88.9	106 2900	112 4081	6374	98.3	110.6
	103.9	2629	2660		2530		89.9	112 3200	116 4549	6801	105.4	117.2
	102.2	2644	2670		2608		92.6	105 3185	98 4345	7467	115.6	124.9
	101.5	2652	2679		2650		94.2	102 3284	96 4246	7673	118.8	126.0
	98.7	2613	2689		2648		94.2	95 3082	89 3778	7446	116.3	122.4
	96.9	2618	2698		2700		96.0	91 3072	87 3481	7809	120.9	125.9
	93.5	2659	2707		2845		101.1	92 3137	95 4217	7855	121.6	120.2
	97.4	2671	2717		2742		97.7	94 3062	96 4186	7642	118.3	121.0
	99.9	2691	2726		2694		95.8	97 3374	100 4693	8139	126.0	131.5
	99.4	2744	2736		2762		98.2	99 3302	102 4306	7545	116.9	119.0
	99.9	2738	2745		2742		97.7	103 3370	98 4055	7426	115.0	117.7
1929		2749	2755		2681		95.4	3442	4500	7364	114.0	119.5
		2748	2765		2639		93.8	3206	4329	6882	106.5	113.5
		2790	2774		2688		95.5	3714	5068	7710	119.4	125.0
		2845	2784		2805		99.7	3663	4950	8542	132.3	132.8
		2859	2793		2898		103.0	3898	5286	9368	129.6	125.8
		2868	2803		2903		103.3	3717	4903	9364	129.6	125.6
		2854	2812		2946		104.8	3785	4851	9757	151.1	144.1
		2837	2822		3034		107.9	3756	4939	9290	143.9	133.3
		2806	2831		2881		102.5	3498	4528	8465	131.0	127.8
		2789	2841		2798		99.3	3588	4534	8199	126.9	127.8
		2743	2850		2735		97.2	3181	3521	6656	103.0	106.0
		2591	2860		2595		92.2	2837	2903	5731	88.3	95.8
1930		2604	2870		2541		90.4	2827	3778	6122	94.3	104.3
		2683	2880		2578		91.7	2839	4035	6275	96.7	105.5
		2685	2889		2584		91.8	3246	4254	6586	102.0	111.1
		2680	2899		2641		93.9	3182	4609	7222	111.9	119.1
		2702	2908		2740		97.4	3233	3982	7350	113.9	117.0
		2610	2918		2643		94.0	2934	3419	6889	106.7	113.5
		2492	2927		2572		91.5	2639	2922	6269	96.6	105.5
		2446	2937		2618		93.0	2524	3061	5975	92.1	99.1
		2382	2946		2447		87.0	2277	2840	5397	83.1	95.6
		2382	2956		2384		84.7	2165	2693	4908	75.7	89.4
		2304	2965		2319		82.4	1867	2112	4047	62.4	75.7
		2285	2975		2288		81.3	1666	2080	3748	57.7	70.1

IRON AND STEEL

	Employment						Iron		Steel		Production		
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Adj.Act.	Index	Seas. Act.	Seas. Act.	Cor.Act.	Index	Ratio P/E
1931	102.5	2260	2985		2205		78.4	104 1714	111 2459	3863	59.5	75.9
	104.2	2265	2995		2175		77.3	106 1707	112 2502	3843	59.3	76.7
	103.9	2296	3004		2210		78.6	112 2032	116 2994	4412	68.0	86.5
	102.2	2269	3014		2219		78.8	105 2020	98 2722	4619	72.4	91.9
	101.5	2214	3023		2182		77.6	102 1994	96 2505	4583	70.6	91.0
	98.7	2138	3033		2168		77.1	95 1639	89 2076	4033	62.2	80.7
	96.9	2002	3042		2068		73.5	91 1436	87 1886	3662	56.4	76.7
	95.5	2048	3052		2190		77.9	92 1281	95 1719	3205	49.4	63.4
	97.4	1988	3061		2042		72.7	94 1169	96 1548	2866	44.2	60.8
	99.9	1951	3071		1953		69.5	97 1173	100 1592	2791	43.0	61.9
	99.4	1907	3080		1920		68.3	99 1103	102 1592	2672	41.2	60.3
	99.9	1912	3090		1914		68.1	103 980	98 1301	2284	35.2	51.7

INDEX NUMBERS FOR IRON AND STEEL



MEAT SLAUGHTERING AND PACKING

Individual Series Notes.

SOURCES. Employment figures from the U.S. Bureau of Labor Statistics Bulletin. Data expressed in hundreds.
Production Index from Standard Statistics Annual Supplement for 1932

SEASONALS. Seasonal for employment computed by the authors using the Reverse First Difference Process.
Production index has already been corrected for seasonal.

INDEX BASES. The base assumed in the computation of the index of employment is:
Monthly Employment Jan. 1923 - 8207 = 100
The base assumed by Standard Statistics in their Production index is:
Average Monthly Production years 1923-25 = 100

Composite Productivity Series Notes

Due to the fact that data for employment in the Meat Slaughtering and Packing industry is unavailable for the years 1919-21, the Composite Productivity Index for these years does not include the Employee-Productivity series for this industry for those years. The first figures available, for the months of July and August 1922, differed so widely from what proved to be a reasonable value for items in this series on employment that they were also omitted from the compilation of the Composite Productivity Index.

MEAT SLAUGHTERING AND PACKING

	Employment				Production		
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Index	Index	RatioP/E
1922-July	100.5	4740	8188	57.9	4716	57.5	101.1	176.0
August	100.6	4690	8191	57.3	4663	56.8	106.7	187.9
September	96.8	8229	8194	100.4	8506	103.8	105.8	101.8
October	99.5	8519	8198	104.0	8560	104.4	99.5	95.5
November	101.3	8900	8201	108.5	8786	107.1	105.1	100.6
December	103.3	8883	8204	108.2	8600	104.9	105.8	100.8
1923-January	105.8	9504	8207	115.9	8985	109.5	106.3	97.1
February	103.4	8526	8210	103.9	8247	100.5	109.1	108.5
March	98.8	8113	8213	98.8	8214	100.1	124.0	123.9
April	95.2	7546	8216	92.0	7930	96.6	120.3	124.5
May	95.3	7291	8219	88.7	7653	93.2	114.9	123.2
June	99.4	7189	8223	87.4	7235	87.1	112.1	128.8
July	100.5	8354	8226	101.5	8315	101.4	114.1	112.6
August	100.6	8953	8229	108.8	8900	108.5	119.7	110.3
September	96.8	9252	8232	112.4	9560	116.5	111.6	95.8
October	99.5	9329	8236	113.3	9372	114.2	117.9	103.1
November	101.3	9530	8239	115.7	9413	114.7	121.6	106.0
December	103.3	8794	8242	116.7	8516	103.8	113.4	109.2
1924-January		9314	8245	112.9	8803	107.3	115.2	107.5
February		9035	8248	109.5	8735	106.5	119.4	112.1
March		8497	8251	103.0	8600	104.8	113.5	108.5
April		8151	8254	98.8	8562	104.4	115.2	110.5
May		7182	8258	87.0	7541	91.8	114.1	124.5
June		7916	8261	95.9	7965	97.1	108.4	116.6
July		8327	8264	100.7	8288	101.0	120.1	119.0
August		8071	8267	97.6	8021	97.7	110.7	113.4
September		6718	8270	81.3	7943	96.8	110.7	114.4
October		8105	8273	98.0	8145	98.1	107.0	109.1
November		8166	8276	98.7	8066	98.3	110.4	112.3
December		8585	8280	103.7	8315	101.4	126.1	124.5

MEAT SLAUGHTERING AND PACKING

	Employment				Production		
	Seasonal	Actual	Secular	% A/S	Cor. Act.	Index	Index	Ratio P/E
1925	105.8	8535	8283	103.0	8066	98.2	114.8	116.9
	103.4	8359	8286	100.9	8084	98.6	108.2	109.7
	98.8	7914	8289	95.5	8010	97.6	98.2	100.6
	95.2	7458	8293	89.9	7815	95.3	103.0	108.1
	95.3	7465	8296	90.0	7834	95.4	99.0	103.9
	99.4	7564	8299	91.2	7615	92.8	103.5	111.6
	100.5	7415	8302	89.4	7378	89.9	103.8	115.4
	100.6	7586	8305	91.3	7542	91.9	102.3	113.2
	96.8	7377	8309	88.9	7622	92.9	105.6	113.7
	99.5	7672	8312	91.1	7708	94.0	109.4	116.3
	101.3	7768	8315	93.5	7670	93.4	95.6	102.3
	103.3	7399	8318	89.0	7164	87.3	102.8	117.7
1926		7995	8321	96.1	7555	92.1	98.4	106.8
		7797	8324	93.7	7540	91.9	99.1	107.8
		7300	8327	87.7	7390	90.1	110.6	122.8
		6850	8330	82.3	7200	87.8	108.3	123.3
		7141	8334	85.7	7498	91.4	99.3	108.6
		8161	8337	98.0	8214	100.1	110.7	110.6
		8271	8340	99.2	8230	100.4	110.8	110.3
		8574	8343	102.7	8523	103.9	114.3	110.0
		8321	8347	99.7	8600	104.8	115.6	110.3
		8766	8350	105.0	8807	107.3	99.5	92.8
		8657	8356	103.6	8546	104.1	98.0	94.1
1927		8778	8356	105.0	8499	103.6	97.6	94.2
		8412	8359	100.6	7950	96.9	95.1	98.2
		8615	8362	103.0	8332	101.5	100.1	98.7
		8358	8367	99.9	8460	103.1	113.1	109.7
		8190	8367	97.9	8608	105.0	110.1	104.8
		8125	8372	97.1	8530	104.0	111.1	106.8
		8733	8375	104.2	8785	107.1	118.4	110.4
		8194	8378	97.8	8155	99.4	111.6	112.3
		8979	8382	107.0	8925	108.8	117.1	107.7
		8501	8385	101.3	8786	107.1	106.1	98.9
		8398	8388	100.1	8483	102.9	95.0	92.4
		8477	8391	101.0	8372	102.0	96.0	94.1
		8689	8394	103.6	8414	102.5	95.4	93.1

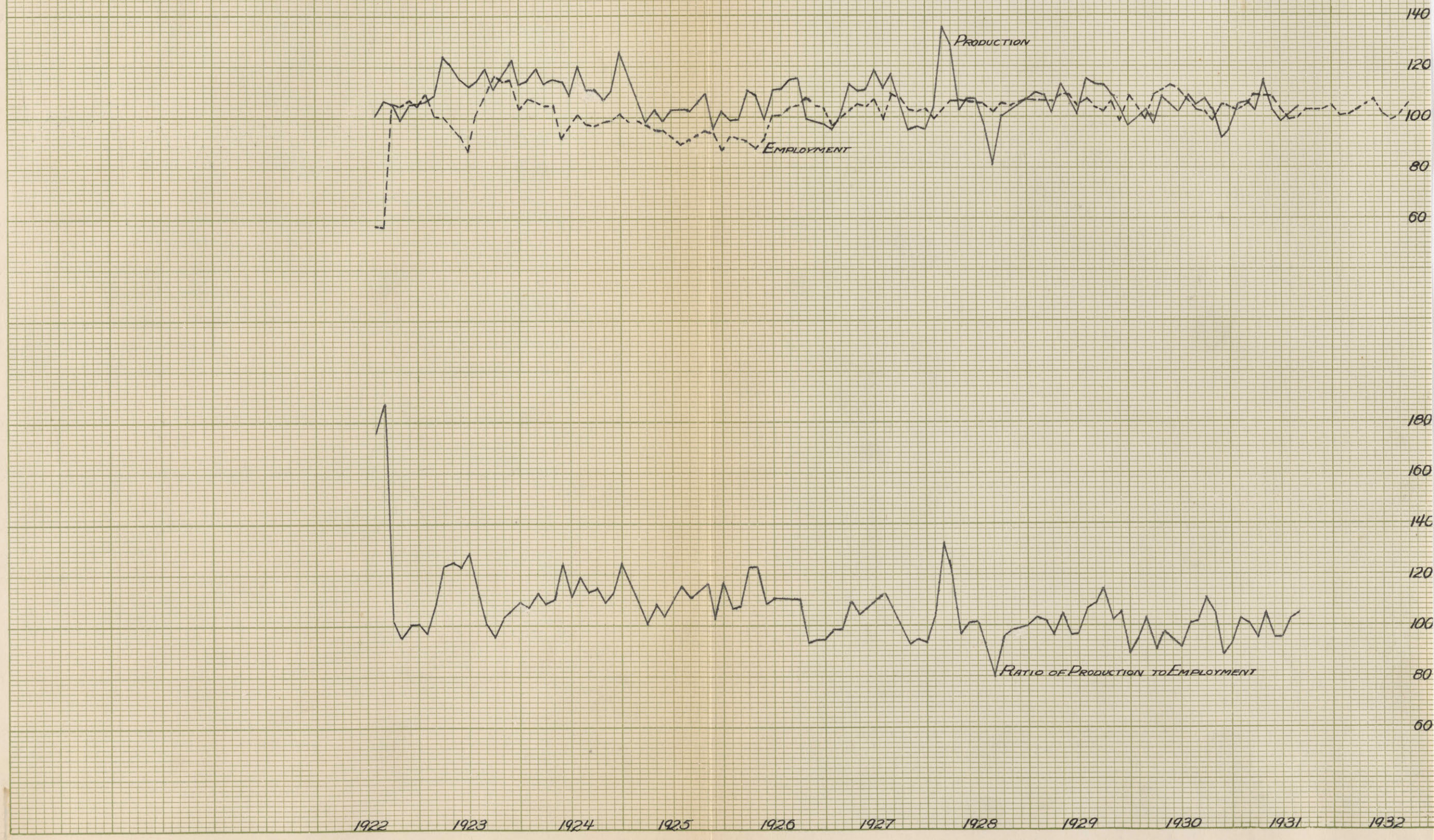
MEAT SLAUGHTERING AND PACKING

	Employment				Production		
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Index	Index	Ratio P/E
1928	105.8	8611	8397	102.5	8140	99.8	103.8	104.0
	103.4	8753	8400	103.9	8441	102.9	135.8	132.0
	98.8	8613	8403	102.5	8720	106.3	129.0	121.4
	95.2	8336	8407	99.2	8960	106.7	103.0	96.7
	95.3	8300	8410	98.7	8712	106.1	107.5	101.2
	99.4	8644	8413	102.7	8697	106.0	107.6	101.5
	100.5	8647	8416	102.7	8608	104.9	97.3	92.8
	100.6	8418	8419	100.0	8365	102.0	81.3	79.7
	96.8	8381	8423	99.5	8665	105.6	100.2	95.0
	99.5	8520	8426	101.1	8560	104.4	102.4	98.1
	101.3	8823	8427	104.6	8716	106.2	104.1	98.1
	103.3	9048	8432	107.3	8760	106.7	106.6	99.9
1929		9259	8435	109.8	8750	106.6	109.9	103.1
		9047	8438	107.2	8750	106.6	108.8	102.0
		8584	8441	101.7	8698	106.0	101.8	96.1
		8460	8444	100.1	8887	108.4	113.5	104.9
		8522	8448	100.8	8946	109.0	105.2	96.7
		8479	8451	100.3	8530	104.0	101.0	97.2
		8850	8454	104.7	8807	107.4	114.9	107.0
		8587	8457	101.6	8534	104.0	112.9	108.6
		8117	8461	96.0	8386	102.2	112.8	115.3
		8667	8464	102.4	8706	102.1	108.4	102.1
		8151	8467	96.2	8046	98.1	103.7	105.7
		8218	8470	108.8	8926	108.7	96.9	89.2
1930		9159	8473	108.1	8657	105.5	99.5	94.3
		8457	8476	99.8	8178	96.6	103.3	103.7
		8789	8479	103.6	8898	108.4	97.8	90.3
		8654	8482	102.0	9090	110.7	108.2	97.7
		8772	8486	103.4	9208	112.2	105.5	94.0
		9677	8489	107.0	9134	111.4	102.0	91.7
		8883	8492	104.7	8841	107.7	108.3	100.5
		8514	8495	100.2	8465	103.2	105.0	101.7
		8101	8499	95.4	8374	102.0	107.7	110.5
		8064	8502	94.9	8105	98.8	103.3	104.6
		8669	8505	100.7	8560	104.4	92.0	88.2
		8754	8508	102.9	8476	103.3	95.4	92.4

MEAT SLAUGHTERING AND PACKING

	Employment				Production		
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Index	Index	Ratio P/E
1931	105.8	8918	8511	104.8	8426	102.7	105.4	102.6
	103.4	8935	8514	105.0	8640	105.4	106.0	100.6
	98.8	8799	8517	103.2	8901	108.5	102.8	94.8
	95.2	8443	8521	99.2	8873	108.1	114.2	105.5
	95.3	8433	8524	98.9	8850	107.9	102.6	95.3
	99.4	8387	8527	98.4	8420	102.6	88.5	95.9
	100.5	8162	8530	95.7	8126	99.0	101.8	102.8
	100.6	8213	8533	96.3	8161	99.5	104.5	105.2
	96.8	8171	8537	95.7	8442	102.9		
	99.5	8395	8540	98.3	8428	102.7		
	101.3	8551	8543	100.1	8442	102.9		
	103.3	8811	8546	103.0	8532	104.0		

INDEX NUMBERS FOR MEAT SLAUGHTERING AND PACKING



RUBBER

Employee Productivity Series Notes.

SOURCES. Employment figures for the rubber industry were obtained from the Federal Reserve Board Index of Factory Employment, page 236.

The production figures are those for the consumption of crude rubber by the manufacturers. This data was obtained from the Rubber Manufacturers' Association. The actual number of long tons consumed by the mills is used.

SEASONALS. Both the employment index and the crude rubber consumption series had to be corrected for seasonal. The correction was made by the Reverse First Difference Process.

INDEX BASES. The Federal Reserve Employment index uses as a base the average monthly employment for the year 1923 = 100.

The base assumed in the computation of the production index is:

Average monthly consumption of crude rubber for years 1923-25 inclusive - 2481 tons = 100

Composite Productivity Series Notes.

Nothing but yearly figures for the consumption of crude rubber are available before the year 1923. Therefore computation of an Employee-Productivity series for this industry was impossible for the period prior to that time. The Composite Productivity Index series does not include Rubber for the years 1919-1922 inclusive.

RUBBER

	Employment					Production						
	Seasonal	Index	Secular	% Ind./S	Cor.Ind.	Seasonal	Actual	Secular	% A/S	Cor.Act.	Index	Ratio P/E
1923-January	99.5	110.4	102.14	108.0	110.9	104.9	3011	2910	103.5	2871	101.0	91.2
February	101.4	115.1	102.12	112.7	113.5	101.1	3015	2916	103.4	2981	104.9	92.4
March	101.9	116.3	102.09	113.9	114.0	110.3	3663	2922	125.3	3320	116.8	102.5
April	102.9	116.9	102.07	114.3	113.6	109.0	2909	2927	99.4	2668	93.8	82.5
May	103.4	116.4	102.04	111.4	112.5	109.7	3616	2933	123.2	3243	114.2	101.5
June	102.8	111.2	102.02	109.0	108.2	101.8	2427	2939	82.6	2383	83.9	77.5
July	99.8	102.1	102.00	100.1	102.3	95.8	1769	2944	60.0	1846	65.0	63.6
August	98.8	90.6	101.97	88.8	91.7	106.2	2036	2950	69.0	1916	67.4	73.5
September	98.5	86.0	101.95	84.4	87.3	95.2	1759	2956	59.5	1848	65.0	73.7
October	97.7	85.3	101.93	83.7	87.3	95.3	2312	2961	78.0	2239	78.8	90.3
November	95.8	87.9	101.90	86.3	91.7	87.5	2044	2967	69.0	2338	82.2	89.6
December	97.5	91.6	101.88	89.9	93.9	83.3	2190	2972	73.7	2630	92.6	98.6
1924		92.4	101.85	90.7	92.7		2906	2978	97.6	2771	97.5	105.4
		93.7	101.83	92.0	92.4		2574	2984	86.2	2547	89.6	97.0
		93.3	101.81	91.5	91.4		2839	2989	95.1	2573	90.6	99.2
		92.1	101.78	90.5	89.5		2713	2995	90.6	2489	87.6	97.9
		91.1	101.76	89.5	88.1		2582	3001	86.1	2354	82.9	94.2
		88.2	101.74	86.7	85.8		2275	3006	75.8	2235	78.7	91.8
		84.0	101.71	82.5	84.2		2370	3012	77.7	2431	85.9	102.0
		84.6	101.69	83.1	85.7		2596	3018	96.0	2727	96.0	111.0
		93.7	101.66	92.1	95.2		3150	3023	104.1	3310	116.5	122.4
		93.0	101.64	91.5	95.2		3152	3029	104.0	3310	116.5	122.4
		97.2	101.62	95.5	101.5		2729	3035	89.8	3118	109.7	108.1
		98.5	101.59	96.7	101.0		2720	3040	89.4	3267	115.0	113.9
1925		99.6	101.57	98.0	100.2		2964	3046	97.4	2827	99.4	99.0
		102.9	101.54	101.1	101.5		2976	3052	97.4	2942	103.6	102.1
		103.7	101.52	102.1	101.7		3350	3057	109.6	3038	106.9	105.0
		104.9	101.50	103.3	101.9		3414	3063	111.4	3121	109.9	107.9
		108.2	101.47	106.6	104.6		3532	3069	115.1	3220	113.4	108.3
		109.1	101.45	107.6	106.2		3582	3074	116.5	3520	123.9	116.6
		109.7	101.43	108.2	110.0		3605	3080	117.0	3763	132.4	120.4
		109.1	101.40	108.6	111.5		3591	3086	116.4	3382	119.0	106.7
		109.6	101.38	107.6	110.6		3569	3091	102.5	3328	117.0	105.7
		102.6	101.36	101.3	105.0		2905	3097	93.8	3050	107.4	102.3
		102.2	101.33	101.0	106.6		2885	3103	93.0	3298	116.0	108.7
		106.4	101.31	105.0	109.0		2875	3108	92.5	3452	121.5	111.4

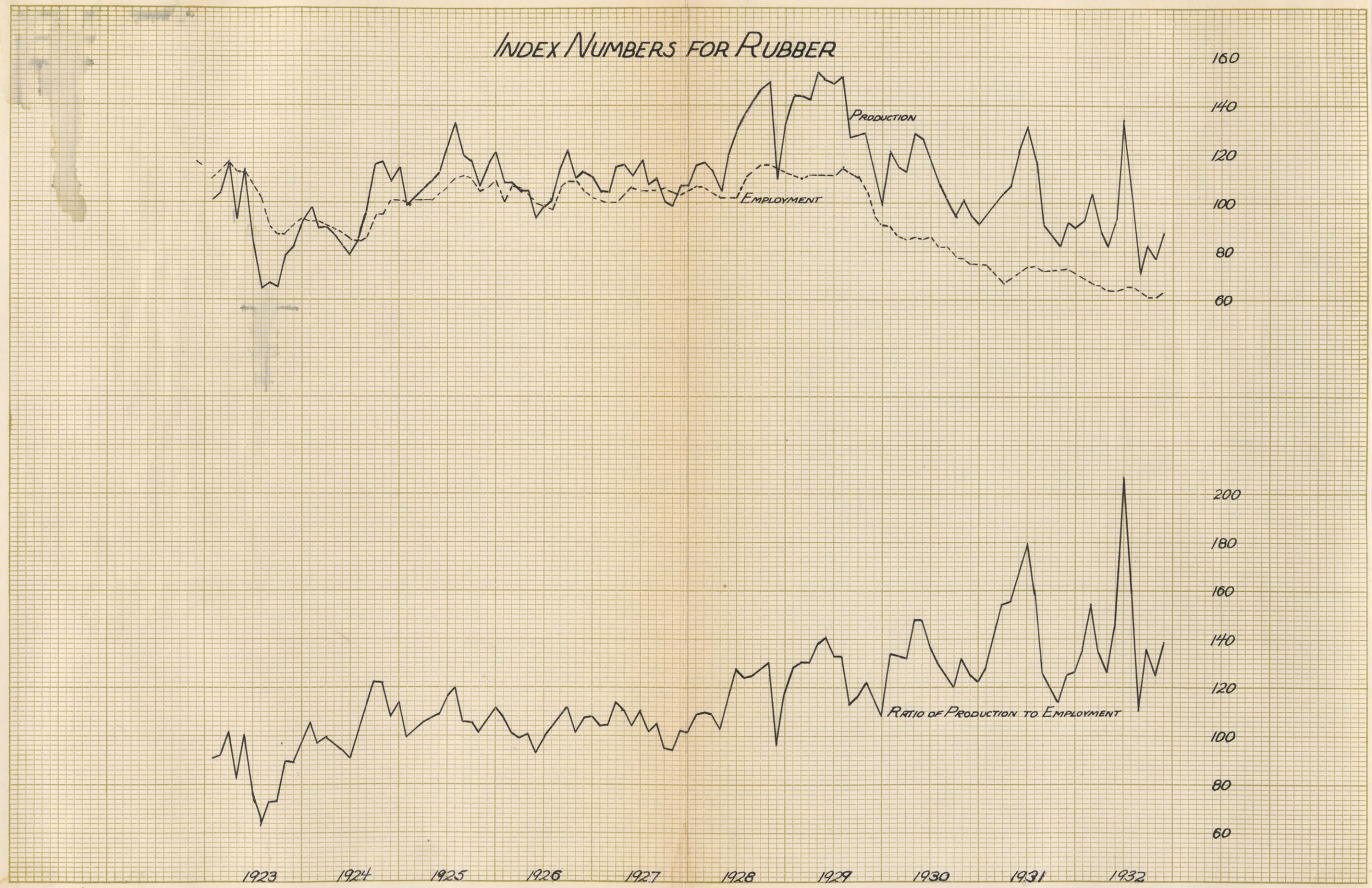
RUBBER

	Employment					Production						
	Seasonal	Index	Secular	%Ind./Sec.	Cor.Ind.	Seasonal	Actual	Secular	% A/S	Cor.Act.	Index	Ratio P/E
1926	99.5	108.1	101.28	106.8	100.7	104.9	3220	3114	103.3	3070	108.0	107.2
	101.4	108.6	101.26	107.3	107.1	101.1	3114	3120	99.8	3080	108.4	101.1
	101.9	108.0	101.24	106.6	106.0	110.3	3294	3125	105.4	2988	105.2	99.2
	102.9	107.5	101.22	106.1	104.5	109.0	3270	3131	104.4	3000	105.6	101.1
	103.4	104.2	101.19	103.0	100.8	109.7	2936	3137	93.6	2675	94.1	93.4
	102.8	102.6	101.17	101.4	99.9	101.8	2860	3142	91.0	2810	98.9	99.0
	99.8	97.3	101.14	96.1	97.5	95.8	2758	3148	87.6	2878	101.3	104.0
	98.8	104.1	101.12	103.0	105.5	106.2	3453	3154	109.5	3251	114.5	108.5
	98.5	107.8	101.10	106.5	109.4	95.2	3290	3159	104.2	3458	121.6	112.2
	97.7	106.5	101.07	105.3	109.0	95.3	2994	3165	94.6	3142	110.5	101.3
	95.8	100.8	101.05	99.7	1052	87.5	2808	3171	88.5	3209	113.0	107.3
	97.5	100.1	101.03	91.1	102.6	83.3	2629	3176	828	3157	111.1	108.2
1927		100.8	101.00	99.8	101.3		3152	3182	99.0	3008	105.9	104.6
		102.2	100.97	101.3	100.6		3014	3188	94.6	2981	105.0	104.5
		102.8	100.95	101.9	100.8		3614	3193	113.1	3278	115.3	114.4
		106.9	100.93	105.9	103.9		3587	3199	112.1	3287	115.6	111.3
		110.1	100.91	109.1	106.5		3459	3205	107.9	3150	110.9	104.1
		108.4	100.88	107.4	105.4		3380	3210	105.3	3220	116.9	110.9
		105.0	100.86	104.0	105.2		2922	3216	90.9	3050	107.4	102.0
		104.3	100.83	102.4	105.6		3346	3222	103.8	3150	110.9	105.0
		104.3	100.81	102.5	106.0		2721	3227	84.4	2860	100.7	95.1
		101.9	100.78	101.1	104.3		2679	3233	82.8	2810	98.9	94.8
		99.2	100.76	98.4	103.6		2679	3239	82.7	3060	107.7	103.9
		102.2	100.74	101.4	104.7		2549	3244	78.5	3060	107.7	102.9
1928		105.1	100.72	104.3	105.6		3440	3250	105.8	3279	115.4	109.2
		107.6	100.69	106.8	106.1		3370	3256	103.5	3332	117.3	110.5
		106.0	100.66	105.3	104.0		3569	3261	109.4	3233	113.9	109.5
		105.7	100.64	105.0	102.7		3277	3267	100.3	3008	105.9	103.1
		105.4	100.62	104.7	101.9		3733	3273	114.0	3402	119.8	117.7
		105.4	100.59	104.8	102.5		3768	3278	115.0	3700	130.2	127.0
		110.7	100.57	110.0	110.9		3741	3284	114.6	3905	137.5	124.0
		111.6	100.55	111.0	113.0		4293	3290	130.5	4041	142.2	125.8
		113.4	100.52	112.2	115.1		3988	3295	121.0	4189	147.4	128.0
		113.2	100.50	112.6	115.9		4086	3301	123.7	4289	150.9	130.1
		109.8	100.47	109.4	114.6		3746	3307	113.2	3138	110.4	96.3
		109.6	100.45	109.2	112.4		2123	3312	94.3	3751	132.0	117.4

RUBBER

	Employment					Production						
	Seasonal	Index	Secular	% Ind./Sec.	Cor.Ind.	Seasonal	Actual	Secular	% A/S	Cor.Act.	Index	Ratio P/E
1929	99.5	112.2	100.43	111.8	112.6	104.9	4300	3318	129.6	4100	144.4	128.0
	101.4	112.3	100.41	111.8	110.6	101.1	4159	3324	125.0	4112	144.7	130.8
	101.9	113.3	100.38	112.9	111.1	110.3	4473	3329	134.4	4057	142.8	130.3
	102.9	117.3	100.36	113.9	111.1	109.0	4752	3335	142.5	4360	153.5	138.0
	103.4	115.3	100.33	114.9	111.5	109.7	4923	3341	147.3	4486	157.9	141.5
	102.8	115.0	100.31	114.6	111.9	101.8	4323	3346	129.3	4248	149.5	133.7
	99.8	114.2	100.28	113.9	114.5	95.8	4153	3352	124.0	4335	152.5	133.1
	98.8	111.5	100.26	111.2	113.0	106.2	3827	3358	114.0	3602	127.9	113.1
	98.5	108.3	100.24	108.0	110.0	95.2	3471	3363	103.2	3649	128.5	116.9
	97.7	102.7	100.22	102.5	105.1	95.3	3480	3369	103.3	3652	128.5	122.1
	95.8	91.2	100.18	91.0	95.1	87.5	2766	3375	82.0	3166	111.2	116.9
	97.5	89.2	100.17	89.0	91.5	83.3	2353	3380	69.7	2828	99.5	108.6
1930		89.7	100.14	89.6	90.1		3619	3386	106.8	3449	121.4	134.8
		87.9	100.12	87.8	86.6		3330	3392	98.0	3292	115.9	133.8
		87.2	100.09	87.1	85.6		3554	3397	104.7	3222	113.5	132.7
		88.6	100.07	88.6	86.2		3969	3403	116.6	3640	128.1	148.7
		88.3	100.05	88.3	85.4		3939	3409	115.7	3589	126.4	148.1
		88.0	100.02	88.0	86.6		3420	3414	100.1	3360	118.3	136.7
		82.7	100.00	82.7	82.9		2951	3420	86.4	3081	108.5	130.8
		81.0	99.97	81.0	82.0		3085	3426	90.1	2904	102.3	124.8
		77.4	99.95	77.4	78.6		2552	3431	74.4	2682	94.4	120.1
		75.3	9993	75.4	77.1		2752	3437	80.1	2890	101.7	132.0
		72.6	9991	72.6	75.8		2369	3443	68.9	2708	95.2	125.5
		73.2	9988	73.3	75.1		2169	3448	63.0	2603	91.7	122.1
1931		73.0	9986	73.1	74.4		2856	3454	82.6	2722	95.6	128.5
		72.0	9983	72.1	71.0		2880	3460	83.2	2849	100.2	141.2
		69.0	9980	69.1	67.7		3279	3465	94.6	2972	104.6	154.5
		71.1	99.78	71.1	69.1		3332	3471	96.0	3058	107.5	155.5
		74.3	99.76	74.5	71.8		3782	3477	108.9	3448	121.3	168.9
		75.6	99.74	75.6	73.5		3792	3482	108.9	3737	131.5	178.8
		74.1	99.71	75.4	74.3		3194	3488	91.6	3334	117.4	158.0
		71.5	9969	71.8	72.4		2759	3494	79.0	2598	91.4	126.2
		71.7	9966	72.0	72.8		2364	3499	67.3	2484	87.4	120.0
		70.2	9964	70.5	71.9		2228	3505	63.6	2339	82.3	114.5
		70.7	9962	71.0	73.8		2294	3611	65.3	2622	92.3	125.1
		69.8	9960	70.1	71.6		2141	3516	61.0	2572	90.5	126.5

INDEX NUMBERS FOR RUBBER



WOOLEN

Employee Productivity Series Notes.

SOURCES. Data for employment were obtained from the U.S. Bureau of Labor Statistics Bulletin. The figures express the actual total number of workers in woolen and worsted mills. One place was omitted from the figures to aid the ease of calculation.

The figures listed as Actual Production for the woolen industry represent the total consumption of raw wool by the combined woolen and worsted mills of the country, in tens of thousands of pounds. Data compiled by the U.S.Department of Commerce.

SEASONALS. The seasonal factors for both the employment and production series had to be computed by the Authors, using the Reverse First Difference Process, as explained under Appendix B-1.

INDEX BASES. In both series the base for the index was taken as the average monthly value for the years 1923-25 inclusive.
In the employment series 7300 = 100.
In the production series 5816 = 100.

Adjustment of Employment actuals had to be made for the years 1919-1924 inclusive because of the variance in the total number of mills reporting during that period. For explanation of the methods of correction see Appendix C-2 also discussion under the Employee-Productivity Series Notes for COTTON. Tabulation of correction data as used in making the Adjusted Actuals for 1919-24 appears below.

Year	Total Reported	Total for Industry	Ratio(K) Rep./Tot.	%(K) of 41.3*	Adjusted Actual
1919	39,601	160,000	24.75%	59.9	66,160
1920	36,832	(160,000)**	24.75%	59.9	61,525
1921	44,723	162,364	27.55%	66.8	67,000
1922	44,725	(178,000)**	25.00%	60.5	80,700
1923	64,233	194,552 *	33.00%	79.9	80,400
1924	64,278	(170,000) **	37.80%	91.5	70,300
1925	68,296	165,224	41.30%	100.0	68,296

**Estimated on the basis of the total wool consumed(average for the month)in each year.
* 41.3-the percent of total mills(reporting over the period 1925-31 constantly) which is assumed to be perfect reporting.

WOOLEN

In the case of this industry the number of mills reporting employees seems to have changed consistently with the end of each year during the period 1919-24 inclusive. The correction factor is therefore applied to each year. They are as follows:-

Year	%(K) of 41.3	Multiplier *
1919	59.9	1.67
1920	59.9	1.67
1921	66.8	1.50
1922	60.5	1.65
1923	79.9	1.25
1924	91.5	1.09
1925	100.0	1.00

* Multiplier is reciprocal of %(K)of 41.3.

Composite-productivity Series Notes.

The figures for March through July 1922 were unavailable so that no computations for that period could be made. When reporting was again resumed in August, the reports for the next two months were so out of line with the rest of the years that it was felt justifiable to omit from the compilation of the Composite index the period March-September inclusive 1922.

WOOLEN GOODS

	Employment							Production				
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Adj.Act.	Index	Seasonal	Actual	Cor.Act.	Index	Ratio P/E
1919-January	97.0	3103	4399	-29.4	3200	5340	73.2	106.7	3825	3584	62.6	85.5
February	99.8	1852	4418	-58.6	1855	3100	42.5	115.0	2730	2373	40.8	96.0
March	102.9	2463	4437	-44.5	2394	4000	54.8	102.0	3438	3370	58.0	105.8
April	103.9	3701	4457	-16.9	3565	5955	81.5	98.3	4567	4646	78.1	95.9
May	102.3	3857	4476	-13.8	3770	6300	86.3	95.6	5241	5482	94.2	109.0
June	99.6	4541	4495	-1.2	4560	7620	104.3	91.1	5573	6119	105.2	100.9
July	96.3	4579	4515	+1.4	4758	7945	108.7	87.3	6322	7242	124.6	114.6
August	96.9	4668	4534	+2.9	4820	8060	110.1	90.0	5601	6723	115.6	105.0
September	100.2	4497	4553	-1.2	4488	7495	102.6	99.9	6026	6028	103.6	101.1
October	103.5	4949	4573	+8.1	4782	7986	109.4	108.2	6923	6400	110.1	100.7
November	101.5	4749	4592	+3.3	4677	7810	106.9	107.1	6059	5660	97.4	91.2
December	96.2	4565	4611	-1.0	4767	7960	109.0	98.8	6382	6461	111.1	101.9
1920-January		4398	4630	-5.0	4533	7575	103.7		7273	6815	117.2	113.0
February		4104	4649	-11.7	4111	6865	94.1		6374	5540	95.3	101.2
March		4836	4668	3.6	4700	7845	107.4		6791	6660	114.5	106.7
April		5171	4688	+10.2	4980	8317	113.9		6694	6808	117.1	102.9
May		5080	4707	+8.0	4967	8295	113.6		5859	6125	105.4	92.8
June		4485	4726	-5.1	4505	7526	103.0		4658	5005	86.1	83.6
July		1941	4746	+59.1	2018	3368	46.0		3710	4250	73.1	159.0
August		2373	4765	-50.1	2452	4095	56.1		3805	4228	72.8	129.8
September		3189	4784	-18.7	3182	5315	72.8		3630	3631	62.5	85.9
October		3350	4804	-30.2	3237	5406	74.0		3844	3553	61.1	82.6
November		2923	4823	-39.4	2882	4815	65.9		2809	2622	45.1	68.5
December		2349	4843	-51.5	2441	4080	55.9		2437	2468	42.4	75.9
1921-January		2361	4862	-51.4	2434	3645	50.0		2981	2794	48.1	96.2
February		3319	4881	-32.0	3325	4980	68.2		3620	3149	54.1	79.3
March		3813	4900	-20.7	3774	5650	77.4		4718	4625	79.5	102.7
April		4751	4920	-3.4	4575	6850	93.8		5307	5400	92.9	99.1
May		4647	4939	-6.0	4534	6805	93.3		5693	5955	102.4	109.8
June		5086	4958	+2.6	5115	7660	104.9		5959	6538	112.4	107.1
July		5071	4978	+1.9	5266	7882	107.9		5308	6080	104.6	97.0
August		5061	4997	+1.3	5226	7826	107.1		5826	6475	111.4	103.9
September		5146	5016	+2.6	5135	7695	105.4		6213	6215	106.9	101.5
October		5150	5036	+2.3	4977	7455	102.0		6729	6220	107.0	101.9
November		5073	5055	+0.3	5000	7495	102.6		6533	6106	105.0	102.1
December		4120	5074	-18.7	4282	6415	87.8		6128	6205	107.7	122.7

WOOLEN GOODS

	Employment						Production				
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Adj.Act.	Index	Seasonal	Actual	Cor.Act.	Index	Ratio P/E
1922	97.0	4311	5093	-15.3	4448	7355	100.7	106.7	6455	6048	104.4	103.6
	99.8	4446	5112	-13.0	4454	7356	100.7	115.0	6637	5766	99.1	98.4
	102.9							107.0	6806	6675	114.8	
	103.9							98.3	5253	5342	9.8	
	102.3							95.6	6451	6748	116.6	
	99.6							91.1	6461	7091	122.0	
	96.3	3873	5209	-25.6				87.3	5759	6595	113.4	
	96.9	3922	5228	-25.0	4050	6700	91.8	90.0	7041	7822	134.5	146.5
	100.2	4159	5247	-20.8	4151	6865	94.0	99.9	6725	6728	117.5	125.0
	103.5	5033	5267	-4.5	4863	8040	110.1	108.2	7279	6725	115.6	104.9
	101.5	4788	5287	-9.5	4720	7805	106.9	107.1	7774	7257	124.8	116.7
	96.2	5249	5306	-1.1	5459	9020	123.5	98.5	7167	7258	124.8	101.0
1923		5452	5325	+2.3	5620	7040	96.5		7778	7284	125.3	129.9
		6708	5344	+25.5	6720	8415	115.2		7112	6183	106.4	92.4
		6694	5363	+24.7	6506	8155	111.6		7719	7570	130.2	116.6
		7365	5383	+36.7	7093	8880	121.5		6927	7050	121.3	99.9
		7362	5402	+36.2	7200	9020	123.5		7328	7665	131.8	106.7
		6578	5421	+21.3	6600	8207	113.4		6465	7100	122.1	107.7
		6413	5440	+17.8	6660	8345	114.4		5691	6520	112.2	98.2
		6500	5460	+19.0	6715	8410	115.2		5923	6585	113.3	98.3
		6137	5479	+12.1	6118	7660	105.0		5724	5726	98.5	93.9
		5993	5499	+8.9	5792	7255	99.2		6362	5880	101.1	102.0
		5944	5519	+7.7	5860	7340	100.5		6174	5762	99.1	98.6
		5934	5538	+7.1	6166	7725	105.9		5581	5670	99.2	93.7
1924		5887	5556	+6.0	6072	6635	90.9		6612	6195	106.5	117.1
		7029	5575	+26.1	7041	7700	105.5		6217	5405	93.0	88.2
		6964	5594	+24.6	6770	7400	101.4		5849	5735	98.0	97.1
		6798	5614	+21.1	6544	7155	98.4		5445	5543	95.4	97.5
		6514	5633	+15.6	6365	6960	95.3		4482	4690	80.7	84.8
		6156	5652	+8.9	6180	6750	92.5		3805	4180	71.9	77.7
		5985	5671	+5.6	6220	6800	93.2		4147	4750	80.0	85.8
		5947	5691	+4.5	6140	6710	92.0		4920	5465	94.0	102.1
		6267	5710	+9.8	6258	6840	93.7		5600	5602	96.4	102.9
		6875	5729	+20.0	6640	7255	99.4		6740	6227	109.1	107.8
		6913	5748	+20.2	6810	7440	102.0		5935	5540	95.3	93.4
		5799	5767	+0.5	6030	6590	90.3		6275	6348	109.2	121.0

WOOLEN GOODS

	Employment						Production				
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Adj.Act.	Index	Seasonal	Actual	Cor.Act.	Index	Ratio P/E
1925	97.0	7097	5788	22.5	7316		100.2	106.7	6316	5920	101.8	101.5
	99.8	6916	5807	19.0	6926		94.9	115.0	5699	4958	85.3	89.9
	102.9	7142	5826	22.5	6940		95.0	102.0	5630	5520	95.0	100.0
	103.9	7263	5846	24.2	6998		95.8	98.3	5315	5406	92.9	97.0
	102.3	6823	5665	16.3	6670		91.4	95.6	4696	4910	84.4	92.4
	99.6	6683	5884	13.5	6712		91.9	91.1	4688	5146	88.5	96.3
	96.3	6346	5904	7.5	6596		90.4	87.3	5007	5738	98.7	109.1
	96.9	6521	5923	10.0	6732		92.2	90.0	5175	5746	98.8	107.1
	100.2	6744	5942	13.4	6732		92.2	99.9	5450	5452	93.7	101.7
	103.5	6677	5962	12.0	6452		88.4	108.2	5811	5370	92.4	104.5
	101.5	6909	5981	17.4	6810		93.9	107.1	5338	4982	85.7	91.9
	96.2	6834	6000	13.9	7106		97.3	98.8	5496	5560	95.6	98.3
1926		6825	6018	13.4	7040		96.5		5089	4770	82.0	85.0
		6288	6037	4.1	6302		86.4		4971	4322	74.3	86.0
		5968	6056	-1.4	5804		79.5		5394	5287	91.0	114.5
		5831	6076	-1.4	5615		76.9		4923	5010	86.1	112.0
		5881	6095	-3.5	5749		78.8		4550	4655	80.1	101.7
		5853	6114	-4.3	6140		84.1		4697	5158	88.6	105.2
		5848	6134	-4.6	6076		83.3		4695	5380	92.5	111.0
		5825	6153	-5.3	6018		82.5		5017	5576	95.9	116.2
		6145	6172	-0.4	6137		84.1		5620	5622	96.7	115.0
		6551	6192	5.7	6236		85.4		6020	5563	95.7	112.1
		6594	6211	6.0	6498		89.0		5870	5480	94.3	106.0
1927		6528	6230	4.8	6788		93.0		5874	5943	102.3	110.0
		6615	6250	5.7	6826		93.4		5696	5338	91.8	98.3
		6578	6269	4.9	6590		90.3		5641	4803	84.3	93.4
		6190	6288	-1.6	6020		82.5		6663	6535	114.4	126.2
		6118	6308	-3.0	5890		80.7		5399	5500	94.6	117.2
		6092	6327	-3.7	5955		81.6		5444	5699	98.0	120.0
		6110	6346	-3.7	6137		84.0		5526	6070	104.5	124.4
		5790	6366	-9.1	6018		82.5		4891	5600	96.3	116.7
		6359	6385	-0.6	6562		89.9		5710	6343	109.2	121.5
		6262	6404	-2.2	6248		85.6		5913	5915	101.7	118.9
		6258	6423	-2.6	6045		82.9		6032	5575	95.9	115.7
		6610	6463	-2.2	6514		89.2		5688	5314	91.4	110.2
		6480	6462	-0.2	6740		92.3		5119	5180	89.1	96.6

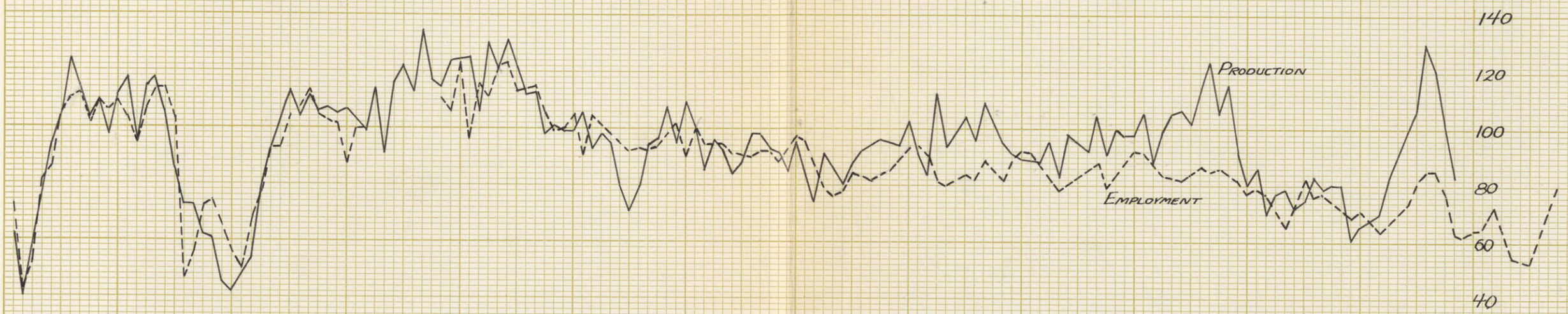
WOOLEN GOODS

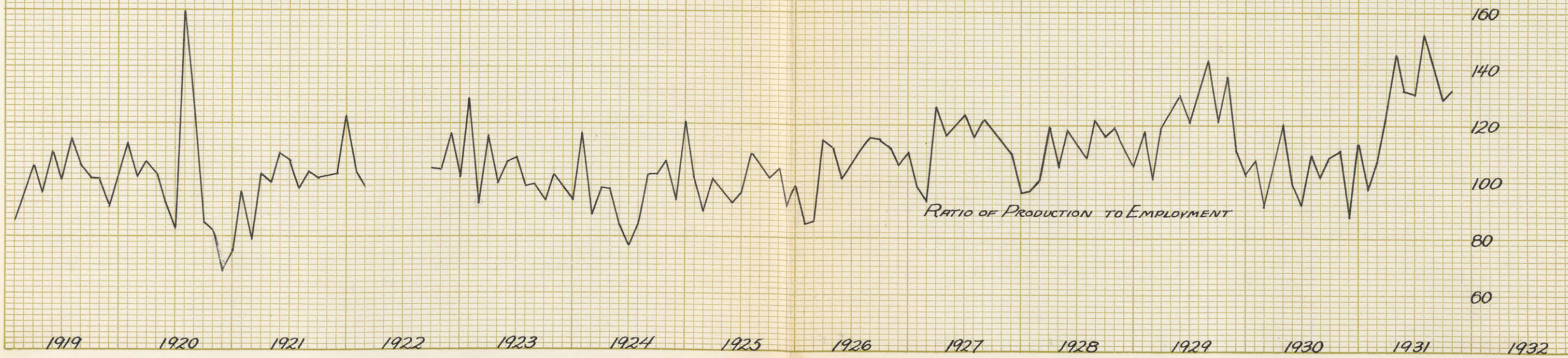
	Employment					Production					
	Seasonal	Actual	Secular	% A/S	Cor. Act.	Index	Seasonal	Actual	Cor. Act.	Index	Ratio P/E
1928	97.0	6462	6481	- 0.3	6664	91.3	106.7	5536	5785	89.2	97.7
	99.8	6352	6500	- 2.3	6364	87.2	115.0	5934	5160	88.7	101.7
	102.9	6150	6519	- 5.6	5980	81.9	102.0	5741	5630	96.9	118.3
	103.9	5922	6539	- 9.4	5705	78.2	98.3	4771	4860	83.5	106.8
	102.3	6098	6558	- 7.0	5960	81.6	95.6	5392	5640	97.0	118.9
	99.6	6080	6577	- 7.5	6106	83.7	91.1	5069	5565	95.7	114.3
	96.3	5993	6597	- 9.2	6223	85.2	87.3	4678	5360	92.2	108.1
	96.9	6100	6616	- 7.8	6330	86.3	90.0	5538	6150	105.8	122.6
	100.2	5787	6635	- 12.7	5777	79.1	99.9	5340	5342	91.9	116.2
	103.5	6350	6654	- 4.6	6139	84.1	108.2	6321	5844	100.6	119.6
	101.5	6608	6674	- 0.9	6513	89.2	101.1	6149	5740	98.7	110.5
	96.2	6496	6693	- 3.0	6752	92.5	98.8	5635	5705	98.2	106.2
1929		6457	6713	- 3.8	6658	91.2		6634	6218	106.9	117.2
		6356	6732	- 5.6	6368	87.3		5893	5125	88.2	101.1
		6252	6751	- 7.3	6078	83.3		5888	5727	99.3	119.2
		6359	6771	- 6.2	6120	83.9		6042	6150	105.8	126.0
		6181	6790	- 8.9	6040	82.8		5988	6262	107.7	130.0
		6143	6809	- 9.8	6170	84.5		5411	5940	102.2	121.6
		6136	6828	-10.1	6372	87.3		5807	6650	114.4	131.0
		6067	6848	-11.4	6266	85.9		6464	7184	123.6	143.9
		6326	6867	- 8.1	6316	86.5		6109	6112	105.2	121.9
		6370	6886	- 7.5	6158	84.3		7288	6740	116.0	137.7
		6090	6906	-11.8	6000	82.2		5734	5352	92.0	111.9
		5468	6925	-21.0	5685	77.9		4642	4698	80.7	103.5
1930		5644	6944	-20.2	5820	79.7		5357	5020	86.3	108.2
		5581	6963	-19.9	5595	76.7		4706	4092	70.4	91.9
		5305	6982	-24.0	5159	70.7		4567	4478	77.0	109.0
		4933	7002	-29.5	4750	65.1		4518	4600	79.1	121.5
		5415	7021	-22.9	5294	72.5		4008	4191	72.0	99.4
		5568	7040	-20.9	5994	82.1		4024	4417	75.9	92.4
		5395	7060	-23.6	5606	76.7		4259	4878	83.9	109.4
		5441	7079	-23.1	5620	77.0		4146	4607	79.2	102.9
		5429	7098	-23.5	5419	74.2		4676	4678	80.5	108.5
		5435	7118	-23.7	5252	72.0		5031	4650	80.4	111.7
		5163	7137	-27.6	5090	69.7		3836	3582	61.6	88.4
		4996	7156	-30.2	5195	71.1		3680	3732	66.7	93.9

WOOLEN GOODS

	Employment					Production					
	Seasonal	Actual	Secular	% A/S	Cor.Act.	Index	Seasonal	Actual	Cor.Act.	Index	Ratio P/E
1931	97.0	4802	7176	- 33.0	4950	67.8	106.7	4157	3895	67.0	98.8
	99.8	4716	7195	- 34.5	4725	64.7	115.0	4718	4103	70.5	107.4
	102.9	5078	7124	- 29.6	4936	67.6	102.0	4957	4860	83.6	123.6
	103.9	5324	7234	- 26.9	5128	70.3	98.3	5858	5960	102.5	145.9
	102.8	5597	7253	- 22.9	5470	74.9	95.6	5521	5778	99.3	132.5
	99.6	5899	7272	- 19.9	5920	81.1	91.1	5624	6179	106.3	131.0
	96.3	5968	7292	- 18.1	6200	85.0	87.3	6617	7574	130.3	153.2
	96.9	6064	7311	- 17.1	6262	85.8	90.0	6279	6980	120.1	140.0
	100.2	5656	7330	- 22.9	5642	77.3	99.9	5838	5840	100.3	129.8
	103.5	4762	7349	- 35.2	4600	63.0	108.2	5279	4878	83.9	133.1
	101.5	4659	7368	- 36.8	4592	62.9	107.1				
	96.2	4507	7388	- 39.0	4686	64.2	98.8				

INDEX NUMBERS FOR WOOLEN GOODS





Woolen Goods – Showing Effect of Corrections

APPENDIX A

METHODS OF PROCEDURE :

The index of Composite Productivity represents a measure of the relative total monthly output per worker in fundamental industries. This index combines the indices of Employee Productivity for the separate industries included in the study. The statistical method used in the computation of results may be outlined as follows :

(The first seven steps indicated apply to each industry separately. For convenience, the name Industry X will be given to represent any of the fundamental industries considered).

1. Collect monthly data on physical volume of output for Industry X (expressed in tons, pounds, units, etc.,)

2. Compute seasonal factors for the actual monthly data. The seasonals for some of the series were obtained directly from the Times Analyst. The other series were computed by the authors with the Reverse First Difference Process. For explanation of the process see Appendix B 1.

3. Multiply each item of the actual data by the seasonal corresponding to its month, thereby obtaining the Corrected Actual. It should be noted that

this is not the usual method of correcting the actual data for seasonal. The usual method is to divide the actual by the product of the corresponding normal trend value and the seasonal. Adoption of the simpler method by the authors involves a possible maximum error of about one percent. For calculations of this nature precision greater than this was deemed unnecessary.

4. Reduce the Corrected Actual monthly figures on physical volume of production in Industry X to an index, using as a base the production for the month of January 1923 = 100.

5. Collect the monthly data for actual employment in Industry X. Correct it for seasonal and reduce it to an index, following steps indicated(2, 3,4) above. The base for the employment index is taken as the average monthly employment for the years 1923 through 1925 = 100.

6. Divide the index of production in Industry X by the index of employment in Industry X for the corresponding month. This ratio will be called the Index of Employee Productivity for X as a matter of convenience.

7. In the case of some of the industries, the Index of Employee Productivity had to be corrected.

Reasons, methods, and results of correction are given with discussion in Appendix C 2.

8. Determine weights for each index of Employee Productivity. These weights will be in the ratio that the total average monthly employment for the years 1923-25 inclusive for each Industry X bear in relation to the average total number of employees in all industries considered. For example, if the average monthly employment in X during the period 1923-25 was one-quarter of the average number employed in all the fundamental industries 1923-25, then the weight applied to X would be 0.25. For discussion of weighing see Appendix B 2.

9. Multiply each index of Employee Productivity by its proper weight.

10. Add all weighted indices of Employee Productivity, thereby obtaining the final Index of Composite Productivity.

11. Plot Index of Composite Productivity and find the secular trend for the period 1919-30 using the method of least squares, datum points to be the average yearly Index of Composite Productivity. The year 1931 was omitted from this trend calculation because it was felt that it would represent so much part-time work as to give a distorted idea of the

actual long-time trend.

APPENDIX B 1

Reverse First Different Process for Computation of Seasonal Factors.

1. From actual monthly data compute the secular trend by the method of least squares, using as datum points the average monthly data for each year, period 1919-26 inclusive.

2. Find the ratio actual/trend. Record the differences (actual/trend - 1) for each month.

3. Find the increase or decrease of the value $\left(\frac{\text{actual}}{\text{trend}} - 1\right)$ for each month over the similar value for the previous month.

4. Plot a scatter diagram of those decreases and increases for each month. From this diagram determine the four middle points as plotted in the range of each month, and take the arithmetic mean of these four points. This mean is called the Modified Median.

5. Add the Modified Medians of the months. If they are correct their sum should be zero. If not, the sum should be divided by twelve and this quotient added to each of the monthly values (noting sign) so that a sum of the corrected modified medians will be zero.

6. Use as a base January = 100. To obtain the First Chained Difference for February, add the corrected modified median (C M M) for February to 100. The first chained difference (F C D) for March will then be F C D February + C M M March. And so forth through the year. When the chaining is complete (F C D) December + (C M M) January should equal 100. This is seldom the case. If not, suppose that instead of being 100 it equals ~~sane~~ some value T. A correction of $\frac{T - 100}{12}$ should be added to every (F C D) (regarding sign) thereby bringing the (F C D) into a complete closed linkage the sum of whose components equals 1200. This second chained difference, as it is sometimes called, is really the seasonal.

APPENDIX B 2

METHOD OF WEIGHTING :

The products made by the Fundamental Industries might be assumed to be of nearly equal importance to the consumer. These industries might therefore be considered as equally influential in the national labor make-up as well as the national financing activities. However, for the purpose of balance in the combining of these industrial ratio series, it is obviously necessary to weight each

industry in such a manner that the composite result will fairly indicate the general average trend of output per employee for these fundamental industries, and not be unduly biased by any single change in the trends of any single component.

Inasmuch as complete data for all the fundamental series was available, or as in some instances, even though available was so far from what was known to be a reasonable or representative figure as to be considered worthless; some system of weighting was necessary which would permit of the picking up or dropping off of one or more series whenever the character of the data warranted it.

The system adopted, therefore, expresses the weight for each industry at any given point in the series as a percentage. It is the ratio expressed in percent of the total number of employees in that industry to the total number of employees in those fundamental industries whose data at that point are sufficiently complete to be included. It is readily seen that every time a new industry A is included in the summation, the proportion that the employees in any other industry B bears to the sum of all those employees (considered in eligible series) will change - necessitating a new system of

weights. The figure for the total employment in each industry as used in calculating weights, is assumed to be constant and equal to the average monthly employment in that industry during the years 1923 through 1925.

APPENDIX C 1

ASSUMPTIONS AND REASONS :

The figures on employment put out by the United States Department of Labor and the United States Department of Commerce as well as those published by the various Industrial Institutes do not purport to be complete. From 1923 to date these figures are totals for the employment in a certain fixed number of mills reporting. In no case is the actual monthly total figure given for all mills in any industry. Similarly the data on production does not give the output of every factory in the country. They represent the output from a definite group of mills which is substantially the same for the years 1923-31. However, inasmuch as the monthly output per employee is an index rather than a unit of physical volume, there is no need to have the percentage of total reported employees equal to the percentage of total reported producers. For instance,

if all the industries reported their output but if only one-third of them reported employment, and the output doubled from year to year, it is logical to believe that for the industry as a whole the index of output per employee would indicate an increase of 100%, of course if the one-third reported no increase in employees.

The Index of Employee Productivity does not represent actually the whole of any one industry. It is merely considered to do so on the assumption that what is true for over three-quarters of an industry will be true for the rest of it.

APPENDIX C 2

ASSUMPTIONS AND REASONS :

For the years prior to 1923 in some industries the number of mills reporting employees varied to such a degree that it was necessary for the authors to correct the original data to a more useable form. This was done as indicated below.

Biennial figures for the total employment in all mills in any industry X were obtained from the Bureau of Statistics. Figures for the total annual employment for years between those reported by the Bureau were estimated by cross-interpolation, using

the total annual production in Industry X corresponding to the years desired as a guide-variable. The sum of the monthly employment (reported for a part of the mills) in any given year was divided by the annual total employment for that year. This gave a ratio between the number of monthly-reported employees and the total number of employees in the whole Industry X. After the year 1923, this ratio became practically constant which indicates that the number of mills reporting employment thereafter had become practically fixed. The ratios found for the years 1919-23 were then taken as a percentage of the 1923 ratio. This percentage, therefore, expressed the relationship between the number of employees actually reported and the number that would have been reported if all the same mills that were included in 1923 had been included in the earlier years. The reciprocal of this percentage was calculated for each year and was used as a multiplier on the monthly data for that year, thus obtaining the adjusted monthly data which was assumed accurate as a basis for further calculations.

The authors feel that this assumption was justified for five principal reasons:

1. Before the correction the index of Employee Productivity for the years 1919-23 was ab-

surdly high compared with the values for all other years.

2. Before the correction the trend of the index of Employee Productivity for years 1919-23 was steeply downward.

3. Before the correction the trend of the Employment curve 1919-31 was unreasonably steep upward.

4. After the correction the slope of the three items above were reduced to more reasonable terms and the new slope of the index of Employee Productivity for the period 1919-23 was nearly identical with the slope of the same curve during the period 1923-31.

5. Whatever interpolation had to be made between the biennial total employment figures, was made on the basis of fluctuation in output for those years rather than by taking the arithmetic mean of the values for the two reported years.

Curve No. on Page shows an example of the results before and after the adjustment in the employment figures for 1919-23.

APPENDIX C 3

ASSUMPTIONS AND REASONS

Occasionally a figure in one of the series for monthly employment or production would be so completely out of line with the general trend of the series, as to indicate an error in reporting. For such cases the authors assumed the error and omitted the extraordinary figure from the calculations of the composite. It was felt that there were better chances of obtaining reliable results if the suspicious data were left out, a new weighting being calculated to take care of the omission.

APPENDIX C 4

ASSUMPTIONS AND REASONS

In calculating the seasonal factors it was felt unnecessary to include all the years covered in the research. The years 1919-26 inclusive were finally chosen because those seasonal factors which were obtained from the Times Analyst had been calculated on this period, and in order to be consistent in their use, the authors felt that the same period should be the basis of the calculated seasonals.