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MIGRATION AND BUSINESS CYCLES

By

HARRY JEROME

OF THE STAFF OF THE

NATIONAL BUREAU OF ECONOMIC RESEARCH
INCORPORATED

With a Foreword by

WESLEY C. MITCHELL

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FOREWORD

Migration and Business Cycles presents the results of investigations made by the National Bureau of Economic Research at the request of a committee of the National Research Council. It forms part of two series of studies. One series, planned by the Committee on Scientific Problems of Human Migration, deals with the character, causes, and effects of mass-movements of men. The second series, planned by the National Bureau, deals with the character, causes, and effects of cyclical fluctuations in economic activities.

The Committee on Scientific Problems of Human Migration was appointed in October, 1922, by the National Research Council on recommendation of the Council's Division of Anthropology and Psychology. Its duties were

- (1) carefully to consider, from the point of view of natural science, the complex migrational situation resulting from the World War and from the virtual elimination of space as a barrier to movements of man and to race intermixture;
- (2) to prepare a research program which might reasonably be expected to yield ultimately such reliable information concerning physical, mental, and social characteristics, relations and values of ethnic groups (races and peoples) as is necessary for the understanding and wise regulation of mass-movements of mankind; and
- (3) to initiate, organize, support, coordinate, or otherwise further, in accordance with the best judgment of the group, important investigations.¹

The members of this Committee as originally organized were Dr. Raymond Dodge, then Professor of Psychology at Wesleyan University, Dr. Frank R. Lillie, Professor of Zoology at the University of Chicago, Dr. John C. Merriam, President of the Carnegie Institution of Washington, Miss Mary Van Kleeck, Director of Industrial Studies in the Russell Sage Foundation, Dr. Clark Wissler, Curator

¹See the report of Dr. Robert M. Yerkes, Chairman of the Committee, *Journal of Personnel Research*, October, 1924, vol. iii, p. 189.

of the Department of Anthropology in the American Museum of Natural History, and Dr. Robert M. Yerkes, Chairman of the Research Information Service of the National Research Council, and also of the Committee.

In preparation for their work, the Committee called a conference of anthropologists, biologists, economists, psychologists and sociologists interested in various aspects of migration. After surveying the field and considering numerous suggestions, the Committee decided that it could render the best service by promoting work upon certain fundamental problems which must be solved as preliminaries to the scientific study of the characteristics, causes and effects of migration. Each problem was referred to a group of technically qualified investigators. The various groups worked in severalty, by whatever methods were best adapted to their tasks. Meanwhile the Committee gave the program as a whole such unity as was possible, by holding occasional conferences, in which all the cooperating investigators took part. The scope of the work undertaken is indicated by the following partial list of topics: the possibility of developing reliable measures of the psychological characteristics of different ethnic groups, the influence of race upon pathology, the behavior of physical traits in race intermixture, and the sources of information concerning the causes of migration available in Europe. To defray the expenses incident to these inquiries, the National Research Council obtained a grant from the Laura Spelman Rockefeller Memorial.

Among the problems which the Committee on Scientific Problems of Human Migration thought important to investigate was the "Shortage and surplus of labor in the United States in its relations to immigration and emigration." This problem was referred to the National Bureau of Economic Research.

Before it received this request to cooperate in the migration program, the National Bureau had begun a series of researches into the phenomena of business cycles. One report within this field, made at the request of a committee of President Harding's Conference on Unemployment, had already been published under the title, *Business Cycles and Unemployment*. A second report was on the point of appearing—*Employment, Hours and Earnings in Prosperity and Depression*, by Dr. Willford I. King, Dr. Leo Wolman's monograph on *The Growth of American Trade Unions, 1880-1923*, was then well under way, and has since been printed. Dr. Frederick

R. Macaulay had begun an elaborate investigation of bond yields and interest rates since 1859, which we hope will appear soon. Dr. Willard L. Thorp was making two collections of materials dealing with cyclical fluctuations—a collection, recently published, of business annals for 17 countries during periods ranging from 36 to 136 years, and a collection of economic statistics which is well advanced. Finally, the present writer had in hand a general treatise upon Business Cycles, the first volume of which will be submitted to the directors of the National Bureau within a few months. Since the "shortage and surplus of labor in its relations to immigration and emigration" is chiefly a problem of short-period oscillations, it was obviously relevant to the National Bureau's existing scheme of work.

At our request, the University of Wisconsin granted leave of absence to Dr. Harry Jerome, Assistant Professor of Economics, in order that he might assume charge of the new undertaking, and later extended the leave. To the University, and particularly to its Department of Economics, our hearty thanks are due. Aided by a small corps of assistants and the advice of other members of the National Bureau's staff, Dr. Jerome analyzed the voluminous, yet incomplete, records of migration to and from the United States, and compared these records with various indices of business activity here and abroad. The present volume presents in concise form his conclusions concerning the short-period fluctuations in the demand for and supply of labor in the United States, and the role played by migration in these fluctuations. The National Bureau hopes that this carefully documented study of a problem too often treated in a controversial spirit will prove useful to all who are interested in migrations and to all who are interested in business cycles.

Before Dr. Jerome had finished the present monograph, the Committee on Scientific Problems of Human Migration asked the National Bureau to undertake another investigation. This concerns the problem of "Migration and the Mechanization of Industry"—that is, the relation between the conditions on which relatively unskilled labor can be hired and the adoption of automatic machinery for the performance of work which may be done by hand. In May, 1924, the recently organized Social Science Research Council appointed a Committee on Human Migration, which included besides three members of the older Committee (Dr. Yerkes, Miss Van Kleeck, and Dr. Wissler), Dr. Edith Abbott,

chairman, Professor John R. Commons, Professor John A. Fairlie, Dr. Robert F. Foerster, Professor Edward A. Miller, Professor Charles E. Merriam, Professor Frederick A. Ogg, Professor Carl Wittke, and the writer. The plan of co-operation between the old Committee and the new one transferred the "machinization study" to the Social Science Research Council, under whose auspices it has been carried nearly to completion by Dr. Jerome.

Finally, the Social Science Research Council has enabled the National Bureau to supplement the present study of short-period fluctuations of migration in the United States by a long-period investigation of mass movements of mankind over the earth. Of course, the preparation of a broad sketch of the great world migrations of the past three or four generations requires the critical examination of many estimates of population movements for years and countries in which accurate records are lacking. It requires also the use of all the relevant statistics compiled in any part of the world. In short, it is a project which calls for close international co-operation among the leading authorities upon population statistics. Dr. Walter F. Willcox, of Cornell University, is organizing this co-operation with the National Bureau, and, when the materials are assembled, he will prepare a report.

Like the National Research Council, the Social Science Research Council asked and obtained financial support for its migration studies from the Laura Spelman Rockefeller Memorial.

Belonging as it does to two series of studies, *Migration and Business Cycles* is designed to cover a limited field. The major issues with which it deals are summed up in two questions:

- (1) To what extent are fluctuations in migration attributable to fluctuations in employment?
- (2) To what extent, in turn, are fluctuations in migration an ameliorating influence, and to what extent an aggravating factor, in employment and unemployment fluctuations?

Dr. Jerome has sought to get the most definite answers to these questions which he can bring from the available records. Other phases of the problem he treats incidentally, if at all. Among the factors affecting migration which he passes over lightly are political conditions, steorage rates, and the methods adopted by steamship companies to stimulate passenger traffic. A scientific analysis of

the causes and consequences of human migration, comprehensive in scope and thorough in detail, can be developed only by co-operative efforts, such as the committees of the National Research Council and the Social Science Research Council are promoting. Many intensive investigations of specific issues, like the present report, must be made before we can attain the well-rounded knowledge needed as a basis for private opinion and public policy regarding migration.

In accordance with the established procedure of the National Bureau, Dr. Jerome's present monograph was submitted in manuscript to our Board of Directors. Criticisms made by members of the Board have resulted in various improvements upon the original draft. This process of criticism and betterment through which the National Bureau's reports pass before publication involves much labor upon the part of the Directors;—labor which is mostly self-effacing, for almost all the suggestions are incorporated in the text before publication. It is but just to state that this volume, like its predecessors, owes much more than appears to the acumen, the wide and varied experience, of the Directors.

WESLEY C. MITCHELL.

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TABLE I.—MALE IMMIGRANTS, BY QUARTERS: 1868-1892*
(Thousands of Immigrants)

YEAR ENDING DEC. 31	TOTAL FOR YEAR ^b	QUARTER ENDING			
		MARCH 31	JUNE 30	SEPTEMBER 30	DECEMBER 31
1868	173.9	21.0	65.6	53.4	33.9
1869	235.2	23.8	103.7	63.9	43.8
1870	214.8	26.8	101.1	57.2	29.7
1871	204.7	17.2	86.4	56.8	44.4
1872	258.3	30.9	108.1	68.6	50.7
1873	256.7	32.0	124.5	60.6	39.6
1874	159.9	19.5	69.5	43.6	27.3
1875	121.9	19.8	49.2	33.3	19.6
1876	103.0	18.5	40.4	27.3	16.8
1877	84.3	13.2	34.7	21.6	14.7
1878	94.6	13.6	36.4	25.5	19.2
1879	159.0	15.1	52.1	42.4	49.4
1880	365.8	45.8	150.0	95.4	74.5
1881	442.2	50.4	190.4	104.1	97.3
1882	458.2	79.7	217.6	94.8	66.1
1883	341.7	46.9	156.0	73.8	65.0
1884	272.4	46.7	123.1	59.7	43.0
1885	199.6	28.8	94.9	43.7	32.3
1886	240.1	29.9	94.9	60.6	54.8
1887	322.0	46.6	144.7	72.3	58.4
1888	326.6	51.3	163.3	64.8	47.1
1889	258.3	37.5	113.6	56.6	50.5
1890	308.6	47.1	127.6	69.3	64.6
1891	369.4	63.5	156.7	80.9	68.4
1892	343.5	70.2	166.3	69.5	37.4

*Compiled from U. S. Bureau of Foreign and Domestic Commerce, *Monthly Summary of Commerce and Finance*, June, 1903, p. 4362, which gives quarterly data from July, 1857 to June, 1903, inclusive.

^bComputed from full quarterly data before they were reduced to thousands.

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TABLE II—MALE IMMIGRANTS, BY MONTHS: 1892-1924*
(Thousands of Immigrants)

YEAR	TOTAL	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1892	.....^b	....	....	....	....	....	....	28.5	25.5	15.1	8.5	15.1	13.0
1893	308.2 ^c	8.8	8.2	28.7	51.8	65.2	43.6	29.4	23.3	16.9	14.4	10.6	7.3
1894	141.1 ^e	5.9	6.3	13.1	24.4	19.7	12.8	9.6	8.9	11.5	12.5	8.2	8.3
1895	186.1 ^e	5.5	6.3	11.6	26.3	28.9	19.6	15.4	14.5	17.3	16.1	13.6	10.8
1896	188.8 ^e	7.1	11.2	25.8	34.0	37.9	16.4	12.4	9.9	9.7	9.8	8.2	6.5
1897	129.8	4.8	5.8	14.1	21.0	21.3	11.8	8.3	7.3	9.6	10.1	8.1	7.8
1898	156.7	6.1	7.9	18.1	23.0	19.8	9.6	11.8	9.4	13.2	13.9	13.0	10.9
1899	231.5	7.2	9.9	21.9	28.2	34.7	23.3	14.8	15.1	16.3	21.6	21.3	17.1
1900	314.0	11.9	17.4	38.3	45.8	48.3	36.2	24.1	19.7	18.0	20.9	16.7	16.6
1901	362.5	13.2	20.5	35.0	51.0	59.2	36.1	22.1	20.4	26.4	24.7	28.2	25.7
1902	527.3	17.1	28.9	64.8	75.1	80.1	52.9	33.3	28.8	34.8	40.5	36.7	34.3
1903	660.3	23.5	37.6	75.5	100.3	99.8	68.1	43.9	41.0	46.8	51.2	43.9	28.7
1904	539.9	19.5	24.3	62.1	69.3	69.6	48.7	37.0	36.6	39.2	42.5	46.6	44.4
1905	745.3 ^e	42.5	52.5	101.8	107.0	95.4	79.3	49.2	38.9	46.2	52.4	38.8	41.2
1906	857.3 ^e	36.0	52.5	104.9	114.7	108.8	81.7	53.9	52.6	60.6	66.0	65.1	60.4
1907	961.8	40.6	51.2	113.7	116.9	137.8	111.2	65.2	63.2	64.4	72.5	80.4	44.8
1908	241.9	17.9	14.6	21.2	25.0	20.4	17.3	14.8	15.2	19.4	22.2	22.5	31.3
1909	665.7	33.3	52.7	90.0	89.0	73.7	55.8	41.6	37.1	41.1	47.4	55.7	48.1
1910	748.1	36.9	44.5	110.2	104.6	96.7	72.1	47.2	49.9	51.4	50.1	47.3	37.3
1911	488.2	24.1	28.7	60.5	69.9	60.8	42.9	29.3	28.4	33.5	37.5	35.7	36.8
1912	674.6	24.9	30.1	66.9	71.2	75.8	59.8	49.9	53.2	66.1	68.1	60.0	48.6
1913	936.0	30.8	40.4	69.2	99.7	97.4	124.8	94.7	84.6	87.0	82.9	65.6	59.0
1914	439.5	28.5	30.8	67.1	87.9	69.8	40.9	32.9	21.5	17.1	16.6	14.8	11.6
1915	153.4	9.1	7.9	11.5	14.5	15.7	13.7	13.0	13.4	14.1	14.6	14.4	11.3
1916	213.1	10.9	15.7	18.1	19.7	19.1	17.8	13.8	17.4	21.7	20.6	20.3	18.1
1917	90.3	15.6	11.2	9.9	12.7	6.6	6.7	5.5	5.6	4.8	4.5	3.4	3.8
1918	65.8	3.4	4.1	3.9	5.4	8.8	8.7	4.4	4.2	5.4	6.6	4.6	6.4
1919	137.7	5.9	6.8	8.7	10.5	9.0	10.7	11.0	11.7	13.9	16.3	14.1	19.0
1920	414.1	17.3	18.3	24.7	30.2	32.4	38.7	37.0	38.7	43.1	46.6	41.7	45.5
1921	290.2	37.2	32.9	35.1	32.4	36.2	23.1	17.0	18.1	16.6	14.9	15.8	11.0
1922	203.9	8.2	5.7	7.9	9.5	12.1	13.1	23.0	23.8	26.8	28.8	26.5	18.4
1923	460.4	16.6	18.9	29.5	33.9	33.6	27.6	53.5	54.5	53.4	50.8	54.3	33.9
1924	203.8	20.8	18.0	22.7	22.6	18.6	20.2	6.6	13.1	15.1	14.4	16.2	15.4

*The monthly data for July 1892 to June 1905, inclusive are compiled from the U. S. Bureau of Statistics, *Monthly Summary of Commerce and Finance*; for the remainder of the period they are from the publications or records of the U. S. Bureau of Immigration.

^bMonthly statistics of immigration by sex are not available prior to July, 1892.

^cIn 1893, 1894, 1895, 1896, 1905, and 1906, the totals of the monthly figures for male immigrants, when added to similar statistics of female immigrants also compiled by the U. S. Bureau of Statistics, give totals differing somewhat from the official totals published by the U. S. Bureau of Immigration.

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TABLE III.—CYCLES IN MALE IMMIGRATION BY MONTHS, OR QUARTERS, 1890-1914^a

Three-month moving averages of percentage deviations from trend, corrected for seasonal variation, and expressed in terms of their standard deviation (30.24 per cent)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1890	.....	-0.3	.....	.....	-0.3	.....	.....	+0.2	.....	.....	+0.4	.....
1891	.....	+0.7	.....	.....	+0.8	.....	.....	+1.1	.....	.....	+1.0	.....
1892	.....	+1.3	.....	.....	+1.6	.....	.....	+0.9	-0.3	-1.0	-1.0	-0.6
1893	-0.9	-0.8	-0.1	+1.3	+2.1	+2.3	+1.9	+1.1	+0.2	-0.7	-1.2	-1.5
1894	-1.6	-1.7	-1.5	-1.3	-1.2	-1.4	-1.4	-1.2	-1.0	-1.1	-1.2	-1.3
1895	-1.4	-1.5	-1.2	-0.7	-0.1	+0.1	+0.2	+0.5	+0.5	+0.4	+0.1	-0.1
1896	0	+0.2	+0.7	+1.2	+0.8	+0.4	-0.3	-0.5	-0.8	-1.0	-1.2	-1.3
1897	-1.4	-1.3	-1.1	-0.8	-0.8	-1.0	-1.3	-1.2	-1.1	-1.1	-1.2	-1.1
1898	-1.1	-1.0	-0.9	-0.9	-1.2	-1.2	-1.2	-0.8	-0.8	-0.7	-0.7	-0.8
1899	-0.9	-1.0	-0.8	-0.5	-0.4	-0.4	-0.5	-0.6	-0.3	-0.1	+0.1	0
1900	-0.1	0	+0.1	+0.2	+0.2	+0.2	0	-0.3	-0.6	-0.8	-0.8	-0.7
1901	-0.4	-0.4	-0.2	-0.1	0	-0.2	-0.5	-0.6	-0.6	-0.4	-0.3	-0.2
1902	0	+0.3	+0.6	+0.7	+0.6	+0.4	0	-0.1	0	+0.1	+0.3	+0.2
1903	+0.4	+0.5	+0.9	+0.9	+0.9	+0.7	+0.5	+0.4	+0.4	+0.4	0	-0.4
1904	-0.9	-0.8	-0.8	-0.6	-0.8	-0.7	-0.7	-0.6	-0.5	-0.3	0	+0.8
1905	+1.2	+1.4	+1.0	+0.7	+0.5	+0.4	+0.3	0	0	-0.1	0	+0.2
1906	+0.8	+1.1	+1.1	+0.9	+0.7	+0.6	+0.6	+0.7	+0.8	+1.1	+1.3	+1.4
1907	+1.3	+1.2	+1.1	+1.2	+1.4	+1.6	+1.5	+1.2	+1.3	+1.6	+1.3	+0.5
1908	-1.0	-1.9	-2.3	-2.5	-2.5	-2.5	-2.3	-2.1	-2.0	-1.8	-1.4	-0.6
1909	+0.4	+0.8	+0.6	-0.1	-0.5	-0.5	-0.5	-0.4	-0.4	+0.1	+0.4	+0.8
1910	+0.7	+0.9	+0.7	+0.5	+0.2	0	+0.2	+0.2	+0.2	+0.1	-0.1	-0.3
1911	-0.6	-0.8	-0.9	-1.0	-1.1	-1.2	-1.2	-1.2	-1.0	-0.9	-0.7	-0.5
1912	-0.5	-0.6	-0.7	-0.7	-0.7	-0.3	+0.1	+0.6	+0.9	+1.0	+0.8	+0.5
1913	+0.3	-0.1	-0.1	-0.1	+0.9	+1.9	+2.9	+2.9	+2.5	+1.9	+1.5	+0.8
1914	+0.2	-0.5	-0.6	-0.6	-0.9	-1.1	-1.4	-1.7	-2.1	-2.2	-2.3	-2.3

^aComputed from data in Table II. Trend eliminated by computing percentage deviations from an eighty-four month moving average smoothed with the aid of French curves.

^bThe data for 1890, 1891, and the first half of 1892 apply to quarters centered in February, May, August, and November, respectively.

TABLE IV—INDEX OF FACTORY EMPLOYMENT IN SELECTED STATES, BY MONTHS, 1889-1923.
 Massachusetts (1889-1923); New Jersey (1895-1919); New York (1904-1923)
 1914 monthly average = 100

YEAR	AVERAGE	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1889	56.2	56.0	56.4	56.4	56.2	56.2	56.2	55.7	56.0	56.2	56.7	56.4	56.0
1890	57.3	56.1	57.0	57.5	57.4	57.4	57.4	56.5	57.0	57.7	58.4	58.0	57.7
1891	58.1	58.0	58.1	58.3	58.6	58.7	58.1	57.5	57.5	58.1	58.3	58.1	58.0
1892	60.4	58.8	59.6	60.3	61.3	61.1	60.3	59.6	59.7	60.7	61.4	61.3	60.7
1893	57.4	61.0	61.4	62.3	62.7	62.6	60.7	57.5	51.9	48.6	53.1	53.1	53.5
1894	53.6	52.5	53.4	53.5	54.5	54.9	53.8	51.9	50.8	51.2	55.1	56.0	55.4
1895	58.9	57.4	57.5	58.7	59.2	59.3	58.9	57.9	58.7	59.5	60.0	60.2	59.8
1896	57.5	59.2	59.7	59.7	59.6	59.2	57.5	54.8	53.3	54.9	56.7	57.0	57.8
1897	59.0	57.8	58.6	59.3	60.1	60.0	58.7	56.6	56.2	59.9	60.8	60.3	60.0
1898	60.5	59.6	59.9	61.1	61.2	60.3	60.2	58.9	59.4	60.4	61.7	61.6	61.7
1899	66.7	63.1	64.2	65.6	66.6	67.0	67.0	65.8	66.7	68.3	68.6	68.9	68.8
1900	69.2	69.9	70.4	71.0	70.4	70.2	69.0	66.5	67.3	68.4	69.2	69.1	69.3
1901	71.4	69.9	70.4	71.4	70.4	71.2	70.6	69.6	70.6	72.1	73.5	73.8	73.5
1902	77.2	75.7	76.1	76.9	76.9	76.9	76.1	75.5	76.2	77.9	79.6	79.6	79.0
1903	79.0	79.3	79.8	80.7	79.3	79.3	79.4	77.7	77.6	78.8	79.8	78.9	78.3
1904	79.1	77.0	78.2	79.6	79.9	78.9	77.8	76.5	77.5	80.4	82.1	81.2	79.6
1905	84.0	80.6	81.8	82.4	84.1	84.2	83.8	83.8	84.6	84.3	85.5	86.0	86.4
1906	88.7	86.9	86.6	87.4	87.6	88.0	89.1	89.3	89.6	89.7	90.1	91.0	89.6
1907	89.7	91.8	91.8	92.9	92.3	91.9	92.6	92.8	92.8	91.3	84.7	83.3	77.9
1908	79.4	75.5	74.2	74.2	72.6	73.1	74.8	80.7	84.4	82.6	85.8	86.8	87.5
1909	94.0	89.5	91.1	92.7	92.6	92.3	92.2	91.7	93.4	96.7	98.5	98.5	98.2
1910	98.9	99.9	100.2	99.2	98.8	98.6	98.1	98.1	98.8	99.0	99.0	99.3	97.8
1911	99.1	98.1	99.4	99.8	99.6	97.7	98.3	98.7	99.4	100.1	100.8	99.7	97.3
1912	101.2	99.0	100.9	101.3	101.2	100.2	99.2	98.9	102.4	103.6	104.0	102.8	101.2
1913	101.8	103.4	104.2	102.6	101.8	100.6	100.6	100.3	101.5	102.8	102.8	101.9	99.7
1914	100.0	101.0	102.3	103.5	102.8	101.5	100.3	98.2	97.8	99.5	100.0	97.4	95.7
1915	102.3	95.9	97.6	98.4	99.1	100.2	101.1	100.8	101.3	104.8	106.9	110.0	111.6
1916	117.8	112.5	114.8	115.8	118.0	116.8	116.8	116.2	116.7	119.2	120.1	122.8	124.1
1917	122.5	123.4	123.8	125.2	123.1	121.9	121.1	119.9	118.8	120.8	122.7	124.1	124.9
1918	125.0	123.6	125.1	126.6	126.1	126.3	126.5	127.7	125.7	125.4	121.4	123.3	121.8
1919	120.2	116.8	115.0	115.4	116.0	116.4	117.8	120.5	122.9	124.0	124.1	125.8	128.3
1920	120.1	128.2	126.9	129.0	127.7	125.6	123.7	122.1	119.2	117.4	115.1	107.5	98.8
1921	97.9	92.6	96.2	98.3	98.3	97.3	97.0	96.5	97.8	100.3	101.2	100.4	98.8
1922	103.2	97.3	99.9	100.6	98.8	99.4	100.3	100.3	103.2	106.1	109.2	111.3	112.6
1923	112.3	113.0	113.5	115.8	114.6	114.0	112.4	111.6	110.8	110.6	112.0	110.7	108.5

*Computed from estimates given in Tables 15, 16, and 17. For methods of arriving at these estimates, see Chapter III.

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TABLE V—CYCLES OF FACTORY EMPLOYMENT IN SELECTED STATES, BY MONTHS:
1889-1914*

Percentage deviations from trend, corrected for typical seasonal variation and expressed in multiples of the standard deviation, which=4.55 per cent

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1889	0	0	-0.11	-0.29	-0.24	-0.07	-0.18	+0.26	+0.04	+0.04	+0.02	0
1890	-0.07	+0.13	+0.18	+0.07	+0.11	+0.24	+0.33	+0.53	+0.51	+0.55	+0.53	+0.55
1891	+0.51	+0.40	+0.35	+0.42	+0.46	+0.40	+0.62	+0.57	+0.51	+0.40	+0.44	+0.51
1892	+0.70	+0.86	+0.97	+1.30	+1.25	+1.12	+1.25	+1.30	+1.38	+1.43	+1.52	+1.41
1893	+1.43	+1.38	+1.60	+1.69	+1.67	+1.12	+0.33	-1.80	-3.38	-1.87	-1.74	-1.47
1894	-1.98	-1.78	-1.85	-1.58	-1.38	-1.63	-1.93	-2.35	-2.48	-1.21	-0.77	-0.86
1895	-0.22	-0.37	-0.02	+0.09	+0.18	+0.15	+0.22	+0.53	+0.51	+0.48	+0.66	+0.59
1896	+0.26	+0.26	+0.15	+0.02	-0.13	-0.66	-1.25	-1.85	-1.60	-1.19	-0.97	-0.62
1897	-0.79	-0.70	-0.62	-0.44	-0.51	-0.84	-1.21	-1.43	-0.44	-0.40	-0.51	-0.55
1898	-0.88	-0.99	-0.75	-0.84	-1.19	-1.10	-1.19	-1.12	-1.12	-0.97	-0.92	-0.84
1899	-0.53	-0.42	-0.11	+0.04	+0.15	+0.26	+0.20	+0.44	+0.62	+0.42	+0.57	+0.57
1900	+0.75	+0.66	+0.66	+0.33	+0.24	-0.07	-0.51	-0.33	-0.33	-0.35	-0.33	-0.22
1901	-0.24	-0.29	-0.15	-0.59	-0.40	-0.46	-0.40	-0.15	-0.07	+0.11	+0.24	+0.22
1902	+0.70	+0.57	+0.64	+0.51	+0.51	+0.35	+0.55	+0.66	+0.81	+1.05	+1.12	+0.99
1903	+0.90	+0.84	+0.90	+0.37	+0.24	+0.51	+0.40	+0.31	+0.31	+0.31	+0.13	+0.04
1904	-0.42	-0.40	-0.09	-0.04	-0.15	-0.44	-0.77	-0.88	-0.35	+0.09	-0.07	-0.13
1905	-0.15	-0.11	-0.07	+0.35	+0.55	+0.46	+0.51	+0.33	0	+0.26	+0.51	+0.99
1906	+0.81	+0.46	+0.57	+0.59	+0.84	+1.16	+1.23	+0.95	+0.70	+0.77	+1.12	+1.12
1907	+1.38	+1.10	+1.27	+1.10	+1.16	+1.38	+1.43	+1.05	+0.44	-1.23	-1.45	-2.42
1908	-3.30	-3.87	-3.96	-4.35	-4.07	-3.60	-2.11	-1.58	-2.26	-1.54	-1.16	-0.64
1909	-0.44	-0.33	-0.04	-0.09	+0.02	+0.04	-0.04	-0.02	+0.53	+0.92	+1.05	+1.36
1910	+1.45	+1.23	+0.92	+0.79	+0.92	+0.84	+0.90	+0.70	+0.48	+0.46	+0.66	+0.70
1911	+0.48	+0.51	+0.53	+0.46	+0.20	+0.40	+0.53	+0.31	+0.22	+0.37	+0.24	+0.11
1912	+0.20	+0.35	+0.35	+0.31	+0.29	+0.11	+0.09	+0.51	+0.53	+0.59	+0.48	+0.51
1913	+0.70	+0.64	+0.20	0	-0.07	-0.02	-0.04	-0.13	-0.09	-0.11	-0.15	-0.22
1914	-0.24	-0.20	0	-0.18	-0.26	-0.44	-0.81	-1.25	-1.14	-1.03	-1.43	-1.38

*Based upon index in Table IV, reduced to deviations from a curvilinear trend based upon preliminary mathematical approximations smoothed with the aid of a French curve. Seasonal variation adjusted for by method described in "The Measurement of Seasonal Variation," by Helen D. Falkner, in the *Journal of the American Statistical Association*, June, 1924, pp. 167-179. Two sets of seasonal indices were computed, one for 1889 to 1903, the other for 1904 to 1914.

APPENDIX

TABLE VI—CYCLES IN PIG IRON PRODUCTION, BY MONTHS, 1890-1914*
Percentage of trend, corrected for seasonal variation

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1890	117.5	121.5	121.5	120.9	122.4	121.3	119.3	118.7	120.1	118.1	116.0	112.0
1891	101.0	92.0	79.2	73.3	85.7	105.4	115.2	116.7	118.1	120.0	119.0	118.4
1892	121.4	126.2	122.7	117.4	114.9	112.0	109.1	104.7	103.8	106.7	109.1	109.0
1893	110.0	113.2	113.2	114.6	116.0	106.1	86.0	63.7	50.9	48.1	54.8	60.8
1894	63.3	68.5	75.5	75.6	55.4	47.1	65.6	89.3	99.6	100.0	102.2	103.1
1895	99.1	97.8	93.0	92.3	93.6	98.3	105.5	112.9	119.9	122.3	121.7	117.5
1896	112.6	108.0	102.8	101.6	100.0	98.1	91.1	77.5	64.4	60.5	67.5	74.8
1897	82.0	84.7	85.9	84.9	84.0	83.1	82.5	88.9	96.9	100.7	104.4	103.7
1898	105.0	105.6	105.9	103.2	101.0	98.1	94.3	94.0	96.0	96.6	98.2	97.9
1899	99.4	95.2	96.8	98.5	100.3	103.4	107.1	108.2	110.4	112.5	112.2	110.4
1900	111.1	109.4	107.5	104.5	106.6	105.7	96.9	87.1	82.1	78.5	77.1	82.8
1901	92.3	98.3	100.0	98.1	102.4	105.0	105.9	103.3	102.3	105.6	104.1	93.8
1902	104.3	99.3	102.7	105.3	108.0	105.5	104.8	105.9	103.9	104.9	101.5	105.9
1903	99.8	102.1	104.4	106.8	111.1	113.9	105.1	105.7	105.2	93.8	68.8	54.5
1904	58.5	80.1	88.1	96.3	92.9	82.8	71.0	73.5	85.5	89.7	92.5	98.0
1905	106.8	103.5	110.8	112.6	113.2	108.7	105.6	109.3	112.8	117.0	118.5	116.8
1906	117.6	116.5	117.0	116.0	114.9	114.3	115.5	108.5	110.6	116.1	122.4	120.0
1907	119.2	118.3	130.4	117.9	121.9	124.1	124.1	120.6	116.2	116.8	96.2	63.7
1908	54.3	57.6	60.0	58.5	59.4	58.1	64.2	68.1	72.0	74.7	77.9	85.9
1909	89.4	90.5	86.3	84.7	92.1	98.5	106.1	110.4	115.5	109.0	123.3	125.3
1910	125.6	122.6	118.8	116.6	111.8	110.2	103.3	98.9	95.5	91.9	89.3	81.6
1911	82.4	88.4	95.1	93.3	84.6	83.3	82.5	86.7	88.1	89.0	90.4	91.1
1912	93.1	96.1	101.7	103.5	107.5	109.4	106.9	109.0	105.9	109.9	114.5	120.4
1913	122.5	118.6	112.8	115.7	115.6	113.3	109.3	106.6	104.1	100.8	94.1	83.0
1914	79.9	83.7	92.6	92.4	82.7	79.7	80.5	81.0	75.9	68.7	61.9	61.5

*Computed from data published in the *Iron Age* and representing prior to October, 1901, estimates made from statistics of furnaces in blast, and subsequent thereto, direct data on production. For method of making adjustments for seasonal variation and trend, see Chapter III.

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