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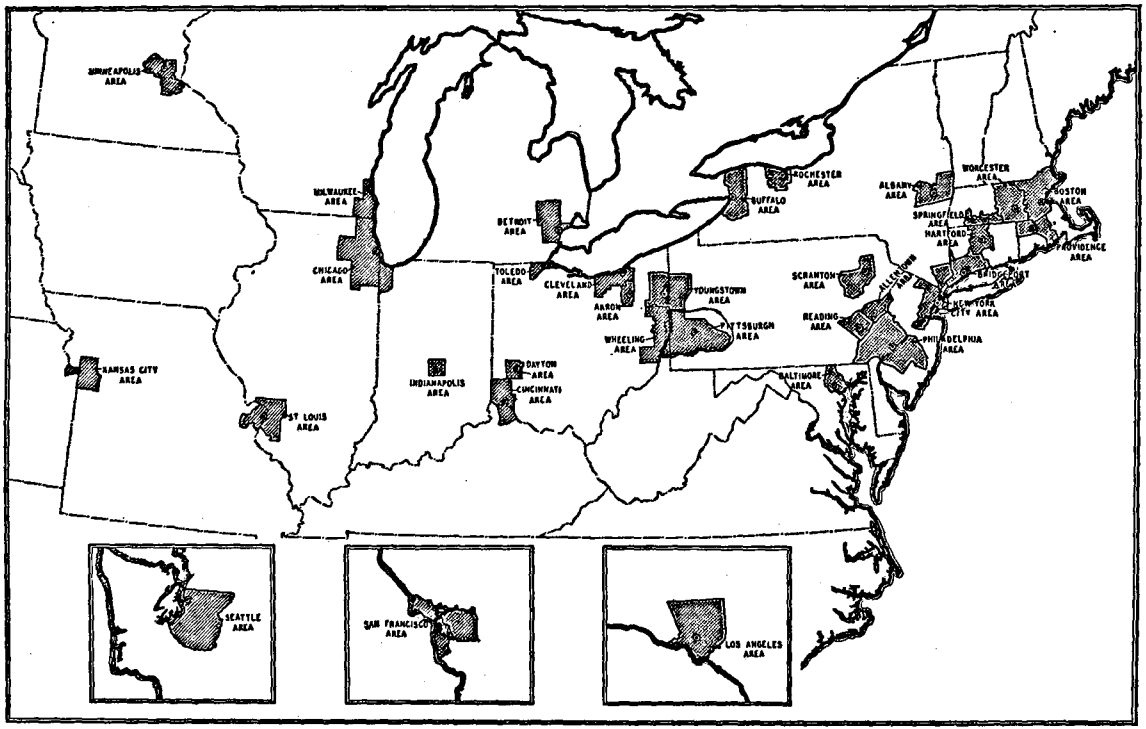
GROWTH OF AMERICAN MANUFACTURING AREAS

A Comparative Analysis with Special Emphasis on Trends in the Pittsburgh District

PITTSBURGH, PENNSYLVANIA
1938

LOCATION OF 33 INDUSTRIAL AREAS DEFINED BY THE UNITED STATES BUREAU OF THE CENSUS



GROWTH OF AMERICAN MANUFACTURING AREAS

A Comparative Analysis with Special Emphasis on Trends in the Pittsburgh District

by

GLENN E. McLAUGHLIN

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DIRECTOR'S PREFACE

Early in its program of regional economic research, under a grant from The Buhl Foundation, the staff of the Bureau of Business Research undertook to compute measures of industrial growth for the Pittsburgh district. It was recognized that an intelligent appraisal of the district's present position and prospects for growth must be based in large part on an understanding of what had gone on before, an understanding that could best be secured through statistical measurement of long-time trends. It followed, of course, that these trends must be related to corresponding trends, not only for the nation but for other centers, especially competing centers, of industrial activity. Economic change in one industrial area can be understood only in terms of economic change elsewhere in the economy of which that area forms a part. Accordingly, a comparative study of industrial growth in the chief American manufacturing districts was undertaken as a necessary parallel inquiry. The fruits of that undertaking are contained in the present monograph.

One of the essentials in an interdependent economy is some degree of regional specialization, whereby each region tends to produce those things for which it has comparative advantages in natural resources, in transportation facilities, in its position with respect to markets, in the skill and energy of its population, or in any of the many other factors, including the chance factor of an early start. These comparative advantages shift with changes in the stage of technical advancement, with changes in consumption demands, with changes in market areas, with changes in public policy. Consequently we do not find that all our economic regions move along parallel lines. There are great differences in rates of growth, not to mention differences in seasonality of economic activity and in the amplitude of the swings from the fat years to the lean years. Moreover, in a relatively young and growing country there are bound to be great differences in the stage of development among economic regions. Infancy of growth in one region may parallel in time ripe maturity in another.

In the reports of the decennial census of manufactures for 1929, the United States Bureau of the Census published, for the first time, extensive data on manufacturing industries classified by industrial areas. Thirty-three such areas were defined, each one consisting of a major manufacturing city, the county in which the central city is situated, and the surrounding industrial counties considered to form a part of the industrial agglomeration. (Data for a few differently defined areas were published in the reports for 1904, 1909, and 1914, and data for certain counties had been published in the reports for earlier census years.) Provision of these records represented a major advance in industrial statistics. Economists, observing the growth of urban clusters of population and manufacturing activity, had long complained of the artificiality of state boundaries. For example, most industrial states include several centers of manufacturing; and more often than not these centers are of diverse industrial composition, representing different stages of economic development and reflecting varied rates of growth. Consider, for illustrative purposes, the differences between the manufacturing area centering in Pittsburgh, dominated by iron and steel, heavy machinery, glass, coke, and producers' goods generally, and that centering in Philadelphia, consisting of many diversified industries, such as printing and publishing, knit goods, radios and phonographs, light machinery, etc. It can be seen, then, that state totals obscure significant detail. Likewise, in many instances, manufacturing districts overlap state lines, for example, New York, Chicago, and Philadelphia. Moreover, the central city is generally a poor measure of the importance of an industrial area and frequently a highly misleading unit for measuring changes in industrial growth. For example, the city of Pittsburgh in 1929 ranked fourteenth among the industrial cities of the country, rank being based on the number of wage earners employed in manufacturing industries, whereas the Pittsburgh Industrial Area ranked sixth among the 33 areas defined by the Bureau of the Census. Again, manufacturing establishments in the city of Pittsburgh employed 14 per cent fewer wage earners in 1929 than in 1899, whereas in the Pittsburgh Industrial Area the number of wage earners in manufacturing industries was 68 per cent greater in 1929 than in 1899. In 1879 the city accounted for 78 per cent of the wage earners in

manufacturing industries in the industrial area, but by 1929 the proportion had declined to 27 per cent. The Pittsburgh district is an extreme example of this disparity between changes in the central city and changes in the area, but in general it may be said that the central city is an inadequate and unsafe unit for such measurements. The industrial areas defined by the Bureau of the Census in the reports for 1929 and continued in the subsequent biennial census reports on manufacturing go far to repair these deficiencies.

In this study, the author, by a laborious and painstaking process, has compiled comparable data for these 33 industrial areas for the census years prior to 1929 and extending back to 1869. This process has required adjustments for changes in classification of industries, for changes in geographic limits, and for errors revealed in later censuses, as well as preparation of estimates to fill gaps in the record. It has required also many special compilations by the Bureau of the Census. As a result, for the first time it is possible to speak with statistical assurance concerning rates of growth and trend lines for the chief manufacturing areas of the country. The study, however, is not a mere statistical record. Wherever possible, the author has sought to point out the economic, geographic, historical, accidental, and other causal factors responsible for industrial growth and for variations in growth among manufacturing centers. These discussions, together with examination of the growth curves, shed light on prospective trends.

Because of its setting in a regional research program, attention is focused throughout this study on industrial growth in the Pittsburgh district. The aim has been to call attention to Pittsburgh's growth in comparison with growth in other industrial areas and, more particularly, with growth in other iron and steel areas. Part I comprehends this comparative measurement and analysis of industrial growth, wherein emphasis is placed on the statistical record. In Part II an effort is made to analyze the reasons for variations in growth among areas, to interpret growth in the Pittsburgh district, and to appraise the district's position and industrial prospects.

This monograph represents part of a program in regional economic research under a grant from The Buhl Foundation, of Pittsburgh. The purpose of that program has been to contribute

toward an understanding of Pittsburgh's economic environment and toward solution of Pittsburgh's economic problems. Through its work, the Bureau of Business Research seeks to provide the factual background for a more intelligent ordering of both private business and public business; to heighten community awareness of critical economic problems; and thus to stimulate group and community action.

RALPH J. WATKINS
Director

December, 1937

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In the preparation of this monograph the author has received valuable assistance from his friends and fellow economists to whom he is deeply grateful. Chief credit is due his colleagues on the staff of the Bureau of Business Research. He is indebted to Dr. J. P. Watson and Mr. Bervard Nichols for helpful editorial suggestions on successive revisions of the manuscript; to Mr. Wilbert G. Fritz for constructive suggestions concerning the measurement and interpretation of trends; to Mr. Theodore A. Veenstra for criticism of the chapter relating to industrial production and population; and to Miss Marion Worthing for assistance on the sections dealing with the economic position of the steel industry in western Pennsylvania.

The author is indebted also to Josephine McLaughlin, his wife, for assistance in editing the manuscript; to Mr. Frederick F. Stephan, Secretary of the American Statistical Association and formerly Director of the Bureau of Social Research of the Federation of Social Agencies of Pittsburgh and Allegheny County, for his constructive interest in the estimates of the population of Allegheny County; and to Professor John H. Cover, of the University of Chicago, for help during the early stages of the inquiry.

Special thanks are due Mr. LeVerne Beales, Chief Statistician for Manufactures, United States Bureau of the Census, for his unfailing courtesy and cooperation in providing the numerous special compilations required in the study. He was patient and helpful also in clearing up many troublesome questions, both in correspondence and in interviews. Likewise, acknowledgments are due Mr. Henry W. Van Pelt, Director, Bureau of Statistics, Pennsylvania Department of Internal Affairs, who supplied numerous special compilations from the state records, and Dr. Leon E. Truesdell, Chief Statistician for Population, United States Bureau of the Census, who provided special data on population.

The statistical work for this study, including the painstaking task of estimating regional figures for years for which there were gaps in the census records, was done in the statistical laboratory of the Bureau of Business Research, under the supervision of Messrs.

Oscar L. Endler and Robert H. Nelson, with the assistance of Messrs. Emil G. Punzak, David Schenker, and Kenneth M. Snader. The charts were prepared in the Bureau's drafting unit under the supervision of Mr. Charles W. Hammers, assisted by Messrs. Frank W. Surovec and Theodore L. Pryor. The preparation of the manuscript for the printer and the reading of proof were supervised by Mrs. Gladys M. Gardner, with the help of Misses Louisa Alexa, Elma Freehling, and Helen Mamula.

GLENN E. MCLAUGHLIN

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INTRODUCTION

Two of the outstanding phenomena that have characterized the economic life of the United States since the Civil War, and especially since the beginning of the present century, have been the rapid growth of industry and the significant changes in the relative importance of different divisions of industrial activity. Some divisions have grown much more rapidly than others and have tended to increase in relative importance persistently from decade to decade, notable examples being manufacturing and the group comprising trade, transportation, and clerical activities. On the other hand, the relative importance of agriculture, measured in terms of number of gainful workers normally employed, has fallen markedly since 1820; and in 1930 many fewer people reported usual employment in this industry than in either of the two other major industry groups just mentioned.

Variations in the rates of growth among different divisions of industry and among individual industries in each of the several divisions reflect large shifts in opportunities for employment and for capital investment. Industries which in terms of employment have grown more rapidly than the total population have had to attract workers from other types of activity or to secure them in increasing proportions from the ranks of new workers. Differential rates of growth have drastically affected the economic importance of most parts of the nation; and no industrial area has remained unaffected. This study deals with variations in the growth of industry in *major* areas. The purpose of studying these variations will be clarified by a brief general consideration of industrial growth.

General View of Industrial Growth in the United States

Mining and Manufacturing Output

The combined output of mining and manufacturing in the United States in 1929 was about three and one-half times the output in 1899. The increase in production was greater for mining than for manufacturing. From 1899 to 1929, mining output increased 285 per cent, that is, with 1899 as the base year, the index

TABLE 1

INDEXES OF GROWTH IN POPULATION AND INDUSTRIAL PRODUCTION FOR THE UNITED STATES, 1899–1936

(1899 Equals 100)

Date	Manufacturing Output[a]	Mining Output[a]	Population[b]	Gainful Workers[b]	Manufacturing Wage Earners[a]
1899	100	100	100	100	100
1900	101	106	102	102	103
1901	112	115	104		108
1902	122	123	106		117
1903	124	135	108		121
1904	122	136	110		114
1905	143	162	112		127
1906	152	170	115		133
1907	151	186	117		138
1908	126	154	119		123
1909	155	189	121		137
1910	159	208	124	131	143
1911	153	207	125		144
1912	177	221	127		150
1913	184	237	130		152
1914	169	225	132		146
1915	189	239	134		154
1916	225	269	136		180
1917	227	288	138		193
1918	223	289	139		198
1919	218	257	140		191
1920	231	293	142	147	193
1921	179	233	145		147
1922	237	254	147		162
1923	281	349	150		186
1924	259	324	153		173
1925	291	332	155		178
1926	299	362	157		181
1927	294	358	159		177
1928	310	355	161		177
1929	330	385	163		188
1930	263	332	165	171	164
1931	222	281	166		139
1932	175	238	167		115
1933	208	275	168		124
1934	216	288	169		142
1935	249	305	170		157
1936	291	348			168

Source:

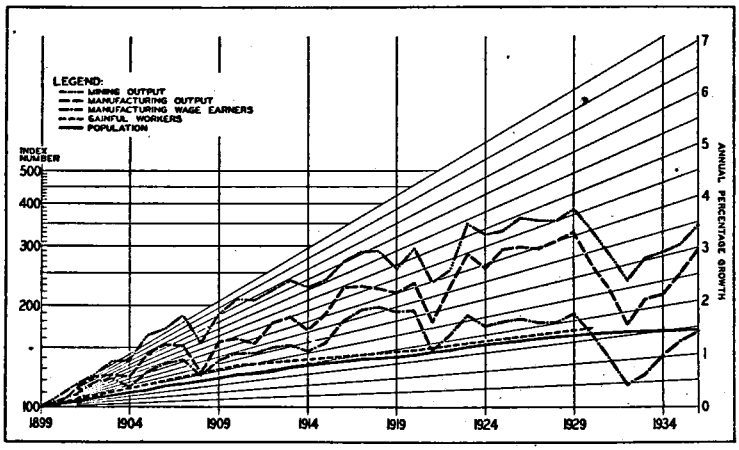
[a] For the period 1899–1924, Persons-Day indexes, *Review of Economic Statistics*, Vol. IX, p. 149; for the period 1925–1936, *Federal Reserve Bulletin*, June, 1937, p. 602.

[b] *Review of Economic Statistics*, Vol. XV, p. 156; the 1933–1935 indexes were computed from data given in the *Statistical Abstract of the United States*, 1936, p. 9.

number of mining output for 1929 was 385 (Table 1 and Chart 1). This growth was equivalent to an average annual gain of 4.5 per cent (as indicated by the scale at the right of the accompanying chart). The comparable relative gain for manufacturing output from 1899 to 1929 was 230 per cent, the average rate of growth being 4 per cent per year. Growth in the physical volume

CHART 1

GROWTH IN POPULATION AND INDUSTRIAL PRODUCTION FOR THE UNITED STATES, 1899–1936



of wholesale and retail trade [1] was slightly less than that in manufacturing. In trade the total percentage gain was 216, and the average annual increase was almost 4 per cent. By contrast, the total gain for agricultural output was only 45 per cent, reflecting an average annual increase of only about 1.25 per cent.

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[c] Computed by the author from data given in United States Bureau of the Census, *Population: 1930*, Vol. V, *General Report on Occupations*, p. 37. The estimated number of gainful workers in 1899 was obtained by interpolation; the 1910 figure was adjusted by the author for over-enumeration in agriculture, and the 1920 figure for under-enumeration in agriculture. See *Occupation Statistics, 1910*, pp. 26–29, and *Occupations, 1920*, pp. 18–24. See also Table 7 in this monograph.

[d] United States Bureau of the Census, *Manufactures: 1929*, Vol. I, *General Report*, p. 15. The figures for the intercensal years up to 1914 have been estimated from the data of the annual censuses of manufacturing in Massachusetts, New Jersey, and Pennsylvania; the figures for intercensal years between 1914 and 1919 have been estimated by using the indexes of manufacturing wage earners of the United States Bureau of Labor Statistics and of the New York Department of Labor with weights of 3 and 1, respectively (see Paul Douglas, *Real Wages in the United States* (1930), pp. 437–39); and the figures for intercensal years since 1919 have been estimated by using the indexes of manufacturing wage earners of the United States Bureau of Labor Statistics.

[1] Estimated by W. M. Persons in *Review of Economic Statistics*, Vol. XV (1933), p. 155.

Though the increase in industrial production between 1899 and 1929 was great, the rate of growth has been falling since the middle of the nineteenth century. For example, from 1860 to 1890, mining output was growing at a yearly rate of about 9 per cent. From 1890 to 1907 the annual rate was about 7.5 per cent; from 1907 to 1917, 4.5 per cent; and from 1917 to 1929, slightly less than 2.5 per cent. Likewise, in both manufacturing and agriculture the rate of increase in output has tended to diminish since 1860.

Gainful Workers and Population

Further indications of the degree of growth in industry as a whole and of the varying rates of growth in the several divisions

TABLE 2

TOTAL POPULATION AND NUMBER OF PERSONS ENGAGED IN GAINFUL OCCUPATIONS, BY GENERAL DIVISIONS OF OCCUPATIONS, FOR THE UNITED STATES, 1820–1930

Year	Number of Persons (Thousands)									
	Total Population	All Occupations	Agricultural	Manufacturing and Mechanical	Trade, Transportation, and Clerical	Domestic, Personal, and Public Service	Professional Service	Mining	Lumbering	Fishing
1820	9,638	2,881	2,071	350	72	288	81	8	5	6
1830	12,866	3,940	2,773	524	122	386	109	11	6	9
1840	17,069	5,420	3,718	792	207	520	147	15	9	12
1850	23,192	7,697	4,965	1,261	415	735	207	89	13	12
1860	31,443	10,531	6,287	1,932	783	1,003	305	168	23	30
1870	38,558	12,927	6,904	2,746	1,347	1,318	379	176	29	28
1880	50,156	17,390	8,505	4,185	2,122	1,622	602	264	49	41
1890	62,948	23,319	9,770	5,969	3,650	2,403	947	408	112	60
1900	75,995	29,073	10,699	7,854	5,444	3,076	1,213	597	121	69
1910	91,972	37,454	11,704	10,629	7,989	4,219	1,706	965	174	68
1920	105,711	41,854	10,923	12,819	10,433	4,207	2,112	1,090	217	53
1930	122,775	48,830	10,472	14,111	13,950	6,124	2,939	984	177	73

Source: P. K. Whelpton, "Occupational Groups in the United States, 1820–1920," *Journal of the American Statistical Association*, September, 1926, p. 339. The census figures for 1930 have been adjusted for comparability with Whelpton's classification.

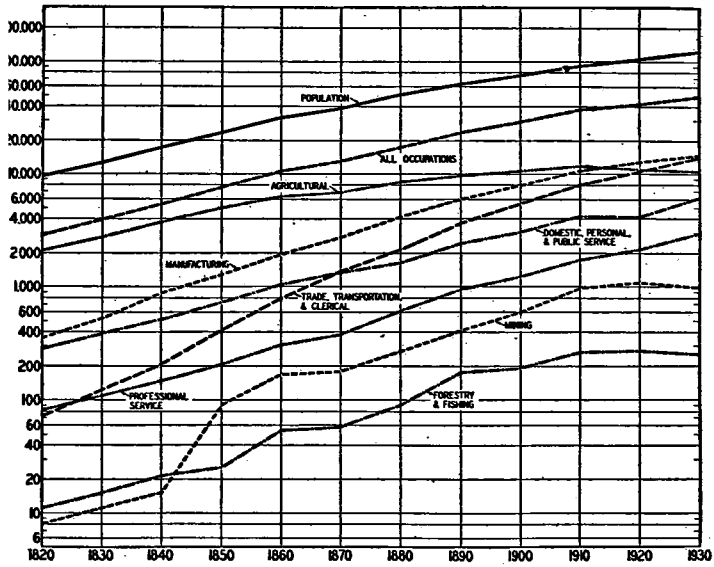
of industry can be obtained from the data pertaining to the number of persons in the United States normally attached to gainful occupations. Growth in the number of these gainful workers from 1900 to 1930 was slightly greater than the growth in population. The same relation characterized the period from 1820 to 1900; that is, a growing proportion of the population was normally employed for money income or its equivalent. From 1820 to 1930 the population of the United States proper expanded from

9,638,000 to 122,775,000; the number of gainful workers increased from 2,881,000 to 48,830,000 (Table 2 and Chart 2). In 1930 the number of gainful workers was nearly 17 times the number in 1820, whereas the total population was only about 13 times the total in 1820.

The number of persons attached to agriculture increased in each census period from 1820 until 1910 (Table 2). During

CHART 2

GROWTH IN POPULATION AND NUMBER OF GAINFUL WORKERS, BY TYPE OF OCCUPATION, FOR THE UNITED STATES, 1820–1930



the World War decade, however, there was an actual decrease; by 1920 those normally employed in agriculture were fewer than those engaged in manufacturing. Manufacturing and mechanical pursuits in 1820 accounted for approximately one-sixth as many workers as did agriculture. Employment in manufacturing and mechanical occupations grew at a nearly constant rate until 1880, after which year the growth curve began to round off. This division of economic activity, however, continued to grow; and in 1920 and in 1930 it was the largest. Gainful workers in the

group composed of trade, transportation, and clerical occupations were nearly 200 times as numerous in 1930 as in 1820. In 1820 these occupations represented one of the smallest divisions, but by 1930 they were nearly as important as manufacturing and accounted for about 3,500,000 more gainful workers than agriculture. Domestic, personal, and public services have grown at rates closely paralleling those for population. Professional services have grown somewhat more rapidly than population. Up to 1860, employment in mining occupations increased rapidly. During the Civil War decade there was no significant gain; but from 1870 to 1910 the increase in this division was very rapid, being almost exactly the same as that for trade, transportation, and clerical occupations. Since 1910 there has been little gain in mining occupations. The growth in forestry and fishing occupations has been irregular, but the trend roughly parallels the growth curve for the total number of gainful workers. The maximum relative importance of forestry and fishing came in 1890.

Manufacturing Employment and Population

From the beginning of the century to the end of the World War, the average number actually employed in manufacturing in the United States, as shown by the Census of Manufactures, grew much more rapidly than population. The number of manufacturing wage earners in 1917 represented an average annual increase from 1899 of nearly 3.7 per cent. In population the average annual gain in this period was only about half as great, or 1.8 per cent per year. The peak in the annual average of manufacturing employment, however, was in 1918. By 1929 the number of manufacturing wage earners had actually fallen, and the average annual growth from 1899 up to 1929 was only 2.2 per cent. For the same period the annual rate of growth in population was 1.7 per cent.

Manufacturing Employment and Population in Major Geographic Divisions of the United States

From 1899 to 1929 the extent of growth in the number of manufacturing wage earners and in the total population varied widely among the different geographic divisions of the country.[2]

[2] For the states included in each division, see p. 16.

Very rapid gains in manufacturing during this 30-year period occurred in the Far West (Mountain and Pacific states), in the South, and in the East North Central states. The number of wage earners in these geographical divisions doubled or more than doubled (Table 3). In the Pacific group of states the number nearly quadrupled. Smaller relative gains occurred in New England (an increase of less than one-third), in the Middle Atlantic section, and in the West North Central states.

TABLE 3

PERCENTAGE INCREASE IN POPULATION AND MANUFACTURING WAGE EARNERS BETWEEN 1899 AND 1929; MANUFACTURING WAGE EARNERS PER 1,000 POPULATION IN 1899 AND 1929; AND PERCENTAGE DISTRIBUTION OF MANUFACTURING WAGE EARNERS, 1899 AND 1929—UNITED STATES AND GEOGRAPHIC DIVISIONS

Geographic Divisions[a]	Percentage Increase 1899 to 1929[b]		Number of Manufacturing Wage Earners per 1,000 Population[b]		Percentage of Total Manufacturing Wage Earners	
	Population	Manufacturing Wage Earners	1899	1929	1899	1929
United States	61.6%	87.5%	62	72	100.0%	100.0%
New England	46.0	28.9	152	135	18.1	12.4
Middle Atlantic	69.9	59.7	104	98	34.1	29.0
East North Central	58.3	136.9	67	100	22.8	28.8
West North Central	28.5	78.2	26	36	5.6	5.4
South Atlantic	51.2	99.0	44	58	9.7	10.3
East South Central	31.0	113.2	23	38	3.8	4.3
West South Central	86.4	162.6	17	24	2.4	3.4
Mountain	121.0	130.3	27	28	0.9	1.2
Pacific	239.1	282.5	51	58	2.6	5.3

Source: Based on population and manufacturing reports of the Bureau of the Census.
[a] For the states included in each division, see p. 16.
[b] For population the years are 1900 and 1930.

In most geographic divisions the increase in population during this period was relatively less than the increase in the number of wage earners employed in manufacturing; the exceptions were the New England and the Middle Atlantic states. In New England the average number employed in manufacturing per thousand of population decreased from 152 in 1899 to 135 in 1929, but in the latter year the ratio was still considerably higher than in any other geographic division. In the Middle Atlantic states the ratio fell from 104 to 98, and in the East North Central states it rose from

67 to 100. The greatest relative change occurred in the East South Central states, where the number of factory workers per thousand of population increased from 23 to 38.

The varying rates of growth in the number of manufacturing wage earners resulted in shifts in the national importance of the several geographic divisions. The Middle Atlantic group of states was in 1899 the country's most important manufacturing district, employing more than one-third of all factory wage earners. These states still ranked first in 1929, with 29 per cent of total factory employment; but in that year the East North Central group of states was of practically equal importance. Partly as a result of the southern movement and development of the textile industry, the relative number of manufacturing workers in New England fell considerably from 1899 to 1929. That geographic division, however, still ranked third, accounting for one-eighth of the national total in comparison with slightly more than one-tenth in the South Atlantic states. The proportion of the national total of factory workers in the Pacific states doubled during this 30-year period, and in 1929 the proportion was about one-half the percentage for the South Atlantic states and practically equal to that for the West North Central states.

Manufacturing and Population in Major Manufacturing Areas Combined

The United States Bureau of the Census in 1929 set up and defined for statistical purposes boundaries for 33 "industrial areas"; the purpose with respect to each area was to include, subject to the necessity of following county lines, the manufacturing activity concentrated in and around a large industrial nucleus. Taken as a group, these areas in 1929 accounted for 56.2 per cent of the total number of manufacturing wage earners in the United States and for 63.4 per cent of the total value added by manufacture. These percentages represent slight relative increases from 1899; from 1899 to 1929 the 33 manufacturing areas added to their share only 0.9 per cent of the total national factory employment and only 1.9 per cent of the total national value added by manufacture.[8] Thus, during that period, manufacturing activity in and around large manufacturing cities grew very little more than manufacturing activity in and around smaller

[8] See note, p. 104.

industrial centers. Relative growth in population in these 33 manufacting areas, however, was much more rapid; their share of the national population increased from 27.6 per cent in 1900 to 35.9 per cent in 1930.

Objectives of this Study

The purpose of this report is to measure and analyze economic growth for the more important industrial sections of the United States and in that setting to focus attention on comparative economic growth in the Pittsburgh district and on the underlying factors which in the past have conditioned and in the future will probably continue to condition economic growth in this district. Having its origin in a regional research program, the investigation is pointed toward a more intelligent understanding of the Pittsburgh district and toward a clearer appraisal of its future prospects. Industrial trends within the district take on significance only as they are related to corresponding trends within the national economy and within other industrial districts, and the economic future is unknown except to whatever extent the probable shape of things in the future is indicated by the picture of the present and the record of the past. Consequently, throughout this study emphasis will be placed on trends in the Pittsburgh district, on the relative position of the district, and on the bearing of these trends and comparisons on probable future tendencies in the Pittsburgh district.

The Period Covered

The several sections of this study cover different periods of time. In the main the period includes the last 30 years of the past century and the first 30 years of this century. The data for manufacturing activity extend from 1869 through 1935, and most of the data for gainful employment and population extend from 1870 through 1930. In some chapters emphasis is given to the latter half of the period, that is, the years since 1899 or 1900. Census data for manufacturing are available for the following years: 1869, 1879, 1889, 1899, 1904, 1909, 1914, 1919, 1921, 1923, 1925, 1927, 1929, 1931, 1933, and 1935.[4] Data on population and

[4] For the earlier censuses, down through that for 1899, the year covered by manufacturing reports was that ended on May 31 in the year following the year named. Beginning with the census of 1904 the calendar year has been the basis; but a few manufacturing establishments have continued to report for the nearest business or fiscal year.

gainful employment are available for decennial years from 1870 to 1930.[5]

Manufacturing Cities and Areas Included in the Analysis

The districts to be compared in this study are the 33 "industrial areas" defined by the United States Bureau of the Census in connection with the Census of Manufactures of 1929. These industrial areas were made up of entire counties, since it has not been deemed advisable to collect manufacturing data by townships or by any other subdivision of a county. The areas with the counties included are listed in Table 4.[6] An industrial area was defined by the Bureau of the Census as: "An area having as its nucleus an important manufacturing city and comprising the county in which the city is located, together with any adjoining county or counties in which there is great concentration of manufacturing industry. The number of wage earners employed in each area is [in 1929] at least 40,000."[7] It will be observed that this definition admits of some play of judgment. The purpose was to include the bulk of manufacturing activity in a given district; and in deciding whether to add additional counties to the nucleus of the area the Bureau of the Census was guided mainly by the number of wage earners in each county in relationship to the land area. Occasionally a county, even though of minor importance, was added because it was more or less surrounded by other counties included on the basis of the other criteria or because it was located near the central city.[8] Moreover, in setting the limits of an industrial area, the Bureau of the Census excluded an important

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[5] In 1870, 1880, 1890, and 1900, the population census was taken as of June 1; in 1910, as of April 15; in 1920, as of January 1; and in 1930, as of April 1.

[6] In order to make comparisons among a number of iron and steel districts, a special manufacturing district was defined by the author for Birmingham, Alabama, for which center the number of manufacturing wage earners fell below the minimum prescribed by the Bureau of the Census. The district was defined in a manner similar to that employed in defining the census industrial areas and thus consists of Jefferson County, Alabama.

[7] If the Bureau of the Census had extended the lower limit in defining an industrial area from 40,000 wage earners to 30,000 wage earners in 1929, seven additional industrial areas would have been included. In order, there would have been single-county census areas around the following cities: Louisville, Syracuse, Columbus, Canton, Birmingham, South Bend, and Grand Rapids. The Birmingham area thus would have ranked thirty-eighth in number of manufacturing wage earners.

[8] United States Bureau of the Census, *Manufactures: 1929*, Vol. I, pp. 11–12.

TABLE 4

COMPOSITION OF INDUSTRIAL AREAS IN TERMS OF COUNTIES AND CONSTITUENT INDEPENDENT CITIES

The 33 Industrial Areas Defined by the United States Bureau of the Census [a]
New York City Industrial Area:
Bronx, Kings, New York, Queens, Richmond, and Westchester counties, New York State; Bergen, Essex, Hudson, Middlesex, Passaic, and Union counties, New Jersey
Chicago Industrial Area:
Cook, DuPage, Kane, Lake, and Will counties, Illinois; Lake County, Indiana
Philadelphia Industrial Area:
Bucks, Chester, Delaware, Montgomery, and Philadelphia counties, Pennsylvania; Burlington, Camden, and Gloucester counties, New Jersey
Detroit Industrial Area:
Oakland and Wayne counties, Michigan
Boston Industrial Area:
Essex, Middlesex, Norfolk, and Suffolk counties, Massachusetts
Pittsburgh Industrial Area:
Allegheny, Beaver, Washington, and Westmoreland counties, Pennsylvania
Providence-Fall River-New Bedford Industrial Area:
Providence County, Rhode Island; Bristol County, Massachusetts
Cleveland Industrial Area:
Cuyahoga and Lorain counties, Ohio
St. Louis Industrial Area:
St. Louis City and St. Louis County, Missouri; Madison and St. Clair counties, Illinois
Milwaukee Industrial Area:
Kenosha, Milwaukee, and Racine counties, Wisconsin
Bridgeport-New Haven-Waterbury Industrial Area:
Fairfield and New Haven counties, Connecticut
Buffalo Industrial Area:
Erie and Niagara counties, New York
Los Angeles Industrial Area:
Los Angeles County, California
Cincinnati Industrial Area:
Butler and Hamilton counties, Ohio; Campbell and Kenton counties, Kentucky
Baltimore Industrial Area:
Baltimore City and Baltimore County, Maryland
San Francisco-Oakland Industrial Area:
Alameda, Contra Costa, Marin, San Francisco, and San Mateo counties, California
Worcester Industrial Area:
Worcester County, Massachusetts
Youngstown Industrial Area:
Mahoning and Trumbull counties, Ohio; Lawrence and Mercer counties, Pennsylvania
Akron Industrial Area:
Summit County, Ohio
Hartford Industrial Area:
Hartford County, Connecticut

[a] The 33 industrial areas centering about the cities for which they are named are listed in order of their rank according to the number of wage earners engaged in manufacturing industries in 1929. A complete discussion of these areas is given in United States Bureau of the Census, *Manufactures: 1929*, Vol. I, pp. 11 and 241–43.

TABLE 4 (*Continued*)

Minneapolis-St. Paul Industrial Area:
Dakota, Hennepin, and Ramsey counties, Minnesota
Rochester Industrial Area:
Monroe County, New York
Albany-Schenectady-Troy Industrial Area:
Albany, Rensselaer, and Schenectady counties, New York
Allentown-Bethlehem Industrial Area:
Lehigh and Northampton counties, Pennsylvania
Springfield-Holyoke Industrial Area:
Hampden County, Massachusetts
Toledo Industrial Area:
Lucas County, Ohio
Indianapolis Industrial Area:
Marion County, Indiana
Kansas City Industrial Area:
Clay and Jackson counties, Missouri; Wyandotte County, Kansas
Seattle-Tacoma Industrial Area:
King and Pierce counties, Washington
Reading Industrial Area:
Berks County, Pennsylvania
Wheeling Industrial Area:
Brooke, Hancock, and Ohio counties, West Virginia; Belmont, Columbiana, and Jefferson counties, Ohio
Dayton Industrial Area:
Montgomery County, Ohio
Scranton-Wilkes-Barre Industrial Area:
Lackawanna and Luzerne counties, Pennsylvania
Other Selected Industrial Areas [b]
Birmingham District:
Jefferson County, Alabama
A 7-County Pittsburgh District:
The Pittsburgh Industrial Area and Armstrong, Butler, and Fayette counties, Pennsylvania
An 11-County Pittsburgh District:
The 7-County Pittsburgh District and Greene, Indiana, Lawrence, and Mercer counties, Pennsylvania
A 16-County Pittsburgh District:
The 11-County Pittsburgh District and Cambria, Clarion, Clearfield, Jefferson, and Somerset counties, Pennsylvania

[b] The Birmingham District is used in this study to compare the 33 industrial areas with an industrial center in the South. The larger Pittsburgh districts are used for a more detailed study of the characteristics of the territory immediately surrounding the Pittsburgh Industrial Area and in order better to explain the economic factors affecting this area and the city of Pittsburgh.

manufacturing city, even though it was located in an adjacent county, if a wide gap of nonindustrial territory intervened between it and the heart of the area or if the industries in the outside city were of a different and unrelated character. Canton, for instance, was not included in the Akron area. Finally, it is important to note that the minimum of 40,000 relates to manufacturing wage earners only.

All but three of the 33 industrial areas are located in the northeastern quarter of the country (see the frontispiece). The remaining three are on the Pacific coast. None of these major manufacturing districts are situated south of the Potomac or the lower Ohio, except for a minor part of the Cincinnati area in Kentucky. Southern New England, the Middle Atlantic states, and Ohio contain all or part of 22 of the 33 areas. From Boston to Baltimore stretches an almost continuous belt of manufacturing territory. About half of the areas are located on deep water, and many of the remainder have access to navigable rivers.

The land area, the total population as of April 1, 1930, the total number of gainful workers as of the same date, and the average number of manufacturing wage earners in 1929, 1933, and 1935 are shown in Table 5 for the 33 manufacturing areas and for the Birmingham district. The Pittsburgh area ranks fifth in land area, seventh in terms of population, seventh in number of gainful workers, and in all three years sixth in number of manufacturing wage earners. These 33 areas are not only the great centers of manufacturing activity in the United States but also the great centers of population, trade, and most forms of economic activity excepting the extractive industries.

Many of the comparisons based on manufacturing employment and on value added by manufacture have been limited to 13 of the 33 industrial areas: namely, the areas centering about New York City, Chicago, Philadelphia, Detroit, Boston, Pittsburgh, Cleveland, St. Louis, Buffalo, Los Angeles, Cincinnati, Baltimore, and San Francisco. With one exception, Minneapolis, which was excluded because of its comparatively low rank among industrial areas after the war, these are the only areas for which close approximations of manufacturing totals could be made for 1904, 1909, 1914, 1921, 1923, and 1925. In these census years the United States Bureau of the Census published no data for counties; but for the first three years named, manufacturing data were published for 13 or more metropolitan districts, which were somewhat smaller than the corresponding industrial areas set up for the Census of Manufactures in 1929.[9] These data were sufficient

[9] In 1904, data were presented for Providence and Minneapolis areas but not for Detroit and Los Angeles areas; in 1909, for a Minneapolis area but not for Los Angeles and Providence areas; and in 1914 for Minneapolis and Birmingham areas but not for a Providence area. There were thus 15 metropolitan areas for which figures were given in the 1914 reports.

TABLE 5

AREA, POPULATION, AND NUMBER OF GAINFUL WORKERS, 1930; MANUFACTURING WAGE EARNERS, 1929, 1933, AND 1935—UNITED STATES, PENNSYLVANIA, AND INDUSTRIAL AREAS

Area	Area (Square Miles) 1930	Population April 1 1930	Number of Gainful Workers (10 Years of Age and Over) April 1 1930	Average Number of Wage Earners Engaged in Manufacturing Industries		
				1929	1933	1935
United States	2,973,776	122,775,046	48,829,920	8,838,743	6,066,513	7,393,762
Pennsylvania	44,832	9,631,350	3,722,103	1,014,046	716,598	841,234
Total, 33 Industrial Areas	50,899	44,116,053	19,111,438	4,963,875	3,306,590	4,104,327
Total, 13 Large Ind. Areas	28,159	33,581,258	14,695,098	3,519,562	2,338,476	2,967,549
Industrial Areas:[a]						
New York City Area[b]	1,765	10,160,159	4,582,230	918,206	620,814	780,986
Chicago Area[b]	3,596	4,675,877	2,084,085	550,903	332,862	429,517
Philadelphia Area[b]	3,551	3,137,040	1,365,083	376,009	261,599	315,940
Detroit Area[b]	1,506	2,100,197	893,673	293,252	202,950	331,505
Boston Area[b]	1,790	2,611,926	1,122,428	285,652	203,064	230,277
Pittsburgh Area[b]	3,055	2,023,269	757,382	227,221	143,421	179,320
Providence Area	997	904,606	394,227	184,895	136,648	142,661
Cleveland Area[b]	960	1,310,661	558,796	176,840	113,611	140,090
St. Louis Area[b]	1,948	1,335,158	587,473	154,321	102,354	116,683
Milwaukee Area	841	878,757	371,945	144,760	80,041	101,734
Bridgeport Area	1,234	850,151	358,519	136,147	97,748	123,074
Buffalo Area[b]	1,556	911,737	371,374	115,212	69,744	83,378
Los Angeles Area[b]	4,115	2,208,492	964,436	114,480	79,553	109,469
Cincinnati Area[b]	1,167	870,365	370,232	114,068	68,257	86,941
Baltimore Area[b]	686	929,439	410,403	99,601	72,634	86,088
San Francisco Area[b]	2,464	1,306,938	627,503	93,797	66,313	78,690
Worcester Area	1,556	491,242	203,657	83,620	63,523	73,827
Youngstown Area	2,120	555,709	199,481	78,903	54,322	61,326
Akron Area	408	344,131	138,976	67,298	43,921	49,898
Hartford Area	729	421,097	180,916	65,482	43,379	55,225
Minneapolis Area	1,325	839,098	368,911	65,148	42,991	49,791
Rochester Area	663	423,881	182,038	63,248	37,864	44,903
Albany Area	1,396	456,755	200,822	63,112	34,000	40,210
Allentown Area	716	342,197	134,377	58,483	42,230	48,818
Springfield Area	636	335,496	142,505	54,208	34,824	40,537
Toledo Area	342	347,709	147,939	53,996	26,657	37,917
Indianapolis Area	397	422,666	186,457	51,117	31,286	36,828
Kansas City Area	1,155	638,476	290,284	48,332	33,648	38,787
Seattle Area	3,812	627,359	283,261	47,449	26,386	31,879
Reading Area	865	231,717	99,523	47,350	35,745	42,338
Wheeling Area	1,750	394,761	145,878	45,906	38,132	47,807
Dayton Area	455	273,481	115,266	42,591	29,739	34,336
Scranton Area	1,343	755,506	271,358	42,268	35,030	34,882
Birmingham District[c]	1,120	431,493	173,001	31,544	18,425	22,471

Source: Population and manufacturing reports of the United States Bureau of the Census.

[a] For composition and full names of the industrial areas, refer to Table 4. The areas are listed here and in other tables, unless otherwise noted, according to rank in average number of manufacturing wage earners in 1929.

[b] These are the 13 large industrial areas.

[c] The Birmingham district is not included in the total for 33 industrial areas. It is shown here to compare with an industrial center in the South.

when included with other census information to make possible the estimating of satisfactory totals for the 13 industrial areas. For 1921, 1923, and 1925 the making of estimates for the 13 areas was facilitated because for those years the Bureau of the Census published figures for several large or medium-sized cities in each area as well as for the metropolis itself. These areas constituted 13 of the 16 largest industrial areas in terms of manufacturing employment in 1929 (Providence, Milwaukee, and Bridgeport areas, which ranked seventh, tenth, and eleventh, respectively, being excluded) and 13 of the 15 largest industrial areas in terms of population in 1930 (the Providence and Milwaukee areas, which ranked thirteenth and fourteenth, respectively, being excluded).

TABLE 6

AREA, POPULATION, AND NUMBER OF GAINFUL WORKERS, 1930; MANUFACTURING WAGE EARNERS, 1929, 1933, AND 1935—FOR 13 LARGE CITIES

City	Area (Square Miles) 1930	Population April 1 1930	Number of Gainful Workers (10 Years of Age and Over) April 1 1930	Average Number of Wage Earners Engaged in Manufacturing Industries		
				1929	1933	1935
New York City	299.00	6,930,446	3,187,459	563,249	392,540	486,353
Chicago	201.90	3,376,438	1,558,858	405,399	249,054	317,505
Philadelphia	128.00	1,950,961	889,850	246,908	166,906	201,449
Detroit	137.90	1,568,662	689,489	221,588	126,557	194,422
Cleveland	70.76	900,429	394,842	146,881	95,189	114,161
St. Louis	61.00	821,960	386,083	109,010	70,759	82,655
Baltimore	78.72	804,874	362,072	85,655	60,936	70,758
Los Angeles	440.32	1,238,048	580,733	76,023	59,819	63,881
Boston	43.90	781,188	355,346	75,907	46,823	52,282
Buffalo	38.90	573,076	239,210	68,854	41,928	49,758
Cincinnati	71.41	451,160	203,003	63,986	39,541	50,425
Pittsburgh	51.30	669,817	278,591	61,503	35,476	42,740
San Francisco	42.00	634,394	333,573	45,482	30,691	34,399

Source: Population and manufacturing reports of the United States Bureau of the Census.

In the following chapters some references will be made to the major city in each of the 13 large industrial areas. For each of these cities, Table 6 presents data concerning the land area, the total population as of April 1, 1930, the number of gainful workers as of the same date, and the average number of manufacturing wage earners in 1929, 1933, and 1935.

Some of the discussion of regional differences in industrial changes is based on data for geographic divisions of the country. The divisions are those used by the United States Bureau of the Census and are composed as follows:

New England
- Maine
- New Hampshire
- Vermont
- Massachusetts
- Rhode Island
- Connecticut

Middle Atlantic
- New York
- New Jersey
- Pennsylvania

East North Central
- Ohio
- Indiana
- Illinois
- Michigan
- Wisconsin

South Atlantic
- Delaware
- Maryland
- District of Columbia
- Virginia
- West Virginia
- North Carolina
- South Carolina
- Georgia
- Florida

West North Central
- Minnesota
- Iowa
- Missouri
- North Dakota
- South Dakota
- Nebraska
- Kansas

East South Central
- Kentucky
- Tennessee
- Alabama
- Mississippi

West South Central
- Arkansas
- Louisiana
- Oklahoma
- Texas

Mountain
- Montana
- Idaho
- Wyoming
- Colorado
- New Mexico
- Arizona
- Utah
- Nevada

Pacific
- Washington
- Oregon
- California

Measures of Industrial Size

Number of gainful workers has been used as a rough measure of comparative industrial activity for states and cities. For industrial areas, growth in the total population had to be used as an approximation of growth in the number of gainful workers and hence as an indirect measure of growth in total economic activity. The total population, of course, includes all workers, whether or not they are working for monetary income; it also includes all unemployables—children, incapacitated or sick persons, old persons—and all employables seeking work. A discussion of the relationship between population and gainful employment and of the significance of these two as measures of economic activity is presented in Chapter 1.

For the purpose of measuring the importance of manufacturing activity, two standards have been used in this study: average number of wage earners and value added by manufacture.

Nature and Treatment of Data

With few minor exceptions all the data on manufacturing, gainful employment, and population discussed in this study have been secured from the published or unpublished records of the United States Bureau of the Census; the data on mining are from the reports of the United States Bureau of Mines. For purposes of year-to-year comparisons, it has been necessary to make some adjustments in the data, owing to changes in areas. A few similar adjustments have already been made in census publications, such as the addition of figures for the former city of Allegheny to Pittsburgh figures for census years before 1907. For a few of the industrial areas and cities it has been necessary to make minor changes in published totals in order to adjust for changes in the types of activity covered by the different censuses.[10]

By far the greatest difficulty in obtaining satisfactory figures lay in the completion, by estimate, of area totals for the years 1904, 1909, 1914, 1921, 1923, and 1925 for the 13 large industrial areas. The number of manufacturing wage earners and the value added by manufacture in these areas in the stated years were approximated from published Federal census data for cities, "metropolitan manufacturing areas," and state figures, and from additional industrial material available from other sources (listed at appropriate places).

Explanation of the Ratio Chart

In the chapters which follow, comparisons of the rates of growth in population and in economic activity in the Pittsburgh Industrial Area and in the other industrial areas defined by the United

[10] Changes in census classifications have necessitated a few adjustments in area or city totals. An important example concerns the motion picture industry, which was only partly included in manufacturing totals in 1919 and was covered as a separate nonmanufacturing industry in 1931, 1933, and 1935. In order to obtain comparable figures for the Los Angeles area and for the city of Los Angeles, estimates for that part of the industry not included in the 1919 reports and the published complete data for 1931, 1933, and 1935 have been added to the published totals for the city and county for those years.

States Bureau of the Census have been made on semilogarithmic, or ratio, charts. That is, vertically the chart is scaled to the logarithms of the numbers which appear at the left margin, the horizontal scale being on the ordinary arithmetic basis.

Those who are not familiar with the semilogarithmic chart may be aided by the following explanation. The two figures in Chart 3 refer to the same hypothetical population data—plotted in Figure 1 on the ordinary arithmetic grid and in Figure 2 on a semilogarithmic grid. It is assumed that area "A" had a population in 1920 of 1,000 and area "B" a population of 200 and that both areas are growing at the constant rate of 10 per cent per annum. In 1921 "A" had, therefore, 1,100 and "B," 220 persons, and in 1922 "A" had reached the number 1,210 and "B" had attained the 242 mark, and so on. The percentage rate of growth is the same in both areas, but the annual increment in the number of people—absolute gain in numbers—is always five times as great for "A" as for "B"; and "A" is every year five times as large as "B."

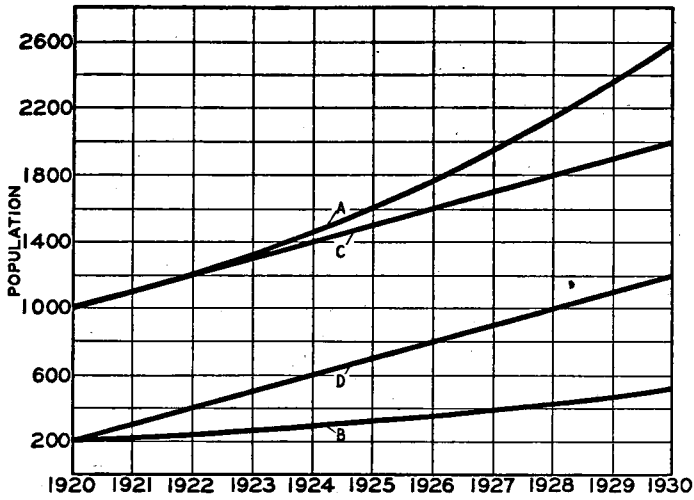
Figure 1 indicates clearly that "A" is adding more people to its population per year than "B"; but it is not evident from that figure that the rates of growth are constant and the same. The reader who had only Figure 1 before him would have to compute percentage changes to discover this relationship. Figure 2, however, on a semilogarithmic background, shows two straight lines parallel to each other. The fact that they are straight indicates that each area is growing at a constant percentage rate; and the fact that they are parallel shows that this percentage rate is the same for both "A" and "B."

"C" and "D" are assumed to represent two other areas with population in 1920 identical with those of "A" and "B," respectively, and further are assumed to be growing at a rate of 100 persons per year; their absolute increments therefore are the same and remain constant. Consequently, their population curves appear as parallel lines on the arithmetic background of Figure 1. Their percentage rates of growth, however, as a simple mental calculation would show, are not the same in any given year and, furthermore, vary from year to year. When plotted on a semilogarithmic basis, the population graphs for "C" and "D" appear as nonparallel curved lines (Figure 2).

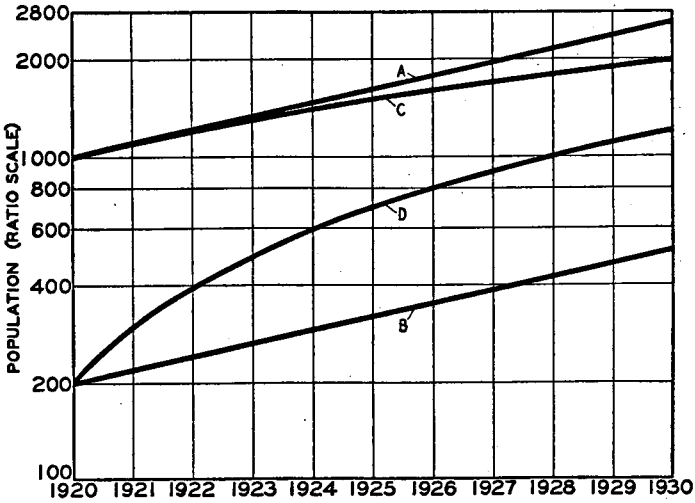
CHART 3

COMPARISONS OF ARITHMETIC AND SEMILOGARITHMIC CHARTS

1. Arithmetic Chart



2. Semilogarithmic Chart



The comparative growth of areas of widely different sizes cannot be adequately compared unless their rates of growth are reduced to a percentage basis. If the New York City Industrial Area were to increase by only 1,000 persons per year, its growth would be inconsequential; yet, for an area with a population of 4,000—such as the Seattle area in 1870—the addition of 1,000 persons in a single year would be very important. The absolute gains are the same in both, but the significance of the increment depends on the size of the area. It must be measured in terms of the annual percentage gain. When, therefore, it is desired to compare rates of population growth either for two or more areas or for different periods in the development of the same area, the ratio chart—semilogarithmic—should be used.

Most of the charts used in the following chapters are on the semilogarithmic basis; some are on the arithmetic basis. Those not familiar with the decided difference between the two types of charts should note carefully the following summary of difference:

Ordinary arithmetic type

1. Equal vertical distances represent equal absolute changes.
2. A straight line represents change by a constant absolute amount.
3. Parallel lines represent equal changes in the same period of time, in terms of absolute amounts.

Semilogarithmic type

1. Equal vertical distances represent equal percentage changes.
2. A straight line represents change by a constant percentage or rate.
3. Parallel lines represent equal percentage changes in a given period of time.

PART I

MEASUREMENT AND STATISTICAL ANALYSIS

CHAPTER 1

GAINFUL WORKERS, 1870–1930

In the Pittsburgh Industrial Area the average number of manufacturing wage earners was less in 1929 than in 1919. The quantity output of manufacturing products, however, appears to have remained approximately constant or actually to have increased slightly during this decade. Mining activity in the district showed considerable decreases after 1919, losses in employment being accompanied by important decreases in output. In manufacturing and mining combined, both employment and production in the Pittsburgh Industrial Area were declining. On the other hand, great increases in employment occurred in other occupational groups in the area during the first postwar decade. These increases were mainly in the service groups, particularly in trade and in personal and professional service. As a consequence, total gainful employment and total output of services and goods in the Pittsburgh area appear to have increased from 1919 to 1929.

It is clear, therefore, that for the purpose of measuring changes in the industrial importance of an area and of comparing growth in economic activity in that area with growth in other areas, an inclusive measure is desirable. Unfortunately, a comprehensive measure of total economic activity for industrial areas is available for only one year. It is the number of persons normally gainfully employed, reported by the Bureau of the Census. These data for 1930 will be used in this chapter for the purpose of showing for each industrial area what proportion of the total population was normally gainfully employed. The same data for the nation, for states, and for major cities are available at decennial intervals; and these will be used here to show the relationship between population growth and growth in the normal working population. On the basis of this observation of relationships, the possibilities of using population data as measures of industrial change will be explored.

Gainful Employment in Relation to Population, by Industrial Areas, 1930

Area comparisons in terms of gainful workers in 1930 yield results very similar to comparisons on the basis of total population in that year (Table 5). The rank of an area according to population in 1930 was usually the same, or almost the same, as the rank according to number of gainful workers. There were exceptions, however, especially when the population totals of two or more industrial areas were not widely different. For example, the San Francisco, Providence, Minneapolis, and Springfield areas ranked higher in number of gainful workers than in population. These differences in rank resulted from variations in the proportion of the total population which was reported as normally gainfully employed in 1930. At one extreme was the San Francisco area with 48.0 per cent of the total population gainfully employed; at the other, the Youngstown area with only 35.9 per cent gainfully occupied.[1]

Consequently, if total population is used as a basis for comparing the usual working population among industrial areas, differences will be understated in some instances and overstated in others. In 1930, the population of the Pittsburgh Industrial Area, for example, was only 3.6 per cent less than that in the Detroit area, whereas the number of gainful workers was 15.1 per cent less.

Growth in Number of Gainful Workers, 1870–1930

The United States

Gainful workers in the United States in 1870 numbered 12,500,000; by 1930 the total had increased to nearly 49,000,000 (Table 7). In 60 years, the number of workers normally employed for money income or its equivalent had reached a total about four times that in 1870. This great increase was related directly to the steep upward trend in total industrial activity; it was influenced also by the transfer of some types of work from the home to the factory and by the increase in paid help in the home.

[1] These extremes resulted primarily from variations in the employment of females and from variations in the relative number of children in the total population; employment of females was relatively much less in the Youngstown area, and children were relatively fewer in the San Francisco area.

The greatest relative increase in gainful employment came between 1870 and 1890, the number of workers nearly doubling in that period. These 20 years were characterized by rapid gains in manufacturing, trade, and transportation. The railway mileage of the country in 1890 was more than three times as great as it was 20 years before, and the numbers employed by the transportation system had gained accordingly. During this period there were tremendous increases in heavy traffic, such as coal, iron ore, and iron and steel. Within manufacturing the greatest increases occurred in textile industries and iron and steel industries.

Pennsylvania, Philadelphia, and Pittsburgh

In Pennsylvania the number of gainful workers increased from about 1,000,000 in 1870 to more than 3,700,000 in 1930. The relative gain in the 60 years was less than that in the United States. In the state, as in the United States, the greatest relative increase occurred between 1870 and 1890, when the working population approximately doubled. Moreover, in both instances the greater gains were made by the trade, transportation, and manufacturing groups.

In Philadelphia the number of gainful workers grew from around 200,000 in 1870 to nearly 900,000 in 1930. The increase in gainful employment was very rapid between 1870 and 1880. Expansion in the textile industry was the outstanding industrial fact of that decade in Philadelphia.

In the area lying in the city of Pittsburgh in 1930 [2] the number of gainful workers grew from about 64,000 in 1870 to nearly 280,000 in 1930. From 1880 to 1890 the increase in gainful employment was very rapid, there being great increases in the number of workers employed in transportation and in the number in manufacturing. A major expansion of the iron and steel industry occurred during this decade. The relative increase in gainful workers during the next decade remained high but was only about half as great as that during the decade of the 1880's.

CHANGE IN PROPORTION OF POPULATION GAINFULLY EMPLOYED

Total population and the number of gainful workers grew at roughly the same rates from 1870 to 1930 (Table 7). This re-

[2] Figures for population and gainful workers are in part estimated to allow for areas annexed in the period considered.

TABLE 7

POPULATION, NUMBER OF GAINFUL WORKERS, AND PERCENTAGE CHANGES IN THE UNITED STATES, PENNSYLVANIA, PHILADELPHIA, AND PITTSBURGH, 1870–1930

Item	1870	1880	1890	1900	1910	1920	1930
United States							
Population	38,558,371[a]	50,155,783	62,947,714	75,994,575	91,972,266	105,710,620	122,775,046
Gainful Workers	12,505,923	17,392,099	23,318,183	29,073,233	38,167,336[b]	41,614,248[c]	48,829,920
Pennsylvania							
Population	3,521,951	4,282,891	5,258,113	6,302,115	7,665,111	8,720,017	9,631,350
Gainful Workers	1,020,544	1,456,067	1,973,368	2,448,589	3,130,681	3,426,359	3,722,103
Philadelphia							
Population	674,022	847,170	1,046,964	1,293,697	1,549,008	1,823,779	1,950,961
Gainful Workers	217,685	348,900	466,791	568,923	711,169	819,000	889,850
Pittsburgh							
Population[d]	186,700	247,300	366,000	482,600	566,400	628,400	669,817
Gainful Workers[d]	64,400	82,100	146,400	199,300	248,100	266,400	278,591

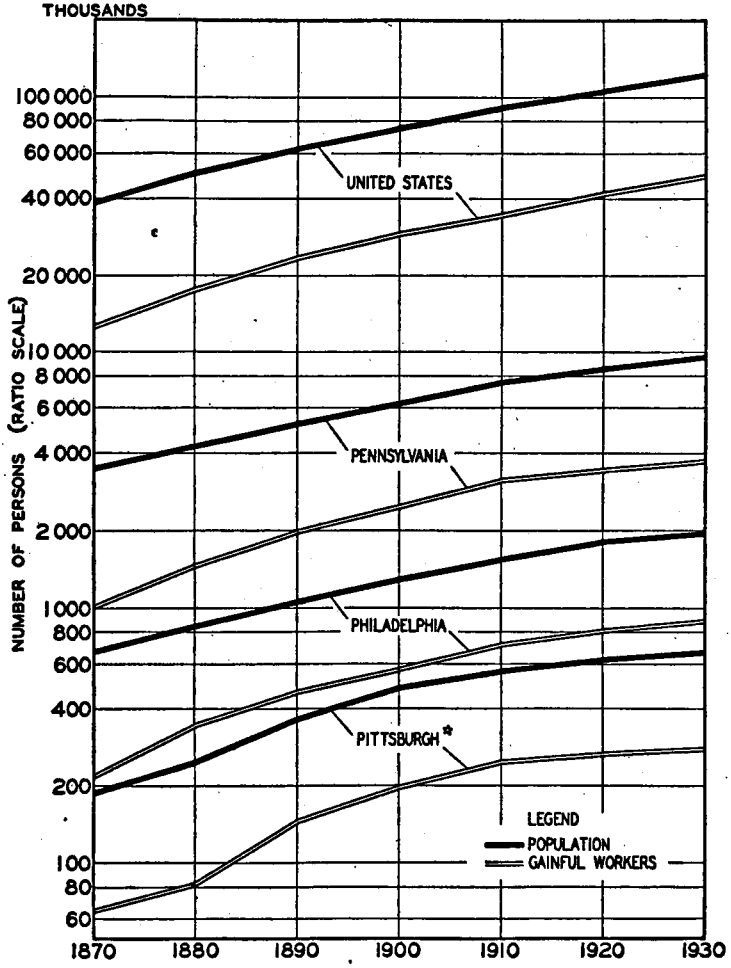
TABLE 7 (*Continued*)

Item	1870–1880	1880–1890	1890–1900	1900–1910	1910–1920	1920–1930	1870–1900	1900–1930	1870–1930
	PERCENTAGE CHANGES								
United States									
Population	30.1%	25.5%	20.7%	21.0%	14.9%	16.1%	97.1%	61.6%	218.4%
Gainful Workers	39.1	34.1	24.7	31.3	9.0	17.3	132.5	68.0	290.5
Pennsylvania									
Population	21.6	22.8	19.9	21.6	13.8	10.5	78.9	52.8	173.5
Gainful Workers	42.7	35.5	24.1	27.9	9.4	8.6	139.9	52.0	264.7
Philadelphia									
Population	25.7	23.6	23.6	19.7	17.7	7.0	91.9	50.8	189.5
Gainful Workers	60.3	33.8	21.9	25.0	15.2	8.7	161.4	56.4	308.8
Pittsburgh									
Population[d]	32.5	48.0	31.9	17.4	10.9	6.6	158.5	38.8	258.8
Gainful Workers[d]	27.5	78.3	36.1	24.5	7.4	4.6	209.5	39.8	332.6

Source: Based on population reports of the United States Bureau of the Census.
[a] See Table 12, note *a*.
[b] Adjusted figure for probable over-enumeration in agriculture, 37,340,000.
[c] Adjusted figure for probable under-enumeration in agriculture, 41, 860,000.
[d] Adjusted for annexations between 1870 and 1930.

CHART 4

TOTAL POPULATION AND NUMBER OF GAINFUL WORKERS, 10 YEARS OF AGE AND OVER, FOR THE UNITED STATES, PENNSYLVANIA, PHILADELPHIA, AND PITTSBURGH, 1870–1930



* 1930 area of city.

lationship holds for the United States and for individual states [8] and cities. When plotted on the ratio scale, the lines of growth for population and for gainful workers are roughly parallel, especially after 1890 (Chart 4). Yet, with few exceptions, the relative growth in number of gainful workers somewhat exceeds that in population. For example, the population of the United States was slightly more than three times as great in 1930 as in 1870, whereas the number of gainful workers was nearly four times as large. The disparity between the rates of growth for population and those for gainful employment was much wider in the first half of this 60-year period than in the latter half. (The reasons for this difference are discussed in the following section.) From 1870 to 1900 the relative growth in the number of gainful workers was a third more than that for population for the United States, three-fourths more for Pennsylvania, and about a third more for Pittsburgh. During the 30 years following 1900 the percentage increases in the two groups of data were very similar.

Since in some periods and with respect to some areas there were significant differences between growth in number of gainful workers and growth of population, attention should be directed to the comparative proportions of the population included among gainful workers, that is, to relative gainful employment.

Relative Gainful Employment, 1870–1930

The United States

From 1870 to 1910 the gainfully employed proportion of the total population of the United States rose from 32.4 per cent to 41.5 per cent. The rise to 1910 was continuous, judged on the basis of the decennial censuses (Table 8). In 1920 the proportion was somewhat lower, and in 1930 there was no further significant change; in the latter year 39.8 per cent of the total population was reported as normally working for monetary incomes. The upward trend in relative employment after 1870 characterized both male and female workers, especially the latter. The change

[8] From 1900 to 1930 the rate of increase in population in seven of the 19 states which contain manufacturing areas did not vary more than plus or minus 5 per cent from the rate of increase in the number of gainful workers; in 11 of the states the growth in population was more than 5 per cent less than the growth in the number of gainful workers; in only one state was the gain in population greater by more than 5 per cent.

in relative employment between 1910 and 1930 was small in comparison with the change during the 40-year period leading up to 1910.

One factor accounting for the rise up to 1910 in the proportion of the population gainfully employed was the considerable increase

TABLE 8

GAINFUL WORKERS AS A PERCENTAGE OF THE POPULATION, BY TOTAL AND BY SEX, UNITED STATES, PENNSYLVANIA, PHILADELPHIA, AND PITTSBURGH, 1870–1930

Area	1870	1880	1890	1900	1910	1920	1930
	Total Gainful Workers as a Percentage of Total Population						
United States	32.4[a]	34.7	37.2	38.3	41.5[b]	39.4[b]	39.8
Pennsylvania	29.0	34.0	37.5	38.9	40.8	39.3	38.6
Philadelphia	32.3	41.2	44.6	44.0	45.9	44.9	45.6
Pittsburgh[c]	34.0	33.2	40.0	41.3	43.8	42.4	41.6
	Male Gainful Workers as a Percentage of Total Male Population						
United States	54.7	57.8	60.2	61.2	63.6[b]	61.3[b]	61.3
Pennsylvania	50.4	58.0	61.9	62.9	64.1	61.9	60.2
Philadelphia	51.2	63.5	67.3	66.4	67.2	66.5	66.5
Pittsburgh[c]	57.2	55.9	64.2	65.4	66.5	64.8	62.7
	Female Gainful Workers as a Percentage of Total Female Population						
United States	9.6	10.7	13.1	14.3	18.1[b]	16.5[b]	17.7
Pennsylvania	7.6	10.1	12.5	13.9	16.3	16.0	16.8
Philadelphia	15.2	20.7	22.9	22.4	25.4	23.6	25.0
Pittsburgh[c]	10.7	10.3	14.3	15.8	19.8	19.8	20.7

Source: Based on population reports of the United States Bureau of the Census.

[a] Based on unadjusted population total, see Table 12.

[b] Adjustment for probable over-enumeration in agriculture results in the following percentages for 1910: Total, 40.6; Male, 62.9; Female, 17.0.

Adjustment for probable under-enumeration in agriculture results in the following percentages for 1920: Total, 39.6; Male, 61.8; Female, 16.5.

See President's Research Committee on Social Trends, *Recent Social Trends in the United States*, p. 274.

[c] See Table 7, note *d*.

in the proportion of the population 16 years of age or older, that is, of working age. In 1870, 58.7 per cent of the population fell in this age group. By 1910, 66.1 per cent of the population were 16 or older. Since gainful employment is limited for the most part to those over 16 years of age, it is obvious that this

shift in the age distribution of the population contributed to an increase in relative gainful employment.[4] Even among the population 16 years and over, however, there was a great upward movement in gainful employment between 1870 and 1910, the percentage rising from 52.2 in 1870 to 59.0 in 1910. After allowance for a changing age distribution, there remained a significant upward movement in the relative number of people reporting gainful occupations.

In part, the gain not arising from change in age distribution resulted from the change in the sex ratio in the total population. In 1870 there were in the United States 102.2 males for every 100 females. (The ratio had been 104.7 in 1860 but had declined as a result of the loss of males during the Civil War and a decline in immigration during the 1860's.) After 1870 the number of males per 100 females rose regularly by decades to 106.0 in 1910. Since a large proportion of immigrants were male, this change was in the main a result of the acceleration in immigration.[5] Gainful employment is higher among men than among women; consequently, the upward movement in immigration had the effect of increasing the gainfully employed proportion of the population.

For the most part, however, the rise in relative employment actually characterized men and women in the usual working ages. The rise was related mainly to the transfer of operations from the home to outside industries. The increase in the extent of gainful employment was much greater for women than for men. Not far from twice as large a proportion of all women were gainfully employed in 1910 as in 1870, whereas the proportion of men gainfully employed had risen by only about a fifth. During this period there was rapid expansion in the textile industries,

[4] A change which to a slight extent offset the influence of the trend toward increasing average age of the population was the decreasing employment in the age group 10 to 15. As late as 1890, 18.1 per cent of all the children in this age group were reported as gainfully occupied; by 1910, only 13.7 per cent of the children in this age group were gainfully employed.

[5] During the 1860's an annual average of 240,000 persons entered the United States; in the period 1900 to 1910, inclusive, the average was 880,000 per year. In the first instance, the total immigration amounted to 6.0 per cent of the population at the end of the decade, and in the second instance to about 9.6 per cent. The all-time peak in immigration came in 1907, when more than one and a quarter million people came into the United States. In judging the effect of immigration upon the population, one should have data on the excess of immigration over emigration. This excess probably was somewhat greater in 1914 than in 1907. Both average yearly immigration and average net influx were much less for the decade 1911–1920, inclusive, than for the previous decade.

the printing industries, and in some service occupations which employed large numbers of women.

After 1910 the gainfully employed percentage of the population fell in the United States and in most states and cities, despite the fact that an increasing part of the total population came within the working ages. Numerous tendencies contributed to this result. There was a sharp decrease in the relative number of children 10 to 15 years of age reported as gainfully employed. The proportion of children in this age group gainfully employed dropped from 13.7 per cent in 1910 to 4.7 per cent in 1930. Furthermore, decreases in gainful employment occurred among older children and young adults, especially among young men.[6] These declines are related to increasing school attendance.[7] For the ages 16 through 44 years, the decrease in employment among males was greater than the gain for females; consequently, for all persons in this group the percentage of gainful employment fell from 1910 to 1930.[8] Within the age group 45 through 64 years there was little change in relative employment, but for both males and females 65 years and over there were considerable decreases.

Pennsylvania, Philadelphia, and Pittsburgh

In Pennsylvania the changes in the extent of gainful employment were analogous to changes in the country, except that between 1870 and 1880 the upward movement in gainful employment for all persons, and especially for males, was much more rapid in the state than in the United States (Table 8). The ratio of gainful workers to total population in Pennsylvania was almost

[6] From 1920 to 1930 the decrease in relative employment in the ages from 10 through 16 was greater for females than for males. In these ages, however, gainful employment was much less important than in the ages 16 through 24, in which the decrease in gainful employment was much greater for males.

[7] The percentage of young women 18 and 19 years old who were gainfully employed fell from only 42.3 in 1920 to 40.5 in 1930; whereas for young men of these ages the drop was from 78.3 per cent to 70.7 per cent. During the same period there was a greater rise in the proportion of males under the age of 20 who were attending school than there was in the proportion of females attending school. In the age group 20 through 24 years there was a considerable increase in the extent of gainful employment among females and a decrease among males; this difference also is related to greater increases in school attendance among males.

[8] For females 16 through 44 years of age there was a rise from 28.1 per cent to 29.7 per cent in the extent of gainful employment; for males, a drop from 93.3 per cent to 89.2 per cent; and for all persons in that age range, a drop from 61.8 per cent to 59.5 per cent.

identical with that in the United States at the end of each decade after 1870.[9]

In Philadelphia the greatest increase in the extent of gainful employment took place between 1870 and 1880; the relative increase was almost the same as that which occurred in the United States in the four decades 1870–1910. In Pittsburgh the greatest gain in relative employment occurred between 1880 and 1890, coincidentally with an extraordinary development of the steel industry in this district. During this decade many immigrants were attracted to the expanding industry of the Pittsburgh district; among these immigrants was a large number of men in the working ages. Since 1880 the normally gainfully employed proportion of the total population has been greater in Philadelphia than in Pittsburgh and greater in Pittsburgh than in Pennsylvania. The latter relationship is to be expected because relative gainful employment is usually greater in urban than in rural districts.

Among males the changes in relative employment in Philadelphia and Pittsburgh since 1870 were similar to the changes in Pennsylvania and the United States; since 1910, however, the decreases have been considerably greater in Pittsburgh than in Philadelphia.[10] The relative employment of females in Philadelphia increased up

[9] In 1880 and in every succeeding census year prior to 1930 relatively more of the total male population was reported as gainfully employed in Pennsylvania than in the United States. In 1930 the position was reversed. In 1870 and since, Pennsylvania has reported a smaller proportion of the female population as being gainfully employed than has the United States.

[10] From 1920 to 1930 there were important general decreases in relative employment in each of the ages from 10 to 20. For both males and females the decreases were usually greater in Pennsylvania than in the United States, greater in Philadelphia than in the state, and greater in Pittsburgh than in Philadelphia. There was a large drop in the extent of employment among children younger than 16 years of age in Pittsburgh. For example, among boys aged 14, gainful employment fell from 7.4 per cent in 1920 to 1.0 per cent in 1930 and among girls of the same age from 5.1 per cent to 0.9 per cent. For each age from 15 through 24 the decrease in relative employment for males was much greater in Pittsburgh than in Philadelphia, the state, or the country. Pittsburgh showed a loss for the age group 25 through 44 years; Pittsburgh, Philadelphia, and Pennsylvania, for men 45 through 64 years. For females, increasing relative employment was general from 20 up to 65 years.

In Pittsburgh the greatest degree of employment for men came in the age group 35 through 39 years, with 98.0 per cent of the men gainfully employed. The maximum also came in this age group in Philadelphia, Pennsylvania, and the United States. For women the maximum relative employment in Pittsburgh came in the age group 18 and 19 years, with 57.1 per cent gainfully employed. The maximum also came in this age group in Philadelphia and Pennsylvania, but in the country it came in the group 20 through 24 years.

to 1910; lower percentages have been reported since. In Pittsburgh the increase continued up to 1930, in which year 20.7 per cent of all women were reported as gainfully employed. This percentage is significantly greater than that for the entire state, but it is significantly less than that for Philadelphia. The relative employment of women in Philadelphia is higher because of the outstanding importance of the textile, paper, and printing industries in that city.

Major Cities of the Industrial Areas

From 1870 to 1900, increases in the normally employed proportion of the total population occurred in major cities in all industrial areas for which figures are available (Table 9). Between 1900 and 1930 there were only seven instances in which the percentage gainfully employed fell. These changes give some approximation of the degree to which population gains understate gains in usual employment.

The reasons for these gains in large cities are much the same as those which account for similar changes in the United States. There are, however, additional considerations which apply to some areas. New districts that have been rapidly settled usually contain a predominance of men in the working ages. Such a condition would explain the increases in relative gainful employment which appear to have occurred in Birmingham and Seattle between 1870 and 1900. The great increase in the city of Los Angeles between 1900 and 1930 probably resulted from the movement to the city of people in the working ages with relatively few dependents and from the unusually rapid gains in female employment incident to the development of the textile and motion picture industries. During this period the employed proportion of the population grew more rapidly in that city than in any other major city in the country. This fact must be borne in mind with reference to the significance of the population gains in the Los Angeles area, discussed in the following chapter.

The influx of immigrant men also played a part in raising the employed proportion of the population. This factor probably accounts for much of the rapid increase from 1870 to 1900 in the gainfully employed part of the population in Philadelphia, as well as for much of the increase in several other areas which drew largely upon immigration for additions to their working population.

In most areas the general decrease in the percentage of the population that came below the working ages was another factor that contributed to gains in relative employment, but an increase in the relative number of children occurred in those comparatively new industrial districts in which the relative number of young and middle-aged men had been very high in 1900.[11]

In some cities the changes in relative gainful employment are related to changing trends in certain industries and, in nearly all cities, to the increasing employment of women. The employment of women has been relatively high in those occupations which from 1900 to 1930 grew most rapidly—clerical occupations, trade, and professional services. Even within other occupational groups, women have been gaining in employment relative to men. These changes, however, have usually been insufficient to offset the decline in relative gainful employment of males since 1910; as a result, relative gainful employment in most cities fell between 1910 and 1930.

In only one major city, Chicago, was the increase in the employed part of the population greater from 1900 to 1930 than from 1870 to 1900. The change in this city during the more recent period was related to an increase in the proportion of the total population in working ages. Chicago attracted a relatively large number of men and women of working ages, apparently with comparatively few dependents.

A question now arises regarding the degree to which changes in the extent of gainful employment in large cities reflect similar changes in corresponding industrial areas. The evidence is not conclusive, because of the varying degree to which an area's population is concentrated in the major city, but changes in percentage employment in major cities serve as a warning to the reader that the increases in population in the areas from 1870 to 1930 do not bear a constant or even an approximately constant relation to gains

[11] For example, in the Seattle and Birmingham areas there was a much more rapid increase between 1900 and 1930 in the number of children and also in the number of women than in the number of men. In Seattle, the number of males per 100 females fell from 177 in 1900 to 104 in 1930, and the percentage of the population in the age group 15–44, inclusive, fell from 60.3 to 51.7. Consequently, the employed part of the population fell markedly in these two cities. If it is desired to compare the significances of population changes in Seattle and in Los Angeles between 1900 and 1930, it is well to bear in mind that during this period there was a great increase in the working proportion of the population in Los Angeles and a great decrease in the proportion in Seattle.

TABLE 9

THE GAINFULLY EMPLOYED PROPORTION OF THE POPULATION: SELECTED DATA FOR THE MAJOR CITY (OR CITIES) IN EACH OF 33 INDUSTRIAL AREAS, 1870 to 1930

Major City (or Cities) in Each Area	Percentage of the Area's Population in the Major City 1930	Percentage of the Area's Population Gainfully Employed 1930	Percentage of the Major City's Population Gainfully Employed 1930	Percentage Change in Gainfully Employed Proportion of Population in the Major City		
				1870–1900	1900–1930	1870–1930
New York City	68.2%	45.1%	46.0%	16.9%	7.5%	25.7%
Chicago	72.2	44.6	46.2	9.8	11.3	22.2
Philadelphia	62.2	43.5	45.6	36.2	3.6	41.2
Detroit	74.7	42.6	44.0	18.9	9.2	29.8
Boston	29.9	43.0	45.5	9.3	1.6	11.0
Pittsburgh	33.1	37.4	41.6	21.5[a]	0.7	22.4[a]
Providence, Fall River, and New Bedford	53.2	43.6	44.7	14.2[b]	− 3.2	8.1[b]
Cleveland	68.7	42.6	43.9	24.0	8.9	35.1
St. Louis	61.6	44.0	47.0	22.0	10.1	34.3
Milwaukee	65.8	42.3	44.0	20.7	12.5	35.8
Bridgeport, New Haven, and Waterbury	48.1	42.2	42.9	18.7[c]	− 0.7	20.7[c]
Buffalo	62.9	40.7	41.7	13.6	8.9	23.7
Los Angeles	56.1	43.7	46.9	—	15.0†	—
Cincinnati	51.8	42.5	45.0	20.6	3.7	25.0
Baltimore	86.6	44.2	45.0	20.6	5.4	27.1
San Francisco and Oakland	70.3	48.0†	50.0†	4.6[d]	7.5	15.1[d]
Worcester	39.8	41.5	42.5	4.2‡	1.4	5.7‡
Youngstown	30.6	35.9‡	37.7‡	—	− 5.8	—
Akron	74.1	40.4	41.7	—	3.2	—
Hartford	39.0	43.0	46.2	28.7	0.0	28.7

TABLE 9 (*Continued*)

Major City (or Cities) in Each Area	Percentage of the Area's Population in the Major City 1930	Percentage of the Area's Population Gainfully Employed 1930	Percentage of the Major City's Population Gainfully Employed 1930	Percentage Change in Gainfully Employed Proportion of Population in the Major City		
				1870–1900	1900–1930	1870–1930
Minneapolis and St. Paul	87.7†	44.0	44.8	—	4.4	—
Rochester	77.4	42.9	44.1	21.7	3.3	25.6
Albany, Schenectady, and Troy	64.8	44.0	45.4	37.6†[e]	0.9	41.3†[e]
Allentown	27.0	39.3	42.6	—	− 0.9	—
Springfield and Holyoke	61.5	42.5	44.4	—	6.2	—
Toledo	83.6	42.5	43.8	11.7[a]	11.7	24.8[a]
Indianapolis	86.2	44.1	45.2	11.4	5.1	17.1
Kansas City, Kansas, and Kansas City, Missouri	81.7	45.5	47.2	11.9[f]	8.5	21.1[f]
Seattle and Tacoma	75.3	45.2	47.0	—	−10.0	—
Reading	48.0	43.0	45.8	25.9	7.0	34.7
Wheeling	15.6‡	37.0	41.7	—	3.5	—
Dayton	73.5	42.1	44.4	20.2	5.2	26.5
Scranton and Wilkes-Barre	30.5	35.9	38.9	13.8[g]	− 3.2	11.0[g]
Birmingham[h]	60.2	40.1	43.6	—	−11.2‡	—

Source: Based on population reports of the United States Bureau of the Census.
† Maximum increase.
‡ Minimum increase or maximum decrease.
[a] The figures for the number of gainful workers in Pittsburgh and in Toledo in 1870 have been adjusted.
[b] Based on Providence and Fall River only. These cities accounted for 40.7 per cent of area population in 1930.
[c] Based on New Haven only. This city accounted for 19.1 per cent of area population in 1930.
[d] Based on San Francisco only. This city accounted for 48.5 per cent of area population in 1930.
[e] Based on Albany and Troy only. These cities accounted for 43.8 per cent of area population in 1930.
[f] Based on Kansas City, Missouri, only. This city accounted for 62.6 per cent of area population in 1930.
[g] Based on Scranton only. This city accounted for 19.0 per cent of area population in 1930.
[h] Not one of the 33 areas.

in number of gainful workers. The probability that a percentage change for a major city is reliable for the entire area varies with the importance of the city in the area. Thus, the increase in the employed proportion of the population in the Minneapolis and Baltimore areas is probably closely approximated by changes in the major city, which in each of these instances accounted for most of the area's population—in 1930, about 90 per cent (Table 9). In the Pittsburgh, Boston, Youngstown, and Allentown areas, however, the changes in relative employment in the major city are probably much less representative of changes in the area, because the major city accounts for less than one-third of the area population.

Change in Population as a Measure of Change in Economic Activity

For the industrial areas to which special attention is given in this study, data on gainful workers are not available except for 1930. The relationship between population and gainful workers is such, however, that change in population may be used to show roughly the change in gainful workers. With respect to population as a measure of economic importance it may be said:

1. That population data furnish the only available basis for estimating trends in the number of gainful workers in industrial areas.
2. That population data understate the growth in gainful employment, particularly between 1870 and 1890. From 1900 to 1930 the two groups of data yield roughly similar percentage gains.
3. That the relationship between total population and the working population may be affected by change in leisure, in unemployment, in school attendance, or in the sex and age distribution of the population.
4. That the total population may serve fairly well as a measure of long-term growth in total economic activity, because it includes all those engaged in non-monetary as well as in monetary pursuits. It is, therefore, not affected by the transfer of activity from the home to the factory.

CHAPTER 2

POPULATION, 1870–1930

The Pittsburgh Industrial Area, embracing Allegheny, Beaver, Washington, and Westmoreland counties, contained in 1930 a population of 2,023,269. The area ranked seventh in that year among the 33 major industrial areas of the country; it was outranked by the New York City, Chicago, Philadelphia, Boston, Los Angeles, and Detroit industrial areas, in the order named. The population of the Los Angeles and Detroit areas exceeded that of the Pittsburgh area by only a relatively small amount—the Los Angeles area by 9.2 per cent and the Detroit area by 3.8 per cent.

This chapter is presented for the purpose of comparing American industrial areas with respect to changes in total population since 1870. Primary emphasis is placed on the comparative position of the Pittsburgh Industrial Area. The population comparisons are given partly because of the general social significance of population changes but mainly because population growth furnishes some indication of growth in total economic activity. As already stated, no directly applicable measure for approximating total economic activity is available; the relationship between changes in population and changes in gainful employment are discussed in the last section of Chapter 1.

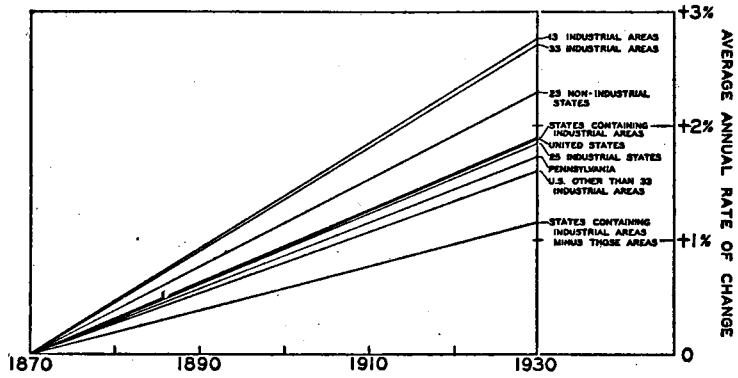
Brief consideration of the average growth of population for the United States, for industrial states, for nonindustrial states, and for the major industrial areas will provide points of reference for the consideration of comparative growth among industrial areas.

Average Annual Rates of Change

From 1870 to 1930 the trend of population of the United States rose at an average rate of 1.89 per cent a year (Table 10 and Chart 5). This is the rate indicated by the semilogarithmic trend line which has been fitted to the decennial census figures; but it is also exactly the same rate as that computed directly from the 1870 and 1930 figures, without consideration of the figures for the intervening census years.

CHART 5

CHANGES IN POPULATION IN THE UNITED STATES, PENNSYLVANIA, GROUPS OF STATES, AND GROUPS OF INDUSTRIAL AREAS, 1870–1930



Industrial and Nonindustrial Parts of the United States

The rate of population growth in 25 industrial or manufacturing states over the same period was only 1.85 per cent, whereas the rate of growth among nonindustrial states was 2.30 per cent.[1] Surprisingly enough, population increased more rapidly in nonmanufacturing states; the growth in manufacturing operations within those states, however, helped to attract population.

For the 33 industrial areas as a group, the rate was 2.71 per cent a year, a rate much higher than that for industrial states and even higher than that for nonindustrial states. For the 13 large industrial areas the rate was only slightly greater than for the 33 areas. The rate for the 33 areas combined also far exceeded the rate of 1.61 per cent for that part of the United States outside the 33 industrial areas. Since this part of the country includes the nonindustrial states and since its rate was considerably less than the rate for the nonindustrial states, the rate of growth in

[1] For purposes of this analysis, an industrial state was defined as one which in 1929 accounted for at least 100,000 wage earners or at least $250,000,000 in value added by manufacture. These minima resulted in 25 states being classified as industrial and 23 as nonindustrial states. The industrial states are listed in Table 10. The classification of the 25 states as industrial does not mean that each was dominated by manufacturing more than by any other form of economic activity but simply that, in 1929, manufacturing operations in each state were more important than such operation in any of the remaining states.

TABLE 10

INDEX NUMBERS OF POPULATION IN THE UNITED STATES, GROUPS OF STATES, GROUPS OF INDUSTRIAL AREAS, AND SELECTED INDUSTRIAL STATES, WITH AVERAGE ANNUAL RATES OF CHANGE, 1870–1930

Area	Population		Indexes of Population (1870 = 100)							Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1870	1930	1870	1880	1890	1900	1910	1920	1930	1870–1930	1870–1930
United States	39,818,449[a]	122,775,046	100.0	126.0	158.1	190.8	231.0	277.7	282.0	1.89%	3.1%
25 Industrial States	32,569,942	98,694,503	100.0	126.8	155.3	187.4	223.6	258.7	303.0	1.85	2.7
23 Nonindustrial States and District of Columbia	5,988,429	24,080,543	100.0	147.9	206.7	250.0	319.6	358.2	402.1	2.30	8.5
33 Census Industrial Areas	9,087,968	44,116,053	100.0	128.9	176.5	230.8	306.7	384.2	485.4	2.71	2.3
United States Excluding 33 Census Industrial Areas	29,470,403	78,658,993	100.0	130.4	159.2	186.7	217.5	240.2	266.9	1.61	4.9
States Containing 33 Census Industrial Areas[b]	24,115,592	74,896,647	100.0	123.7	152.9	184.9	223.9	261.5	310.6	1.90	1.9
States Containing 33 Census Industrial Areas Minus the 33 Census Industrial Areas[c]	14,954,107	30,472,458	100.0	120.4	138.4	156.6	173.1	186.5	203.8	1.16	3.3
13 Large Census Industrial Areas[d]	6,685,603	33,581,258	100.0	129.3	175.6	233.0	309.8	388.8	502.3	2.76	1.9

Source: Based on population reports of the United States Bureau of the Census.

[a] See Table 12.

[b] The states of Kansas and Kentucky are omitted, though they contain parts of the Kansas City area and the Cincinnati area, respectively.

[c] Excluding Kansas and Kentucky and those parts of the Kansas City area and the Cincinnati area in those states.

[d] For list of 13 large industrial areas, see Table 11, note *c*.

TABLE 10 (*Continued*)

Area	Population		Indexes of Population (1870 = 100)							Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1870	1930	1870	1880	1890	1900	1910	1920	1930	1870–1930	1870–1930
Industrial States:[a]											
Washington	23,955	1,563,396	100.0	313.6	1,491.3	2,162.8	4,767.2	5,663.2	6,526.4	7.21	45.1
California	560,247	5,677,251	100.0	154.3	216.6	265.1	424.4	611.7	1,013.4	3.77	5.8
Texas	818,579	5,824,715	100.0	194.4	273.1	372.4	476.0	569.7	711.6	3.12	12.5
Minnesota	439,706	2,563,953	100.0	177.6	298.0	398.3	472.1	542.9	583.1	2.89	16.3
New Jersey	906,096	4,041,334	100.0	124.8	159.5	207.9	280.0	348.3	446.0	2.57	1.5
West Virginia	442,014	1,729,205	100.0	139.9	172.6	216.9	276.3	331.1	391.2	2.27	3.7
Michigan	1,184,059	4,842,325	100.0	138.2	176.8	204.5	237.3	309.8	409.0	2.21	4.4
Rhode Island	217,353	687,497	100.0	127.2	159.0	197.2	249.6	278.1	316.3	1.97	4.1
Connecticut	537,454	1,606,903	100.0	115.9	138.8	169.0	207.4	256.9	299.0	1.91	1.6
Illinois	2,539,891	7,630,654	100.0	121.2	150.6	189.8	222.0	255.3	300.4	1.87	2.9
Massachusetts	1,457,351	4,249,614	100.0	122.4	153.6	192.5	231.0	264.3	291.6	1.86	4.1
New York	4,382,759	12,588,066	100.0	116.0	137.0	165.8	207.9	237.0	287.2	1.80	1.6
Pennsylvania	3,521,951	9,631,350	100.0	121.6	149.3	178.9	217.6	247.6	273.5	1.74	3.2
Wisconsin	1,054,670	2,939,006	100.0	124.7	160.6	196.2	221.3	249.6	278.7	1.72	5.3
North Carolina	1,071,361	3,170,276	100.0	130.6	151.0	176.8	205.9	238.9	295.9	1.71	2.6
Alabama	996,992	2,646,248	100.0	126.6	151.8	183.4	214.4	235.5	265.4	1.63	4.0
Georgia	1,184,109	2,908,506	100.0	130.2	155.2	187.2	220.3	244.6	245.6	1.55	6.2
Ohio	2,665,260	6,646,697	100.0	120.0	137.8	156.0	178.9	216.1	249.4	1.50	1.5
South Carolina	705,606	1,738,765	100.0	141.1	163.1	190.0	214.8	238.6	246.4	1.45	6.8
Missouri	1,721,295	3,629,367	100.0	126.0	155.6	180.5	191.3	197.8	210.8	1.20	7.2
Maryland	780,894	1,631,526	100.0	119.7	133.5	152.1	165.9	185.6	208.9	1.19	18.3
Tennessee	1,258,520	2,616,556	100.0	122.6	140.4	160.6	173.6	185.8	207.9	1.17	3.8
Iowa	1,194,020	2,470,939	100.0	136.1	160.2	186.9	186.3	201.3	206.9	1.12	7.8
Virginia	1,225,163	2,421,851	100.0	123.5	135.2	151.3	168.3	188.5	197.7	1.11	3.1
Indiana	1,680,637	3,238,503	100.0	117.7	130.4	149.7	160.7	174.4	192.7	1.07	2.2

[a] Listed according to rank in average annual percentage rate of change, 1870–1930.

the less industrialized parts of the industrial states must have been comparatively low. Such is the case. The rate for the 25 industrial states minus the industrial areas was 1.37 per cent a year; and the rate for the 16 industrial states that included industrial areas minus the areas was only 1.16 per cent a year. Though complete data are not readily available, the highest rates of growth in population during the period from 1870 to 1930 appear to have occurred in the industrial sections of agricultural or nonindustrial states. The lowest rates of growth characterized the less industrialized sections of major industrial states.

All but one of the various area groups discussed above grew in population from 1870 to 1930 with a great degree of regularity. The exception was the 23 nonindustrial states, for which the average deviation from a constant rate of growth was 8.5 per cent. For the United States the deviation from constant growth averaged only 3.1 per cent. Small average deviations occurred in the 13 large industrial areas and in the states containing the 33 industrial areas.

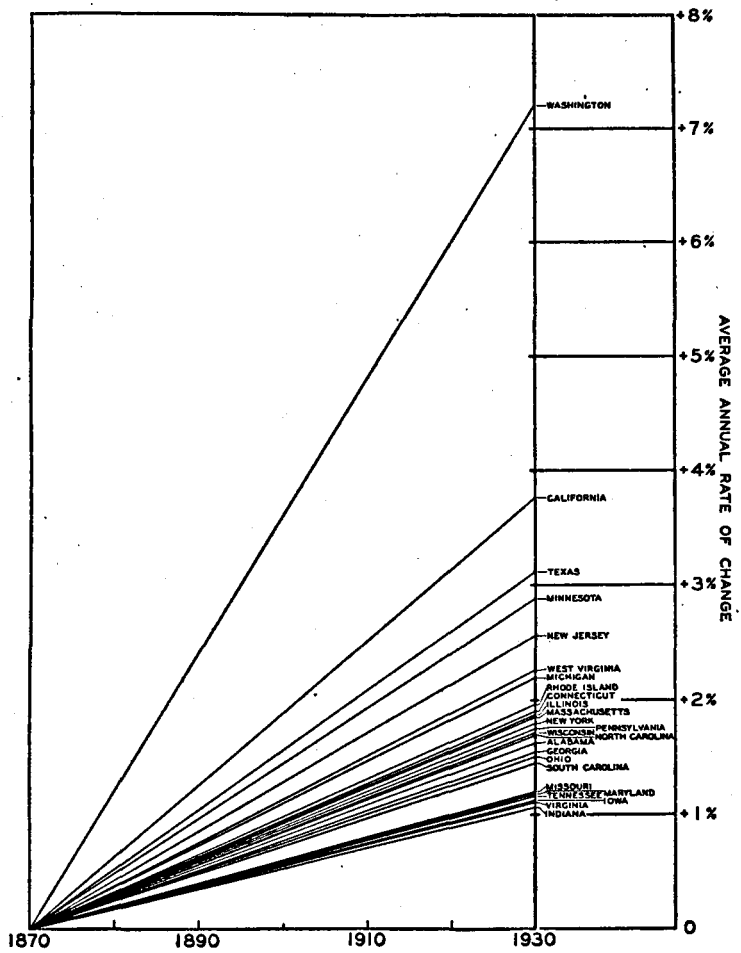
Individual Industrial States

Among the 25 industrial states the average annual increase in population varied from 1.07 per cent in Indiana to 7.21 per cent in Washington (Table 10 and Chart 6). Eighteen of the states, however, were concentrated within a narrow part of this range and grew at rates between 1 per cent and 2 per cent. The growth in Washington was approximately twice as rapid as that in California, the state which reported the second highest rate. The population of Massachusetts averaged a rate of growth approximately the same as that for all industrial states combined. The rate for Pennsylvania was somewhat less.

In Washington the gains in population were very irregular, the average deviation from a constant trend in that state being 45.1 per cent, or more than twice as great as that in any other industrial state. There is no significant tendency among these states for the deviation from trend to vary with the annual rate of gain, even though each is at a maximum in the state of Washington. In Pennsylvania, population growth was relatively regular; the average deviation amounted to only 3.2 per cent for census years 1870 to 1930, inclusive.

CHART 6

CHANGES IN POPULATION IN INDUSTRIAL STATES, 1870–1930



Individual Industrial Areas

Among the 33 industrial areas and the Birmingham district, the average annual rates of gain over the 60-year period varied from 0.94 per cent in the Albany area to 9.24 per cent in the Seattle area (Table 11 and Chart 7). There is a tendency for the rates in these areas to concentrate between slightly less than 2 per cent and

TABLE 11

INDEX NUMBERS OF POPULATION IN THE UNITED STATES, PENNSYLVANIA, AND INDUSTRIAL AREAS, WITH AVERAGE ANNUAL RATES OF CHANGE, 1870–1930

Area	Population		Indexes of Population (1870 = 100)							Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1870	1930	1870	1880	1890	1900	1910	1920	1930	1870–1930	1870–1930
United States	39,818,449[a]	122,775,046	100.0	126.0	158.1	190.9	231.0	265.5	308.3	1.89%	3.1%
Pennsylvania	3,521,951	9,631,350	100.0	121.6	149.3	178.9	217.6	247.6	273.5	1.74	3.2
Total, 33 Industrial Areas	9,087,968	44,116,053	100.0	128.9	176.5	230.8	306.7	384.2	485.4	2.71	2.3
Total, 13 Large Ind. Areas	6,685,603	33,581,258	100.0	129.3	175.6	233.0	309.8	388.8	502.3	2.76	1.9
Industrial Areas:[b]											
Seattle Area	3,529	627,359	100.0	289.9	3,256.7	4,691.6	11,489.1	15,114.8	17,777.2	9.24	67.2
Los Angeles Area[c]	12,394	2,208,492	100.0	218.0	818.6	1,374.0	4,067.5	7,555.7	17,819.0	9.04	13.7
Detroit Area[c]	159,905	2,100,197	100.0	130.1	186.6	246.1	363.4	792.8	1,313.4	4.38	14.1
Akron Area	34,674	344,131	100.0	126.3	156.0	206.8	312.2	825.0	992.5	4.13	19.2
Minneapolis Area	70,963	839,098	100.0	183.6	486.6	592.7	820.6	970.8	1,182.4	4.10	24.5
Chicago Area[c]	482,108	4,675,877	100.0	157.9	288.2	434.1	571.0	730.5	969.9	3.84	12.1
Cleveland Area[c]	162,318	1,310,661	100.0	143.2	215.8	304.3	439.5	637.1	807.5	3.71	3.0
Kansas City Area	80,620	638,476	100.0	145.2	291.2	356.4	501.0	633.2	792.0	3.52	12.2
Toledo Area	46,722	347,709	100.0	144.2	218.9	328.7	412.5	590.1	744.2	3.44	5.2
Milwaukee Area	129,817	878,757	100.0	141.0	221.8	306.1	403.3	515.9	676.9	3.24	6.4
San Francisco Area[c]	195,709	1,306,938	100.0	168.3	219.5	265.1	381.4	495.1	667.8	3.05	5.6
Indianapolis Area	71,939	422,666	100.0	142.9	196.2	274.2	366.5	483.8	587.5	3.04	4.0
Pittsburgh Area[c]	405,554	2,023,269	100.0	130.4	193.8	267.3	362.9	434.0	498.9	2.84	7.3
New York Area[c]	2,007,641	10,160,159	100.0	129.4	172.0	238.1	334.2	402.4	506.1	2.82	3.3
Scranton Area	160,915	755,506	100.0	138.2	213.3	280.2	374.6	420.9	469.5	2.69	10.3

TABLE 11 (*Continued*)

Area	Population		Indexes of Population (1870 = 100)							Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1870	1930	1870	1880	1890	1900	1910	1920	1930	1870–1930	1870–1930
Industrial Areas:[b]—*Continued*											
Springfield Area	79,309	335,496	100.0	132.8	173.0	223.7	291.7	378.7	423.0	2.51	3.6
Dayton Area	64,006	273,481	100.0	122.7	157.6	203.3	255.9	327.4	427.3	2.46	1.2
Buffalo Area[c]	229,136	911,737	100.0	119.6	168.2	222.0	271.0	328.8	397.9	2.40	4.1
Bridgeport Area	216,533	850,151	100.0	124.0	165.9	209.4	269.1	340.0	392.6	2.39	3.0
Hartford Area	109,007	421,097	100.0	115.0	135.0	179.3	229.5	308.3	386.3	2.37	4.3
Youngstown Area	146,935	555,709	100.0	120.6	130.4	157.3	215.5	306.0	378.2	2.30	7.9
Providence Area	252,076	904,606	100.0	133.7	175.2	230.4	294.7	330.9	358.9	2.23	6.8
Rochester Area	117,868	423,881	100.0	122.9	160.8	184.8	240.3	298.7	359.6	2.17	1.9
Boston Area[c]	835,441	2,611,926	100.0	125.3	159.8	201.8	242.4	277.1	312.6	1.96	4.4
St. Louis Area[c]	446,388	1,335,158	100.0	110.7	135.8	174.0	219.4	250.2	299.1	1.95	3.2
Allentown Area	118,228	342,197	100.0	115.3	136.1	163.7	208.5	255.1	289.4	1.88	2.7
Philadelphia Area[c]	1,056,984	3,137,040	100.0	122.4	149.3	179.0	214.6	256.8	296.8	1.84	1.4
Baltimore Area[c]	328,241	929,439	100.0	125.7	153.5	181.5	206.0	246.4	283.2	1.72	2.4
Wheeling Area	145,859	394,761	100.0	123.1	144.3	161.6	204.3	242.2	270.6	1.69	2.5
Worcester Area	192,716	491,242	100.0	117.7	145.7	180.0	207.4	236.2	254.9	1.64	4.0
Cincinnati Area[c]	363,784	870,365	100.0	120.2	143.4	160.6	181.6	196.8	239.3	1.38	2.6
Reading Area	106,701	231,717	100.0	114.9	128.7	149.6	171.7	188.2	217.2	1.30	1.0
Albany Area	253,948	456,755	100.0	115.7	125.6	131.6	151.3	160.9	179.9	0.94	1.9
Birmingham District[d]	12,620	431,493	100.0	188.0	699.9	1,112.7	1,794.6	2,456.8	3,419.1	6.14	29.1

Source: Based on population reports of the United States Bureau of the Census.

[a] See Table 12, note *a*.

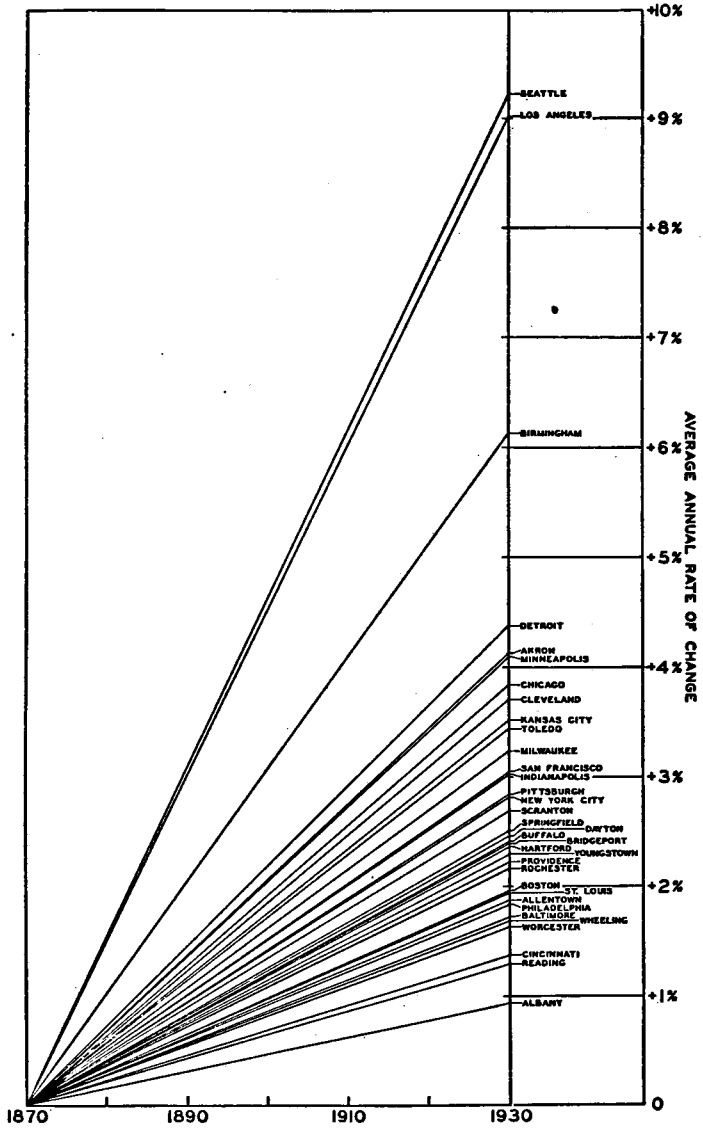
[b] Listed according to rank in annual percentage rate of change, 1870–1930.

[c] These are the 13 large industrial areas.

[d] Not one of the 33 industrial areas.

CHART 7

CHANGES IN POPULATION IN INDUSTRIAL AREAS, 1870–1930



somewhat more than 3 per cent per year. For eight of the areas the rates were less than that for the United States, and in two additional areas the rates were only slightly greater. The average annual rate for Scranton, 2.69 per cent, came the nearest to the rate for the 33 areas; also relatively close were the rates for the New York City and Pittsburgh areas. (If the annual rate be computed simply in terms of the population increase of 1930 over 1870, instead of in terms of trend, the rate for the Pittsburgh area is closest to that for the group.) Of the Pennsylvania areas, only Reading had an average rate lower than that for the state.

In most areas the growth of population was fairly regular (Table 11). For the areas with high rates of gain, however, the variations in census years from a constant rate of growth were much greater than the average. In the Seattle area the average variation was 67.2 per cent—an indication of very irregular growth. Population increases were the most regular in the Reading area. Of Pennsylvania areas, Scranton and Pittsburgh reported comparatively irregular population gains.

Comparative Growth in the United States, Groups of Areas, Pennsylvania, and Pennsylvania Areas

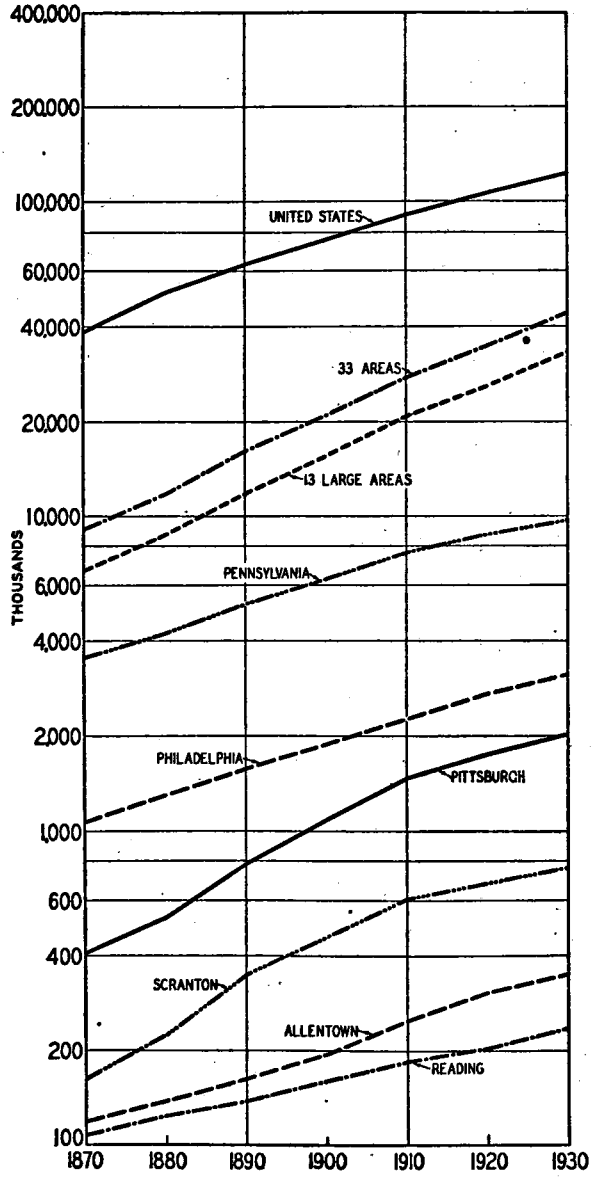
The population of the United States grew from approximately 40 million in 1870 to nearly 123 million in 1930 (Table 12). In six decades 83 million people were added to the population total for the country. An important proportion of this gain was accounted for by the 33 industrial areas, in which population increased by 35 million during the 60-year period, or from 9 million to 44 million. In the 13 large industrial areas (see Table 12) the corresponding increase was from less than 6.7 million to 33.6 million.

The population of Pennsylvania increased by 6 million from 1870 to 1930, or from 3.5 million to 9.6 million. More than half of this increase occurred in the Philadelphia[2] and Pittsburgh areas; 2 million persons were added to the population of the former (a growth from 1.1 million to 3.1 million) and more than one and a half million to the population of the latter (a growth from 0.4 million to 2.0 million). The additions to the populations

[2] For the part included in New Jersey, see Table 4. Between 1870 and 1930 the New Jersey part of the Philadelphia area increased by less than 300,000.

CHART 8

POPULATION OF THE UNITED STATES, THE GROUP OF 33 INDUSTRIAL AREAS, THE GROUP OF 13 LARGE INDUSTRIAL AREAS, PENNSYLVANIA, AND EACH OF THE INDUSTRIAL AREAS LOCATED IN PENNSYLVANIA, 1870–1930



of the other Pennsylvania areas from 1870 to 1930 were: Scranton, 0.6 million; Allentown, 0.2 million; and Reading, 0.2 million.

Relative Growth of 33 Areas Combined

As already indicated, the rate of population growth from 1870 to 1930 was greater in the group of 33 industrial areas than in the country as a whole; the average annual increases were 2.71 per cent and 1.89 per cent, respectively. For every 100 persons in these areas in 1870, there were 485 in 1930; the corresponding 1930 figure for the United States was 308. From 1870 to 1880 the relative population increase was somewhat greater in the group of areas than in the United States, but for each decade since 1880 the percentage gain in the areas was approximately half again as great as that in the country. In other words, the proportion of the national population in these industrial districts rose almost steadily during this 60-year period, increasing from 22.82 per cent in 1870 to 35.93 per cent in 1930 (Table 13). The two curves at the top of Chart 8 tend significantly to converge.

Relative Growth of the 13 Large Areas Combined

The 13 large areas exhibit much the same relative position with respect to the United States as did the 33 areas—failing to grow so rapidly during the 1870's but gaining much more rapidly in each subsequent decade. The share of the national total in the 13 large areas increased from 16.79 per cent in 1870 to 27.35 per cent in 1930. The 13 areas actually grew somewhat faster than the 33 areas throughout most of the period and especially between 1920 and 1930. In 1870, 73.6 per cent of the total population of the larger group of areas were concentrated in the 13 large areas. This percentage rose to 74.4 in 1920 and 76.1 in 1930. The rates of growth for the two groups, however, are approximately equal; the corresponding curves in Chart 8 are practically parallel.

Rate of population growth in each of the industrial areas has tended to be greater than that in the surrounding territory. Moreover, the rate of growth in the 13 large areas has been greater in most decades than the rate of growth in the states in which these areas are located. Important exceptions are the Philadelphia area (partly in New Jersey), in which the rate of growth was less in each decade than the rate of growth in New Jersey, and less from 1880 to 1910 than the rate for Pennsylvania; and the San Fran-

TABLE 12

POPULATION OF THE UNITED STATES, PENNSYLVANIA, AND INDUSTRIAL AREAS, 1870–1930

Area	1870	1880	1890	1900	1910	1920	1930
United States	39,818,449[a]	50,155,783	62,947,714	75,994,575	91,972,266	105,710,620	122,775,046
Pennsylvania	3,521,951	4,282,891	5,258,113	6,302,115	7,665,111	8,720,017	9,631,350
Total, 33 Industrial Areas	9,087,968	11,717,707	16,036,871	20,976,202	27,874,016	34,918,476	44,116,053
Total, 13 Large Ind. Areas	6,685,603	8,644,833	11,737,570	15,575,717	20,709,118	25,991,486	33,581,258
Industrial Areas:[b]							
New York City Area[c]	2,007,641	2,598,074	3,452,329	4,779,318	6,708,582	8,078,095	10,160,159
Chicago Area[c]	482,108	761,433	1,389,662	2,092,883	2,752,820	3,521,789	4,675,877
Philadelphia Area[c]	1,056,984	1,294,251	1,578,022	1,892,128	2,268,209	2,714,271	3,137,040
Detroit Area[c]	159,905	207,981	298,359	393,585	581,167	1,267,695	2,100,197
Boston Area[c]	835,441	1,046,799	1,334,892	1,685,682	2,025,286	2,315,111	2,611,926
Pittsburgh Area[c]	405,554	528,928	786,010	1,083,846	1,471,800	1,759,989	2,023,269
Providence Area	252,076	336,914	441,588	580,712	742,926	834,195	904,606
Cleveland Area[c]	162,318	232,469	350,265	493,977	713,462	1,034,107	1,310,661
St. Louis Area[c]	446,388	494,338	606,183	776,657	979,163	1,117,049	1,335,158
Milwaukee Area	129,817	183,009	287,950	397,368	523,540	669,694	878,757
Bridgeport Area	216,533	268,565	359,139	453,366	582,604	736,150	850,151
Buffalo Area[c]	229,136	274,057	385,472	508,647	621,021	753,393	911,737
Los Angeles Area[c]	12,394	27,025	101,454	170,298	504,131	936,455	2,208,492
Cincinnati Area[c]	363,784	437,376	521,539	584,163	660,727	716,024	870,365
Baltimore Area[c]	328,241	412,649	503,848	595,712	676,334	808,643	929,439

TABLE 12 (*Continued*)

Area	1870	1880	1890	1900	1910	1920	1930
Industrial Areas:[b]—*Continued*							
San Francisco Area[c]	195,709	329,453	429,535	518,821	746,416	968,865	1,306,938
Worcester Area	192,716	226,897	280,787	346,958	399,657	455,135	491,242
Youngstown Area	146,935	177,224	191,613	231,154	316,648	449,563	555,709
Akron Area	34,674	43,788	54,089	71,715	108,253	286,065	344,131
Hartford Area	109,007	125,382	147,180	195,480	250,182	336,027	421,097
Minneapolis Area	70,963	130,294	345,330	420,627	582,326	688,930	839,098
Rochester Area	117,868	144,903	189,586	217,854	283,212	352,034	423,881
Albany Area	253,948	293,756	318,863	334,120	384,177	408,598	456,755
Allentown Area	118,228	136,281	160,851	193,580	246,499	301,607	342,197
Springfield Area	79,309	105,342	137,213	177,403	231,369	300,305	335,496
Toledo Area	46,722	67,377	102,296	153,559	192,728	275,721	347,709
Indianapolis Area	71,939	102,782	141,156	197,227	263,661	348,061	422,666
Kansas City Area	80,620	117,040	234,773	287,323	403,892	510,519	638,476
Seattle Area	3,529	10,229	114,929	165,568	405,450	533,400	627,359
Reading Area	106,701	122,597	137,327	159,615	183,222	200,854	231,717
Wheeling Area	145,859	179,610	210,488	235,758	298,033	353,298	394,761
Dayton Area	64,006	78,550	100,852	130,146	163,763	209,532	273,481
Scranton Area	160,915	222,334	343,291	450,952	602,756	677,302	755,506
Birmingham District[d]	12,620	23,722	88,326	140,420	226,476	310,054	431,493

Source: Totals compiled from population reports of the United States Bureau of the Census.

[a] The revised figure for 1870 is 39,818,449 instead of 38,558,371, the figure originally reported for that year. Subsequently, the census count in several southern states was found to be incomplete.

[b] For full name and definition of the industrial areas, see Table 4.

[c] These are the areas which are selected to form the group of 13 large industrial areas. See text, p. 12, for explanation.

[d] Not one of the 33 industrial areas.

TABLE 13

PERCENTAGE OF THE UNITED STATES POPULATION IN PENNSYLVANIA AND INDUSTRIAL AREAS, 1870–1930

Area	Percentage of the United States Population						
	1870	1880	1890	1900	1910	1920	1930
United States	100.00%[a]	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Pennsylvania	8.85	8.54	8.35	8.29	8.33	8.25	7.84
Total, 33 Industrial Areas	22.82	23.36	25.48	27.60	30.31	33.03	35.93
Total, 13 Large Ind. Areas	16.79	17.24	18.65	20.50	22.52	24.59	27.35
Industrial Areas:[b]							
New York City Area[c]	5.04	5.18	5.48	6.29	7.29	7.64	8.28
Chicago Area[c]	1.21	1.52	2.21	2.75	2.99	3.33	3.81
Philadelphia Area[c]	2.65	2.58	2.51	2.49	2.47	2.57	2.56
Detroit Area[c]	0.40	0.41	0.47	0.52	0.63	1.20	1.71
Boston Area[c]	2.10	2.09	2.12	2.22	2.20	2.19	2.13
Pittsburgh Area[c]	1.02	1.05	1.25	1.43	1.60	1.66	1.65
Providence Area	0.63	0.67	0.70	0.76	0.81	0.79	0.74
Cleveland Area[c]	0.41	0.46	0.56	0.65	0.78	0.98	1.07
St. Louis Area[c]	1.12	0.99	0.96	1.02	1.06	1.06	1.09
Milwaukee Area	0.33	0.36	0.46	0.52	0.57	0.63	0.72
Bridgeport Area	0.54	0.54	0.57	0.60	0.63	0.70	0.69
Buffalo Area[c]	0.58	0.55	0.61	0.67	0.68	0.71	0.74
Los Angeles Area[c]	0.03	0.05	0.16	0.22	0.55	0.89	1.80
Cincinnati Area[c]	0.91	0.87	0.83	0.77	0.72	0.68	0.71
Baltimore Area[c]	0.82	0.82	0.80	0.78	0.74	0.76	0.76
San Francisco Area[c]	0.49	0.66	0.68	0.68	0.81	0.92	1.06
Worcester Area	0.48	0.45	0.45	0.46	0.43	0.43	0.40
Youngstown Area	0.37	0.35	0.30	0.30	0.34	0.43	0.45
Akron Area	0.09	0.09	0.09	0.09	0.12	0.27	0.28
Hartford Area	0.27	0.25	0.23	0.26	0.27	0.32	0.34
Minneapolis Area	0.18	0.26	0.55	0.55	0.63	0.65	0.68
Rochester Area	0.30	0.29	0.30	0.29	0.31	0.33	0.35
Albany Area	0.64	0.59	0.51	0.44	0.42	0.39	0.37
Allentown Area	0.30	0.27	0.26	0.25	0.27	0.29	0.28
Springfield Area	0.20	0.21	0.22	0.23	0.25	0.28	0.27
Toledo Area	0.12	0.13	0.16	0.20	0.21	0.26	0.28
Indianapolis Area	0.18	0.20	0.22	0.26	0.29	0.33	0.34
Kansas City Area	0.20	0.23	0.37	0.38	0.44	0.48	0.52
Seattle Area	0.01	0.02	0.18	0.22	0.44	0.50	0.51
Reading Area	0.27	0.24	0.22	0.21	0.20	0.19	0.19
Wheeling Area	0.37	0.36	0.33	0.31	0.32	0.33	0.32
Dayton Area	0.16	0.16	0.16	0.17	0.18	0.20	0.22
Scranton Area	0.40	0.44	0.55	0.59	0.66	0.64	0.62
Birmingham District[d]	0.03	0.05	0.14	0.18	0.25	0.29	0.35

Source: Based on population reports of the United States Bureau of the Census.
For footnotes, see Table 12.

TABLE 14

PERCENTAGE INCREASE IN POPULATION FOR THE UNITED STATES, PENNSYLVANIA, AND INDUSTRIAL AREAS, 1870–1930

Area	1870 to 1880	1880 to 1890	1890 to 1900	1900 to 1910	1910 to 1920	1920 to 1930	1870 to 1900	1900 to 1930	1870 to 1930
United States	26.0%[a]	25.5%	20.7%	21.0%	14.9%	16.1%	90.9%	61.6%	208.3%
Pennsylvania	21.6	22.8	19.9	21.6	13.8	10.5	78.9	52.8	173.5
Total, 33 Industrial Areas	28.9	36.9	30.8	32.9	25.3	26.3	130.8	110.3	385.4
Total, 13 Large Ind. Areas	29.3	35.8	32.7	33.0	25.5	29.2	133.0	115.6	402.3
Industrial Areas:[b]									
New York City Area[c]	29.4	32.9	38.4	40.4	20.4	25.8	138.1	112.6	406.1
Chicago Area[c]	57.9	82.5	50.6	31.5	27.9	32.8	334.1	123.4	869.9
Philadelphia Area[c]	22.4	21.9	19.9	19.9	19.7	15.6	79.0	65.8	196.8
Detroit Area[c]	30.1	43.5	31.9	47.7	118.1	65.7	146.1	433.6	1,213.4
Boston Area[c]	25.3	27.5	26.3	20.1	14.3	12.8	101.8	54.9	212.6
Pittsburgh Area[c]	30.4	48.6	37.9	35.8	19.6	15.0	167.3	86.7	398.9
Providence Area	33.7	31.1	31.5	27.9	12.3	8.4	130.4	55.8	258.9
Cleveland Area[c]	43.2	50.7	41.0	44.4	44.9	26.7	204.3	165.3	707.5
St. Louis Area[c]	10.7	22.6	28.1	26.1	14.1	19.5	74.0	71.9	199.1
Milwaukee Area	41.0	57.3	38.0	31.8	27.9	31.2	206.1	121.1	576.9
Bridgeport Area	24.0	33.7	26.2	28.5	26.4	15.5	109.4	87.5	292.6
Buffalo Area[c]	19.6	40.7	32.0	22.1	21.3	21.0	122.0	79.2	297.9
Los Angeles Area[c]	118.0	275.4	67.9	196.0	85.8	135.8	1,274.0	1,196.8	17,719.0
Cincinnati Area[c]	20.2	19.2	12.0	13.1	8.4	21.6	60.6	49.0	139.3
Baltimore Area[c]	25.7	22.1	18.2	13.5	19.6	14.9	81.5	56.0	183.1

TABLE 14 (*Continued*)

Area	1870 to 1880	1880 to 1890	1890 to 1900	1900 to 1910	1910 to 1920	1920 to 1930	1870 to 1900	1900 to 1930	1870 to 1930
Industrial Areas:[b]—*Continued*									
San Francisco Area[c]	68.3	30.4	20.8	43.9	29.8	34.9	165.1	151.9	567.8
Worcester Area	17.7	23.8	23.6	15.2	13.9	7.9	80.0	41.6	154.9
Youngstown Area	20.6	8.1	20.6	37.0	42.0	23.6	57.3	140.4	278.2
Akron Area	26.3	23.5	32.6	50.9	164.3	20.3	106.8	379.9	892.5
Hartford Area	15.0	17.4	32.8	28.0	34.3	25.3	79.3	115.4	286.3
Minneapolis Area	83.6	165.0	21.8	38.4	18.3	21.8	492.7	99.5	1,082.4
Rochester Area	22.9	30.8	14.9	30.0	24.3	20.4	84.8	94.6	259.6
Albany Area	15.7	8.5	4.8	15.0	6.4	11.8	31.6	36.7	79.9
Allentown Area	15.3	18.0	20.3	27.3	22.4	13.5	63.7	76.8	189.4
Springfield Area	32.8	30.3	29.3	30.4	29.8	11.7	123.7	89.1	323.0
Toledo Area	44.2	51.8	50.1	25.5	43.1	26.1	228.7	126.4	644.2
Indianapolis Area	42.9	37.3	39.7	33.7	32.0	21.4	174.2	114.3	487.5
Kansas City Area	45.2	100.6	22.4	40.6	26.4	25.1	256.4	122.2	692.0
Seattle Area	189.9	1,023.6	44.1	144.9	31.6	17.6	4,591.6	278.9	17,677.2
Reading Area	14.9	12.0	16.2	14.8	9.6	15.4	49.6	45.2	117.2
Wheeling Area	23.1	17.2	12.0	26.4	18.5	11.7	61.6	67.4	170.6
Dayton Area	22.7	28.4	29.0	25.8	27.9	30.5	103.3	110.1	327.3
Scranton Area	38.2	54.4	31.4	33.7	12.4	11.5	180.2	67.5	369.5
Birmingham District[d]	88.0	272.3	91.6	61.3	36.9	39.2	1,012.7	207.3	3,319.1

Source: Based on population reports of the United States Bureau of the Census.
For footnotes, see Table 12.

cisco area, where the rate of population growth was less than the rate for California in all decades except that between 1920 and 1930.

Relative Growth of Pennsylvania and Pennsylvania Areas

Population growth in Pennsylvania was almost consistently at a lower rate during the 60-year period and was significantly less regular than corresponding growth in the United States. Since 1890 the population of the state has tended to increase at a decreasing rate. During the 60-year period the rate of growth has tended to drop away from the 2 per cent per annum growth line. Pennsylvania's share of the national population fell from 8.85 per cent in 1870 to 7.84 per cent in 1930.

Of the five industrial areas located entirely or mostly in Pennsylvania, the Pittsburgh and Scranton areas grew much more rapidly during the 60-year period than did the state. The Philadelphia and Allentown areas grew at approximately the same rate as did the state, and the Reading area grew less rapidly. The 1930 population of the Pittsburgh Industrial Area represented an average gain of 2.84 per cent per year since 1870. The average annual increase for the Scranton area was 2.69 per cent, for the Allentown area 1.88 per cent, for the Philadelphia area 1.84 per cent, and for the Reading area 1.30 per cent. Down to 1910 both the Pittsburgh and Scranton areas had grown at an average annual rate of about 3.50 per cent, but for each the rate fell materially in the next two decades—so much so that the population trend tended to round off much more noticeably in these two areas than in the other three Pennsylvania areas. Of the five areas, the Pittsburgh area ranked second in percentage gains in the first two decades after 1870, first in the next two decades, and third in the two decades ended with 1930.

As a proportion of the United States population, the Pittsburgh area gained almost consistently, rising from 1.02 per cent in 1870 to 1.65 per cent in 1930. The state percentage of the national total was falling, as the proportion of the state population within the Pittsburgh area rose from 11.5 to 21.0 per cent. In the Philadelphia area, the percentage of the national population fell from 2.65 per cent to 2.56 per cent.

Percentage increases in population in each of the Pennsylvania areas for all intercensal periods since 1870 are contained in Table

14. Here are presented percentage changes for three important periods:

Area	Percentage Increase in Population		
	1870 to 1930	1900 to 1930	1920 to 1930
Pittsburgh	398.9%	86.7%	15.0%
Scranton	369.5	67.5	11.5
Philadelphia	196.8	65.8	15.6
Allentown	189.4	76.8	13.5
Reading	117.2	45.2	15.4

Comparative Growth in Iron and Steel Areas

Eight of the 33 industrial areas are important centers of iron and steel production.[8] Population data for these areas, together with those for the Birmingham district, have been plotted in Chart 9 (from Table 12). These nine areas accounted in 1930 for nearly three-fifths of total national gainful employment in blast furnaces, steelworks, and rolling mills. The Pittsburgh area was by far the most important, contributing 18.6 per cent of the total. Chicago accounted for 12.2 per cent and the Birmingham district for only 2.1 per cent (see Table 15, which presents percentages relating to the importance of the industry in 16 iron and steel areas and districts). Among the nine areas the local importance of this industry in 1930 in terms of gainful employment varied from 3.7 per cent in Chicago and Baltimore to 30.0 per cent in Youngstown. The proportion of the area population working in this industry varied from 1.6 per cent in the Chicago and Baltimore areas to 10.8 per cent in the Youngstown area.

Chicago and Pittsburgh were the largest of these iron and steel areas throughout the 60-year interval. In terms of population the

[8] The Philadelphia Industrial Area contains important representation in the steel industry, but it is not included in this section because that area is not primarily, or even secondarily, a steel area. Nor is the New York City area discussed here, even though it accounts for a large number of gainful workers in the iron and steel industry; because most of these workers are employed in central offices and sales offices and not in manufacturing.

Moreover, it should be noted that most of the nine areas discussed in this section were not so important in the iron and steel industry in 1870 as in 1930. Indeed, in 1870 the industry was nonexistent in the Birmingham district.

TABLE 15

GAINFUL WORKERS IN THE IRON AND STEEL INDUSTRY: SELECTED DATA FOR SPECIFIED INDUSTRIAL AREAS AND DISTRICTS, 1930

Area	Number of Workers Normally Gainfully Employed in the Iron and Steel Industry*	Percentage of the United States Total Accounted for by Each Area or District	Percentage Ratio of Iron and Steel Gainful Workers to Total Population, for Each Area or District	Percentage Ratio of Iron and Steel Gainful Workers to Total Gainful Workers, for Each Area or District
United States	627,053	100.0%	0.5%	1.3%
Pittsburgh Industrial Area	116,690	18.6	5.8	15.4
Chicago Industrial Area	76,468	12.2	1.6	3.7
Youngstown Industrial Area	59,942	9.6	10.8	30.0
Cleveland Industrial Area	31,953	5.1	2.4	5.7
Philadelphia Industrial Area	24,300	3.9	0.8	1.8
Wheeling Industrial Area	24,011	3.8	6.1	16.5
New York City Industrial Area	17,141	2.7	0.2	0.4
Buffalo Industrial Area	15,507	2.5	1.7	4.2
Baltimore Industrial Area	15,054	2.4	1.6	3.7
Allentown Industrial Area	13,197	2.1	3.9	9.8
Birmingham District[a]	12,950	2.1	3.0	7.5
Johnstown District[b]	12,754	2.0	6.3	19.5
Canton District[c]	12,746	2.0	5.7	15.0
St. Louis Industrial Area	10,055	1.6	0.8	1.7
Detroit Industrial Area	7,928	1.3	0.4	0.9
Worcester Industrial Area	7,210	1.1	1.5	3.5
Remainder of the United States	169,147	27.0	0.1	—

Source: Based on population reports and special tabulations of the United States Bureau of the Census.

* The census volumes on population state that these data relate to "blast furnaces and steel rolling mills." The data, however, apparently cover other industries: structural and ornamental iron, wrought pipe, tin cans, and wire. See W. S. Woytinsky, *The Labor Supply in the United States* (1936), p. 22. Moreover, gainful workers include employes in distribution and management as well as in direct production. Consequently, for most areas the number of gainful workers is much larger than the number of wage earners shown in Table 24. The relative difference is great for the New York City, Philadelphia, and Worcester areas. On the other hand, an under-enumeration of gainful workers in the iron and steel industry appears to have occurred in the Buffalo, Milwaukee, and St. Louis areas and in the Canton and Harrisburg districts.

[a] Jefferson County, Alabama.

[b] Cambria County, Pennsylvania.

[c] Stark County, Ohio.

Cleveland area was much smaller in 1870 than either the Baltimore area or the Buffalo area. Between 1900 and 1910 the Cleveland area passed these areas and since then has ranked third in population among iron and steel areas. The Wheeling and Allentown areas were smaller in 1930 than the Pittsburgh area was in 1870.

Decade percentage gains are given in Table 14. Comparative changes for the nine areas for three significant periods follow:

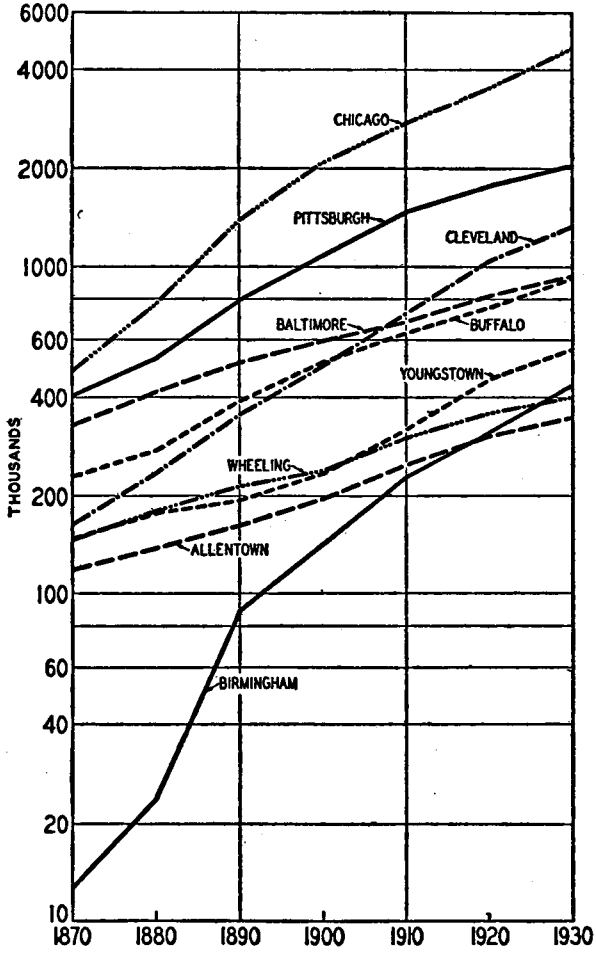
Area	Percentage Increase in Population		
	1870 to 1930	1900 to 1930	1920 to 1930
Birmingham	3,319.1%	207.3%	39.2%
Chicago	869.9	123.4	32.8
Cleveland	707.5	165.3	26.7
Pittsburgh	398.9	86.7	15.0
Buffalo	297.9	79.2	21.0
Youngstown	278.2	140.4	23.6
Allentown	189.4	76.8	13.5
Baltimore	183.1	56.0	14.9
Wheeling	170.6	67.4	11.7

Of these nine areas, Birmingham has grown by far the most rapidly; during the period of mushroom growth between 1880 and 1890, average gains were at the rate of 14 per cent per year, and the average annual rate of increase over the full 60-year period approximated 6 per cent. Average annual rates of population growth in the Chicago and Cleveland industrial areas have not been very far apart, the respective rates being 3.84 per cent and 3.71 per cent. For the Pittsburgh area the 1930 population figure represents an average annual gain over the period of 2.84 per cent. These three areas were in much later stages of development than the Birmingham district. The population growth curves suggest that by 1930 the Chicago and Cleveland districts were approaching industrial maturity and that the Pittsburgh area was even nearer that stage. In comparisons of relative growth in different areas, therefore, variations in the stage of industrial development must be taken into consideration. There is a tendency toward inverse relationship between relative population gains and the industrial age of the area. This statement, however, applies less to the areas discussed below. Two older industrial areas—newer, however, in the production of iron and steel than Pitts-

burgh—the Buffalo and Youngstown areas, grew during this 60-year period at average annual rates of 2.40 per cent and 2.30 per cent, respectively. Although less than the Pittsburgh rate, these

CHART 9

POPULATION OF IRON AND STEEL INDUSTRIAL AREAS, 1870–1930



rates were still significantly greater than that for the country. Three of the iron and steel areas grew less rapidly than did the United States. These were the Allentown, Baltimore, and Wheel-

ing areas. Rates of growth in these three areas were similar, averaging about 1.75 per cent per year.

Birmingham, Chicago, and Cleveland ranked as the most rapidly growing iron and steel areas for the entire period, for the last half of the 60-year period, and for the last decade of the period. The Pittsburgh area, which ranked fourth in relative gain for the whole period, was outranked in relative gain during the latter half of the period by the Youngstown area and during the last decade by all the other iron and steel areas except the Allentown and Wheeling areas.

Another significant way of comparing the population gains of these iron and steel areas is to express their population in each year as a fraction of that of the United States and to determine the extent to which each area has come to have a greater share of the national total (Table 13). Although the Birmingham district grew at a far greater rate than any other iron and steel area, it was relatively so small in 1870—only 0.03 per cent of the national total—that even after the great percentage gains, the district in 1930 included only 0.35 per cent of the United States total; whereas the Chicago area, which ranked next in relative growth during the period, included 1.21 per cent of the national total in 1870 and 3.81 per cent in 1930 (Chart 10). The Pittsburgh Industrial Area included 1.02 per cent of the national total in 1870 and 1.65 per cent in 1930; most of this gain, however, was made between 1880 and 1910. The Cleveland area acquired a somewhat greater share of the national population during this 60-year period, rising in percentage importance from 0.41 to 1.07. The Buffalo and Youngstown areas also gained somewhat in national importance, whereas the other three areas—Baltimore, Allentown, and Wheeling—lost slightly.[4]

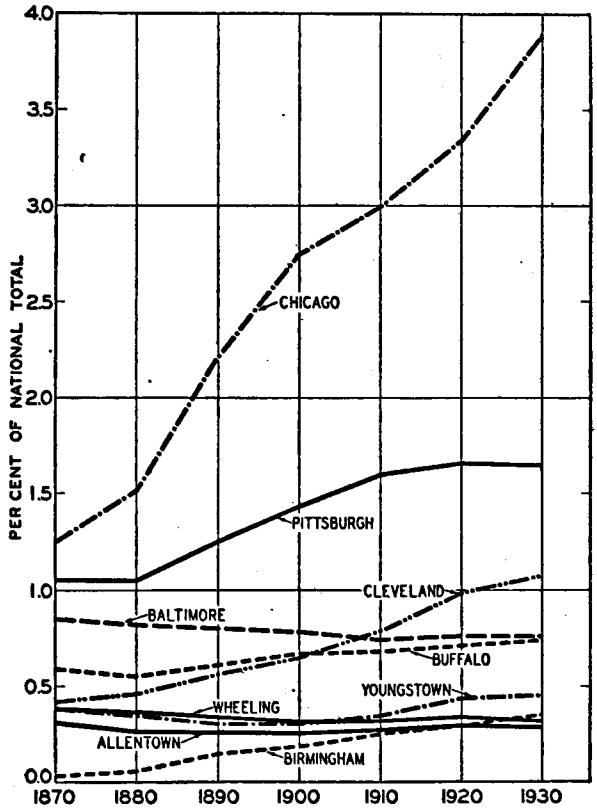
It is true, of course, that not all the increase in population in steel-producing districts resulted from activity in that industry. In most of these regions, however, growth in the iron and steel industry was much more rapid than growth in population, since, with the exception of the Birmingham district, the iron and steel

[4] If the percentages plotted in Chart 3 had been based upon the total for all industrial areas, the curves would rise less or fall more, because the all-areas total was growing more rapidly than the national total. From some points of view this would be a significant way of expressing the relative change in the population of an area; the populations of the total and of the individual items would be more or less industrially homogeneous.

industry was introduced and developed after the areas had already achieved importance in other forms of industrial activity. The annual increase in the production of pig iron in the Chicago area, for example, averaged about 12 per cent from 1869 to 1929 in

CHART 10

PERCENTAGE OF THE NATIONAL POPULATION IN IRON AND STEEL INDUSTRIAL AREAS, 1870–1930



comparison with an average annual increase in population of only 3.84 per cent; in both instances the rates of gain fell materially about 1890. In the Birmingham district the average annual gains over the same period were 11 per cent for pig iron production and 6.14 per cent for population. In Pittsburgh the trend in pig iron

production rose by an average annual increase of 16 per cent from 1872 to 1890, by about 8 per cent from 1890 to 1910, and by somewhat less than 0.5 per cent from 1910 to 1930.[5] It may be noted that during the 40-year period ended with 1910, population grew by about 3.5 per cent per annum, and from 1910 to 1930 by about 2 per cent. The bend in the population curve for the Pittsburgh area at about 1910 roughly coincides with a similar bend in the curve for pig iron production as well as with the bend in the curve for total industrial production.[6]

Patterns of Percentage Gains in Subperiods

There has been a tendency for each area to maintain approximately the same rank in relative population gains for decades since 1870. Notably, Los Angeles, Seattle, and Birmingham have usually ranked at or near the top, and Albany, Reading, and Cincinnati have placed at or not far from the bottom of the list. A comparison of the percentage increases in the two halves of the 60-year period yields an important relationship. The coefficient of rank correlation is 0.66 (perfect correspondence being 1.00). On the average, the relative gain in the population of an area between 1900 and 1930 was significantly related to the relative gain between 1870 and 1900. The widest variations were for Youngstown, Akron, Hartford, and Detroit, all of which ranked much higher in gains during the second 30-year period, and for Scranton, Providence, and Minneapolis, all of which ranked higher in the first 30-year period. Of the four areas which ranked higher in the second 30-year period, three were areas whose rates of growth were sharply raised by the great expansion in the automobile industry. The Pittsburgh area ranks twelfth in relative gain from

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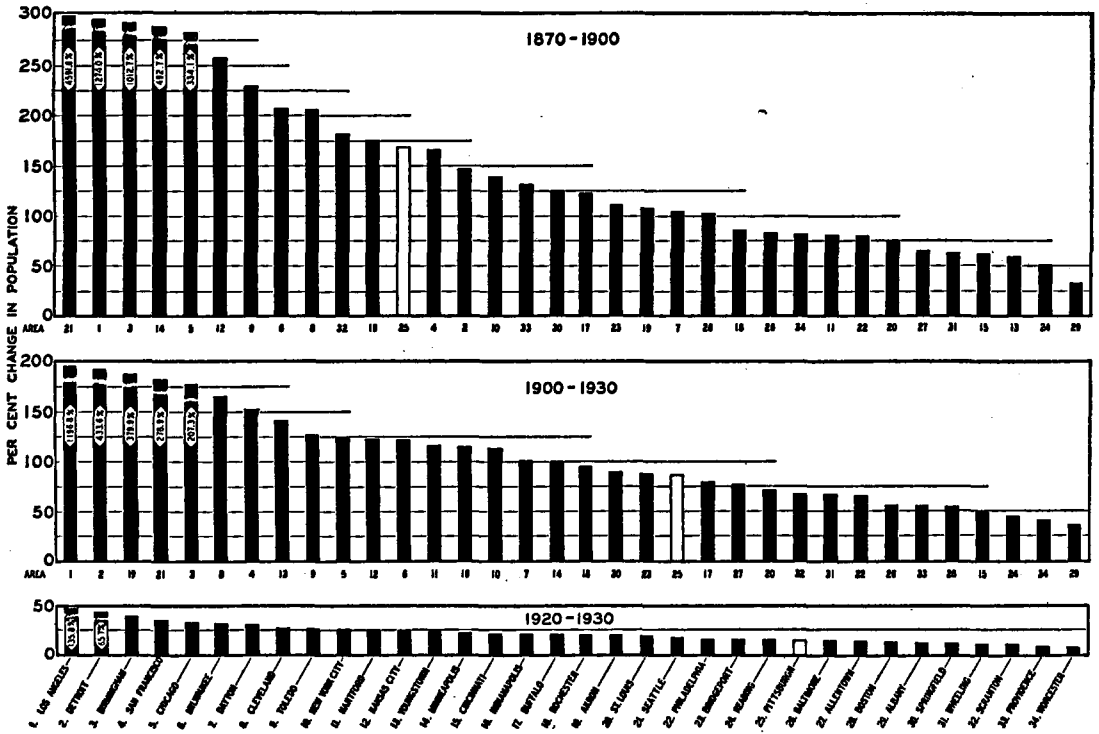
[5] Data presented by Wilbert G. Fritz, in "Long-Time Trend of Production in the Pittsburgh District," *Pittsburgh Business Review*, November, 1934, p. 20, indicate that the average annual rise in the trend of total industrial production in the Pittsburgh district was about 10.5 per cent from 1884 to 1900; about 5.5 per cent from 1900 to 1913; and about 1 per cent since. For production figures for pig iron by districts, see Vanderblue and Crum, *The Iron Industry in Prosperity and Depression.*

[6] It is perhaps significant to note that in terms of relative increase in population three of the areas made a better record during the second 30-year period than during the first. These are the Youngstown, Wheeling, and Allentown areas. It was also during the period since 1900 that the steel industry developed rapidly in these areas, more rapidly in fact than in the United States as a whole. In the Wheeling area the rapid growth both in steel production and in population occurred between 1900 and 1910.

CHART 11

PERCENTAGE CHANGES IN POPULATION IN INDUSTRIAL AREAS FOR THE PERIODS 1870–1900, 1900–1930, AND 1920–1930



1870 to 1900, twenty-second from 1900 to 1930, and twenty-fourth from 1910 to 1920.

The pattern of percentage gains was much the same for the two 30-year periods and also for the decade between 1920 and 1930. There appears, however, to be some tendency in the last decade for the relative gains to become equalized. (Compare the heights of the bars in Chart 11.)

Areas with High Rates of Growth

Five of the industrial areas stand out as having grown in population at remarkably high rates from 1870 to 1930. These areas include two of the largest industrial areas in the country, Los Angeles and Detroit; two middle-sized areas, Minneapolis and Seattle; and one smaller area, Akron. Population curves for these areas, together with that for the Pittsburgh area, are plotted in Chart 12. Also relatively great was the growth in the Birmingham district, the curve for which is included in Chart 9.

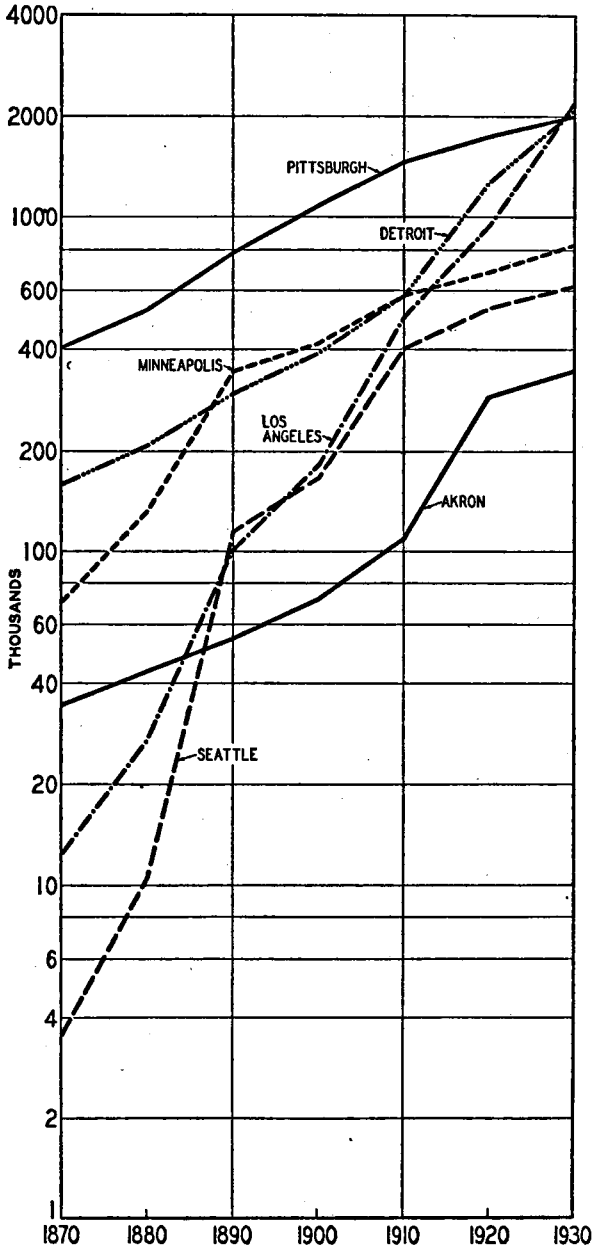
Growth was the most rapid in the Los Angeles and Seattle areas; in each, the 1930 population was approximately 178 times as great as the 1870 population. This increase represents an average annual gain of about 9 per cent. The high rates of increase in these two areas are extraordinary, but it should be noted that in 1870 they were relatively undeveloped frontier districts. The unusual fact about the Los Angeles area is not so much the rapid increase during the early period from 1870 to 1900 but the fact that substantially the same rate of growth held during the next 30 years and that the population curve did not begin to bend downward as did the Seattle curve after 1910 and the Minneapolis curve after 1890. No other industrial area even approximated the growth of the Los Angeles area from 1900 to 1930, when the population in that district rose to 12 times the total in 1900. Either the Los Angeles area has grown from infancy to a stage approaching maturity in much less time than has been customary among industrial areas in the past, or the area is still a long way from maturity; the former supposition is probably more valid.

In 1930, total population in the Birmingham district was 34 times that in 1870; in the Detroit area, 13 times; in the Minneapolis area, 12 times; in the Akron, Chicago, and Cleveland areas, 8 to 10 times. (The latter two areas are not included in Chart 12 but are given in Chart 10.) The relative gain in the Pittsburgh

CHART 12

POPULATION OF INDUSTRIAL AREAS WITH HIGH RATES OF GROWTH, 1870–1930

(The Pittsburgh area is included for comparison)



area was less than one-half that in either the Akron area or the Chicago area. During the decade 1920–1930 the relative growth of the Los Angeles area was more than double that of the Detroit area.

The explanations for the rapid growth of the areas in this group are varied. In Detroit and Akron the remarkable increases came mainly as a result of the development of new industries and the increasing consumer demand for the products of the new industries—the automobile industry in Detroit and the related tire industry in Akron. Population growth in the Cleveland area has likewise been related to expansion in the automobile industry. Growth in the Los Angeles area is somewhat more difficult to explain. An important factor has been the general population movement, particularly of older persons, to southern California because of climatic conditions. (Evidence of the unusual proportion of older persons is contained in the age distribution of the population and in the percentage of gainfully employed persons.) Probably of equal importance was the development of two new and rapidly growing industries, motion pictures and petroleum refining. Moreover, since 1920 the expansion in the automobile tire industry has been of significance. Rapid growth in Birmingham (Chart 9) can be explained by the industrial expansion which occurred after the discovery of almost ideal conditions for the assembling of raw materials for the iron and steel industry. The most rapid growth in the Minneapolis area occurred between 1870 and 1890, the period in which settlement of the Northwest was progressing rapidly.

Only three of the 33 areas—Detroit, Akron, and Youngstown—have population curves which have tended to rise at increasing rates. For these areas the upward swing appears after 1900. The explanation probably lies in the rapidly growing importance of the motor vehicle industry and of the accompanying demand for automobile tires and automobile sheets.

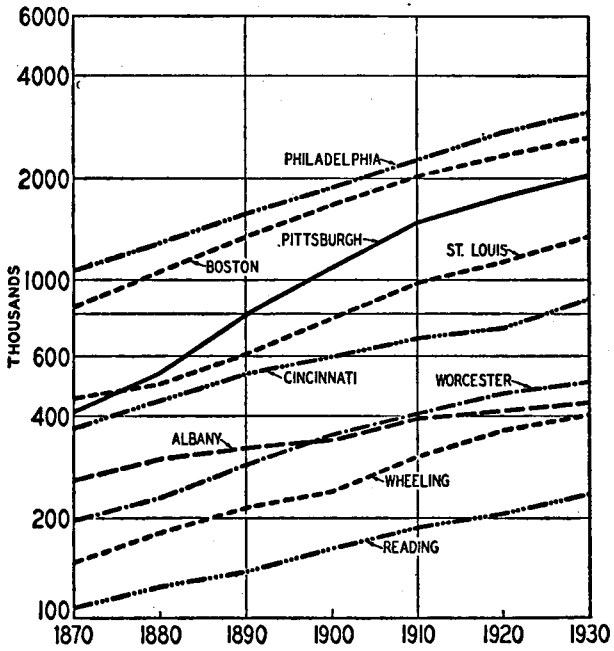
Areas with Low Rates of Growth

The five areas that grew the least rapidly in population during the full 60-year period are the Albany, Reading, Cincinnati, Worcester, and Wheeling areas. Four are relatively small areas; Cincinnati is medium-sized. Four larger areas grew at only slightly greater rates. These are the Baltimore, Philadelphia, St. Louis,

and Boston areas. (The Allentown area also belongs in the group having low rates, ranking between Baltimore and Philadelphia in percentage increase over the 60-year period.) Chart 13 shows clearly that the Pittsburgh area does not belong in the group of slowly growing areas. The rates of population growth for these areas range from 1 per cent per annum in the Albany area

CHART 13

POPULATION OF INDUSTRIAL AREAS WITH LOW RATES OF GROWTH, 1870–1930
(The Pittsburgh area is included for comparison)



to slightly less than 2 per cent in the Boston area. All the areas in this group except Boston and St. Louis lost in national importance during this period.

These areas of slow growth, it should be noted, are old population centers. They may be divided into a group of relatively small-sized areas and a group of relatively large-sized areas. Among the latter are three very old industrial regions, if not actually the oldest in the country—Philadelphia, Boston, and Balti-

more—and also the first important manufacturing district west of the Alleghenies—Cincinnati. They are either areas in which no new important industries developed during the 60-year period or areas in which the growth of such new industries was insufficient to offset the losses or lack of growth in long-established industries. An example of the second situation is the Albany area. There, population growth was slowing down by 1900. During the nineties this area grew at only about 0.3 per cent per year. But at that time the electrical manufacturing industry began to develop in Schenectady, which is included in the Albany area. This industry was more than sufficient to offset the declining importance of the textile and iron and steel industries in that area but not sufficient to lift Albany from the position of the industrial area of slowest growth in the country—with regard to both population and manufacturing employment.

Areas with Medium Rates of Growth

The industrial areas which grew in population at medium rates of growth include the New York City and Pittsburgh areas; three medium-sized areas—those centering in Buffalo, Scranton, and Bridgeport (it was not practicable to plot the curve for the Bridgeport area in Chart 14 because it lay too close to the Buffalo and Scranton curves); and three small areas—the Hartford, Springfield, and Dayton areas. Population in these areas in 1930 was from a little less than four to about five times that in 1870, the increases in the 60 years ranging from 286.3 per cent in the Hartford area to 406.1 per cent in the New York City area. These eight areas may be termed average as far as population gains are concerned. The San Francisco area also is plotted in Chart 14—though it ranks considerably above the group in percentage gain (567.8 per cent)—since it falls among those areas which grew at medium rates in number of manufacturing wage earners (Chart 3).

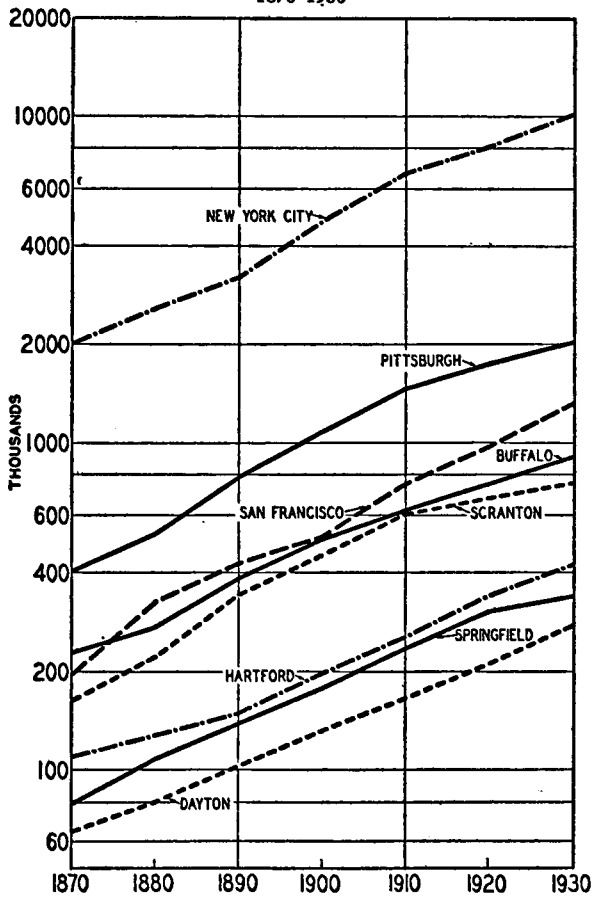
Population in the eight areas in this group increased at average yearly rates ranging between 2.3 and 2.8 per cent. These rates compare with average annual gains among areas with low rates of growth of from 1 per cent to nearly 2 per cent and with rates among rapidly growing areas—if Cleveland and Chicago are included—of from 3.7 to somewhat more than 9 per cent.

The Position of the Pittsburgh Area

On the basis of the average annual rate of growth, the Pittsburgh Industrial Area may be termed the average area during the

CHART 14

Population of Industrial Areas with Medium Rates of Growth, 1870–1930



60-year period, because the percentage increase in the area (398.9 per cent) lay closest to that for the 33 areas as a whole (385.4 per cent). During the first 30 years, however, the Pittsburgh area

gained more rapidly than the group of 33 areas and during the second half of the period less rapidly; thus, between 1900 and 1930 the population in the Pittsburgh area increased 86.7 per cent in comparison with a gain of 110.3 for all areas. With respect to population growth the Pittsburgh area and the New York City area exhibit many similarities. For the entire period each grew at an average annual rate of 2.8 per cent. Furthermore, each area made its most rapid gains before 1910 (Chart 14). The New York City area, however, grew more rapidly than the Pittsburgh area after that year. Moreover, population growth in the New York City area has been somewhat more regular than that in the Pittsburgh area.

Changes in Rank in Population among the 33 Areas

The New York City area ranked first in population throughout the period from 1870 to 1930. This was the only area which did not change rank (Table 16). The Philadelphia and Boston areas each changed position only once: the Philadelphia area in 1900, when it dropped from second to third place, losing second place to Chicago; and the Boston area in 1890, when it was exceeded in population by Chicago and dropped from third to fourth place.

Moreover, the rank of the Pittsburgh area was comparatively constant. The area ranked sixth in 1870, below the New York City, Philadelphia, Boston, Chicago, and St. Louis industrial areas, which ranked in the order named. After exceeding the St. Louis area in population, the Pittsburgh area ranked fifth in 1880. It maintained this rank until 1930, when it ranked seventh, having dropped below the Los Angeles and Detroit areas.

The greatest gain in comparative position was made by the Los Angeles area, which rose from thirty-second place in population in 1870 and 1880 to thirty-first in 1890, to twenty-eighth in 1900, to eighteenth in 1910, to tenth in 1920, and to fifth in 1930. It will be noted that the change in the rank of this area was affected less by the unusually high relative gains during the first 30 years of the period than by the continuance of these gains during the latter half of the period. The next greatest change in rank occurred in the Seattle area, which rose from thirty-third position to twentieth. Other great increases in rank occurred in the following areas: Detroit, from seventeenth to sixth; Minneapolis, from twenty-eighth to seventeenth; Milwaukee, from twentieth to fourteenth;

TABLE 16

THE 33 INDUSTRIAL AREAS RANKED ACCORDING TO POPULATION, 1870–1930

Industrial Area[a]	Rank by Population						
	1870	1880	1890	1900	1910	1920	1930
New York City Area	1	1	1	1	1	1	1
Chicago Area	4	4	3	2	2	2	2
Philadelphia Area	2	2	2	3	3	3	3
Boston Area	3	3	4	4	4	4	4
Los Angeles Area	32	32	31	28	18	10	5
Detroit Area	17	17	17	17	16	6	6
Pittsburgh Area	6	5	5	5	5	5	7
St. Louis Area	5	6	6	6	6	7	8
Cleveland Area	15	14	13	12	9	8	9
San Francisco Area	13	10	10	10	7	9	10
Baltimore Area	8	8	8	7	10	12	11
Buffalo Area	11	12	11	11	12	13	12
Providence Area	10	9	9	9	8	11	13
Milwaukee Area	20	18	18	16	17	18	14
Cincinnati Area	7	7	7	8	11	15	15
Bridgeport Area	12	13	12	13	14	14	16
Minneapolis Area	28	23	14	15	15	16	17
Scranton Area	16	16	15	14	13	17	18
Kansas City Area	25	26	20	20	20	20	19
Seattle Area	33	33	29	29	19	19	20
Youngstown Area	18	20	22	22	23	22	21
Worcester Area	14	15	19	18	21	21	22
Albany Area	9	11	16	19	22	23	23
Rochester Area	22	21	23	23	25	25	24
Indianapolis Area	27	28	26	24	26	26	25
Hartford Area	23	24	25	25	27	27	26
Wheeling Area	19	19	21	21	24	24	27
Toledo Area	30	30	30	31	30	31	28
Akron Area	31	31	33	33	33	30	29
Allentown Area	21	22	24	26	28	28	30
Springfield Area	26	27	28	27	29	29	31
Dayton Area	29	29	32	32	32	32	32
Reading Area	24	25	27	30	31	33	33

Source: Based on population reports of the United States Bureau of the Census.

[a] The industrial areas are listed in order of rank for 1930. For full name and definition of areas, see Table 4.

and Cleveland, from fifteenth to ninth (the Cleveland area ranked eighth in 1920).

The Albany area declined most in comparative position; it ranked ninth in population among the 33 areas in 1870 and twenty-third

in 1930. The Reading area dropped from twenty-fourth place to thirty-third; the Allentown area, from twenty-first to thirtieth; the Cincinnati area, from seventh to fifteenth; the Worcester area, from fourteenth to twenty-second; and the Wheeling area, from nineteenth to twenty-seventh.

SUMMARY WITH RESPECT TO THE PITTSBURGH INDUSTRIAL AREA

1. The most rapid relative growth of population in the Pittsburgh Industrial Area occurred between 1880 and 1890, but the rate of growth in the area did not begin to fall materially until after 1910. Since that year the population increase in the area has averaged about 1.5 per cent per year, approximately the same rate as that for the United States.

2. Until 1910 the Pittsburgh area was developing rapidly; since then it has exhibited many of the characteristics of a mature, slowly growing area. During the years from 1870 to 1930 the Pittsburgh area was in much the same stage of development that the Philadelphia area had been in during the 60 years leading up to 1870. Many areas, on the other hand, are now in about the same stage of development that the Pittsburgh area was in about 1900 or 1910, i.e., just beginning to reach maturity. There would be far more similarity between the population curves of the areas if it were possible to compare them for the same stages of development rather than for the same period of time.

3. The relative increase in population in the Pittsburgh area over this 60-year period is almost exactly the same as that for the total of the 33 industrial areas included in the study. In a sense, then, the Pittsburgh area may be termed the average American industrial area, but only from the standpoint of average growth over this span of years. During the first half of the period the area was growing more rapidly than the 33 areas; during the latter half of the period, less rapidly.

4. Among the Pennsylvania industrial areas, the Pittsburgh area increased most rapidly in population over the period from 1870 to 1930, but since 1910 the rate of growth has been slightly less in the Pittsburgh area than in the Philadelphia and Reading areas. The comparatively faster growth in the Pittsburgh area is probably related to the fact that it is the youngest industrial area in Pennsylvania. The 40 years prior to 1910 represented the period of rapid development of the iron and steel industry in that area.

5. Among the iron and steel areas the rate of population growth in the Pittsburgh area is exceeded by that in the Birmingham, Chicago, and Cleveland areas. These areas are the newer centers of iron and steel production; moreover, they have developed since Pittsburgh attained first rank in the industry. Relative growth in the Pittsburgh area exceeds that in the Youngstown area, an area of approximately the same industrial age.

6. Comparisons of the Pittsburgh area with areas growing at different rates during the 60-year period indicate that this area is properly classified among those areas which have grown at moderate rates. There is little similarity between the population curve for Pittsburgh and those for the rapidly growing areas or, except for the last 20 years, those for the slowly growing areas.

7. Changes in the population rank of the Pittsburgh area among American industrial areas have been related to a number of factors; among these may be mentioned the age of the area, the stage of industrial development in the area, the westward movement of population, the rapid development of the iron and steel industry in the Middle West after 1900, the concentration of important new industries in one or two areas, and the changes in the markets for iron and steel. The drop in the rank of the Pittsburgh Industrial Area from fifth in population in 1920 to seventh in 1930 is related closely to the development of the automobile industry in the Detroit area and of the motion-picture, petroleum, and "climate" industries in the Los Angeles area. These are the two areas which passed the Pittsburgh area in population during that decade. The falling rate of population growth in the Pittsburgh Industrial Area is related to all the factors listed above and perhaps particularly to the development of heavy industry centers in the Midwest. The center of population and also the center of consumption were moving westward during this entire period.

CHAPTER 3

MANUFACTURING WAGE EARNERS, 1869–1935

The Pittsburgh Industrial Area had an average of 227,221 wage earners employed in manufacturing in 1929, 143,421 in 1933, and 179,320 in 1935. Among the 33 industrial areas in the country, the Pittsburgh area ranked sixth in each of these three years, being preceded by the New York City, Chicago, Philadelphia, Boston, and Detroit areas. These six areas have maintained this order in rank in all the biennial census years in the postwar period, except that the Detroit area outranked the Boston area in 1925 and in 1929 and the Boston and Philadelphia areas in 1935. Although the relative decrease in manufacturing employment in the Pittsburgh area from 1929 to 1933 was more severe than that in any of the first five areas except Chicago, the drop was not severe enough to cause the area to fall to seventh place below the Providence area. The Pittsburgh area reported an average employment of some 42,000 more manufacturing wage earners in 1929 than did the Providence area; but in 1933, only about 7,000 more. In 1935 Pittsburgh was again far ahead of Providence, with a margin of about 37,000 wage earners.

This chapter is presented for the purpose of comparing American industrial areas with respect to changes in manufacturing employment since 1869. Special emphasis is placed on the comparative position of the Pittsburgh Industrial Area. The average number of wage earners in manufacturing furnishes a fairly satisfactory measure of importance in manufacturing, especially up to 1919. After that year, for the country as a whole, the rapid mechanization of industry and other efficiency methods led to a decrease in manufacturing employment at the same time that quantity output was rising; and, although the increase of productivity cannot be so well measured for the respective industrial areas, most of them reflected declining manufacturing employment in spite of rises in production. On the other hand, in 1931 and 1933 the number of manufacturing wage earners on payrolls was in many areas unusually high relative to output, owing to the sharing of work.

One great advantage of the use of the number of wage earners as a measure of industrial size is that it is not affected by changes in the price level as are the value measures of industrial activity. If the average working day remained approximately constant and if there were little change in productivity, comparisons among areas and for different periods would yield practically the same results whether the measure were number of wage earners, quantity of output, or value added by manufacture adjusted for price changes.

In some industries, mechanization processes have displaced much hand labor; on the other hand, the average length of the working day has been decreasing for many years, especially since 1914. Reduction of hours in the normal working day has prevented the displacement of workers from being as extensive as it otherwise would have been under conditions of increasing productivity.[1] Even so, in manufacturing there appears to have been a declining tendency in the number of wage earners since 1919. Yet it can hardly be supposed that all industrial areas were affected alike with respect to net displacement by mechanization and other efficiency methods. Nor can it be supposed that such displacement was countered in equal degree in the several areas by rising trends in the service occupations. Nevertheless, manufacturing is in itself of enormous importance and it is everywhere accompanied by extensive employment in the numerous service occupations. Much light, therefore, can be thrown on comparative industrial trends by a study of comparative trends in manufacturing employment.

General Trends in Manufacturing Employment, 1899–1931

Trends in manufacturing employment have been determined for the period 1899 through 1931.[2] They have been extended, however, through 1935 (see Chart 15). For the United States the trend in manufacturing employment rose rapidly after 1899; and by about 1905 the rate at which the trend was rising had reached the maximum. From 1905 to around 1910 the increase in normal

[1] On the other hand, the reduction of hours has led rather generally to increased efficiency and probably in some instances to increased output per working day.

[2] From 1899 up to about 1920 the trends were fitted by inspection and are of the "S" type, known mathematically as ogive curves; after 1921 they are all linear, i.e., straight lines, with constant annual absolute losses or gains.

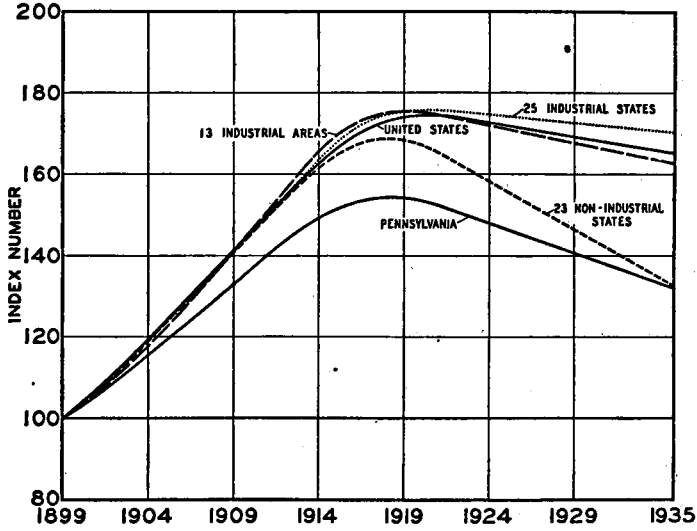
numbers employed was approximately constant. After 1910 the gains were progressively smaller, and in 1920 the peak in the trend was reached.

Trends in Industrial and Nonindustrial States

The trends for the group of 25 industrial states,[8] for the remaining 23 less industrialized states, for Pennsylvania, and for

CHART 15

TRENDS IN AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN THE UNITED STATES, GROUPS OF STATES, PENNSYLVANIA, AND THE GROUP OF 13 LARGE INDUSTRIAL AREAS, 1899–1931



the group of 13 areas are similar to that for the United States. In Pennsylvania and in the nonindustrial states the high point in the trend came in 1918; in the group of 13 industrial areas it came in 1919; and in the 25 industrial states it came in 1920.

In Chart 15 the trends for the area groups discussed above and that for Pennsylvania have been expressed as index numbers with the trend point for 1899 as 100. The peak in trend for the 25 industrial states, relative to the 1899 base, was only slightly above that for the 13 industrial areas. The industrial states grew some-

[8] See note, p. 40, and also Table 10.

what more rapidly in manufacturing employment than did the United States, although up to about 1912 the trend for the United States, that for the industrial states, and the trend for the nonindustrial states are almost identical. After 1912 the trend for the nonindustrial states began to flatten out much more rapidly than that for the industrial states; and the highest trend point for the former group of states, construed in relation to 1899, was about 5 per cent lower than that for the latter group. The rise in trend was even less in Pennsylvania than in the group of nonindustrial states, but since 1921 the trend decline has been much greater for that group than for Pennsylvania. The net result was that the trend points for the two for 1935 were approximately equal. For Pennsylvania the trend value for 1935 is approximately the same as that for 1909; for the nonindustrial states the trend value for 1935 is approximately the same as that for 1907. Among the five trend curves presented in Chart 15, that for the 25 industrial states shows the least decline in the postwar period.

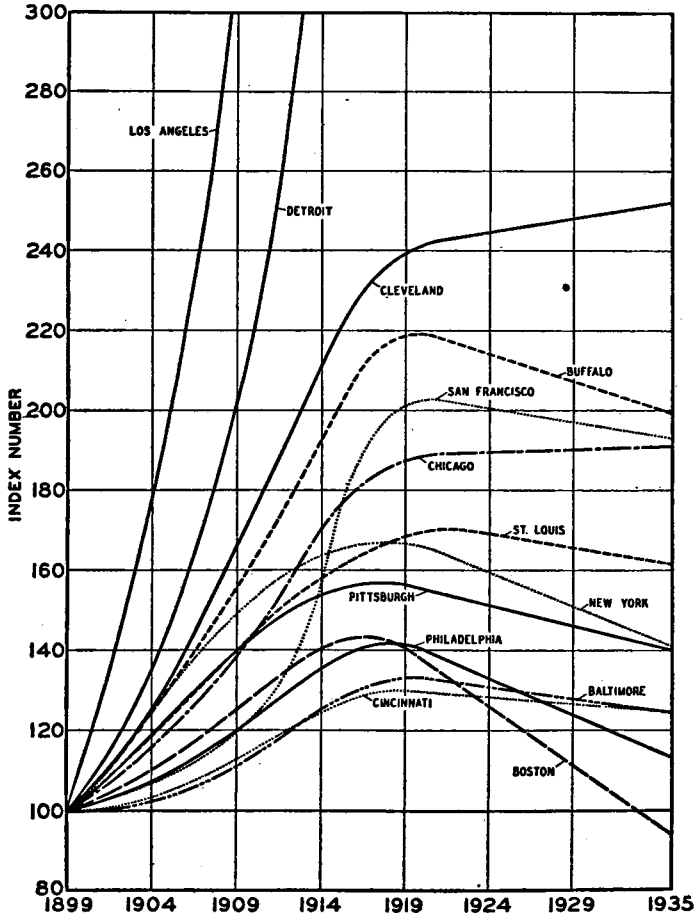
Trends in the 13 Large Industrial Areas

Although variations in the rapidity of growth in manufacturing employment occur among the 13 large industrial areas for which comparatively complete figures have been obtained, there are, nevertheless, general tendencies which characterize the trends in manufacturing employment in nearly all of them (Charts 16 and 17). From 1899 until shortly before the World War there was an increasing normal increment in number of manufacturing wage earners in most of these areas. The growth began to slow down sharply during the war, and after about 1920 the trend in manufacturing employment in most of the 13 areas was down; in those areas in which the manufacturing employment continued to grow, the trend increase was much less than that before the war. Because of the inadequacy of scale in Chart 16, the trends for Los Angeles and Detroit are shown on a more compressed vertical scale in Chart 17.

Of the 13 areas the Boston area was the first to reach a peak in the trend in manufacturing employment. After 1916 the trend in this area was definitely downward, and by 1934 the trend value had fallen below that for 1899. The Boston area not only reached peak employment before any other large area but subsequently recorded far the most precipitous downward slope in trend. A

CHART 16

TRENDS IN AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN EACH OF THE 13 LARGE INDUSTRIAL AREAS, 1899–1931

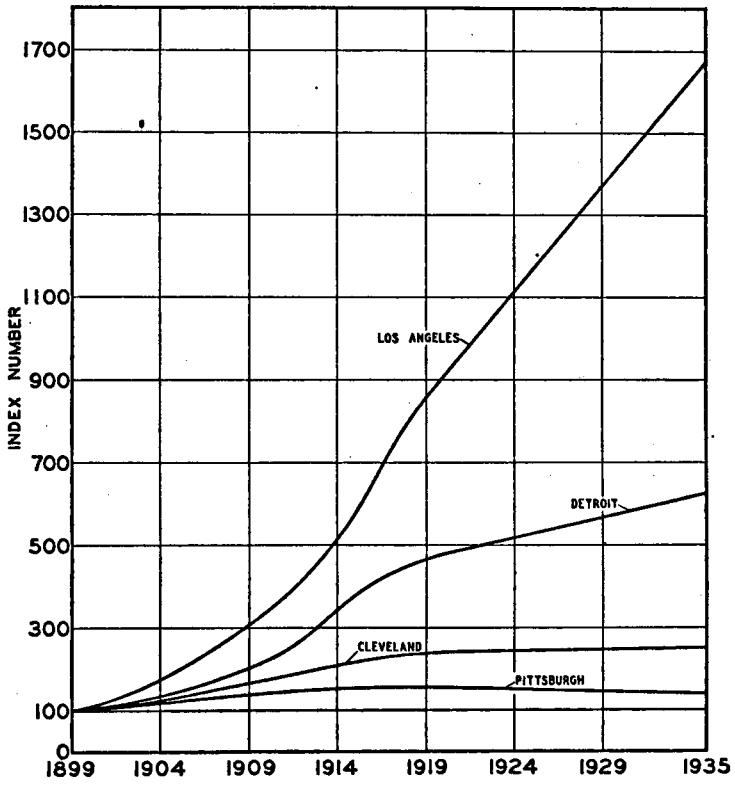


declining trend also characterized manufacturing employment in the Philadelphia area, for which the top of the growth curve came in 1918. By 1934 the normal, or trend, value for Philadelphia was the same as it was in 1907. Of the areas in which manufacturing employment has begun to decline, the St. Louis area was

the latest to reach the peak in trend. Employment tended to grow in this area until 1922, after which year the trend turned downward. Among the trends in manufacturing employment for the 13 large areas, those for Baltimore and Cincinnati rose the least from 1899 to the peak and subsequently fell the least.

CHART 17

TRENDS IN AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN THE LOS ANGELES, DETROIT, CLEVELAND, AND PITTSBURGH AREAS, 1899–1931



In only four of the areas did the trend in manufacturing employment continue to rise through 1935. These were the Los Angeles, Detroit, Cleveland, and Chicago areas. The upward slope in the trend for the last-named area was very moderate (Chart 16), whereas that for the Los Angeles area was very pro-

nounced (Chart 17). Of the group of large areas this southern California area registered the greatest rise in trend for the entire period 1899 through 1935.

In the Pittsburgh Industrial Area the most rapid rise in trend since 1899 occurred about 1901. From then until 1908 the growth was approximately constant. By 1912 the curve was flattening out rapidly and by 1918 had reached a maximum (Chart 16). Since 1918 the trend in this area has been falling slightly more rapidly than the trends for the St. Louis and San Francisco areas and much less rapidly than those for the New York City and Buffalo areas. In 1934 the trend value for manufacturing employment in the Pittsburgh area was approximately the same as that for 1910.

Average Annual Rates of Change, 1899–1914

Growth in the number of manufacturing wage earners in the United States and in individual industrial states in the period 1899 to 1933 shows two distinct trends: a rapid upward movement to 1919 and either a slightly upward or a slightly downward movement since that year. To determine the trend in manufacturing employment, however, it appeared proper to eliminate the influence of the abnormally great activity of the war period, which, as far as census data were concerned, appeared only in the figures for 1919.[4] Consequently, the prewar trend in manufacturing employment was determined from data for the years 1899, 1904, 1909, and 1914. The postwar trend was based upon the biennial figures for 1921 through 1931. The year 1933 was not included in the computations, since such inclusion would unduly lower the trend. The period on which the trend was based begins in the depression of 1921 and ends in the early part of the much more severe post-1929 depression.

The number of manufacturing wage earners in the United States increased from 4,700,000 in 1899 to 7,000,000 in 1914, or by about 50 per cent. The average rate of growth during this period was 2.82 per cent per year (Table 17 and Chart 18). Over the same

[4] For most areas, to have included 1919 data in the computations would have accentuated the upward trend preceding the war and overemphasized the downward trend since the war. Furthermore, the comparison among individual manufacturing states would have been affected because of the varying importance of the war boom.

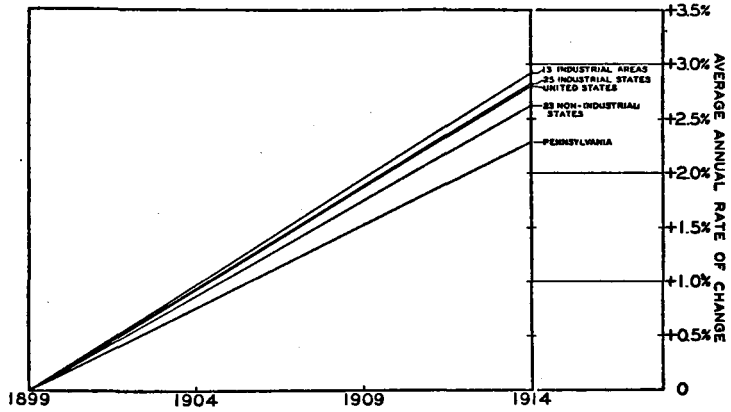
period, population increased about 1.8 per cent per year. For the full 20-year period from 1899 to 1919 the average gain in employment was 3.27 per cent per year; the difference between this and the rate of employment gain from 1899 to 1914 indicates the degree to which the prewar rate of growth would have been affected by the inclusion of data for the 1919 boom.

Industrial and Nonindustrial Parts of the United States

In the 25 more important industrial states, which include about 90 per cent of factory wage earners, the average annual rate of

CHART 18

AVERAGE ANNUAL RATES OF CHANGE IN THE NUMBER OF MANUFACTURING WAGE EARNERS IN THE UNITED STATES, GROUPS OF STATES, PENNSYLVANIA, AND THE GROUP OF 13 LARGE INDUSTRIAL AREAS, 1899–1914



growth in manufacturing employment during the 15-year period up through 1914 was 2.83 per cent, almost identical with the percentage for the entire country. For the remaining 23 states of less industrial importance the rate was 2.63. Not only was the growth in industrial states greater than that in nonindustrial states, but it was also much more stable. The index of instability of growth, i.e., average percentage deviation from constant growth, was 2.2 for industrial states and 4.4 for nonindustrial states. The growth in industrial states was also slightly more regular than that for the entire country. The irregularity of growth in the group of nonindustrial states consisted largely of an unusually great gain in 1909 and of an actual loss from 1909 to 1914. The annual rate

TABLE 17

INDEX NUMBERS OF AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN THE UNITED STATES, GROUPS OF STATES, AND SELECTED INDUSTRIAL STATES, 1899–1919, WITH AVERAGE ANNUAL RATES OF CHANGE, 1899–1914

Area	Average Number of Manufacturing Wage Earners		Indexes of Average Number of Manufacturing Wage Earners (1899 = 100)					Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1899	1919*	1899	1904	1909	1914	1919*	1899–1914	1899–1914
United States	4,712,763	9,099,372[a]	100.0	116.0	140.4	149.3	193.1	2.82%	2.4%
25 Industrial States	4,223,192	8,199,403	100.0	116.1	139.9	149.7	194.1	2.83	2.2
23 Nonindustrial States[a]	489,571	899,969	100.0	115.3	144.6	142.9	183.8	2.63	4.4
Industrial States:[b]									
Washington	31,523	132,928	100.0	143.4	219.3	213.2	421.7	5.54	9.9
West Virginia	33,080	83,036	100.0	132.3	193.1	214.9	251.0	5.49	5.0
Texas	38,604	107,522	100.0	127.1	181.9	193.9	278.5	4.80	5.4
North Carolina	72,322	157,659	100.0	118.0	168.0	189.2	218.0	4.64	4.2
Michigan	155,800	471,242	100.0	112.5	148.6	174.0	302.5	3.96	2.8
California	77,224	246,492	100.0	130.0	149.3	180.6	319.2	3.90	2.2
New Jersey	213,975	508,686	100.0	124.5	152.5	174.6	237.7	3.82	2.1
Ohio	308,109	730,733	100.0	118.2	145.1	165.7	237.2	3.50	1.2
Tennessee	45,963	95,167	100.0	131.8	160.7	161.8	207.1	3.34	6.7
Virginia	66,223	119,352	100.0	121.2	159.6	155.3	180.2	3.24	5.7
South Carolina	47,025	79,450	100.0	126.4	155.3	152.7	169.0	3.00	6.3

TABLE 17 (*Continued*)

Area	Average Number of Manufacturing Wage Earners		Indexes of Average Number of Manufacturing Wage Earners (1899 = 100)					Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1899	1919*	1899	1904	1909	1914	1919*	1899–1914	1899–1914
Industrial States:[b]—*Continued*									
Illinois	332,871	653,114	100.0	114.0	139.9	152.3	196.2	2.98	2.0
Alabama	52,711	107,159	100.0	118.0	136.9	149.3	203.3	2.74	2.0
Minnesota	64,557	115,623	100.0	107.9	131.3	143.8	179.1	2.61	2.3
New York	726,909	1,228,330	100.0	117.9	138.1	145.5	169.0	2.60	2.8
Iowa	44,420	80,551	100.0	111.4	138.8	142.1	181.3	2.58	3.4
Indiana	139,017	277,580	100.0	110.9	134.5	142.1	199.7	2.52	2.3
Wisconsin	137,525	263,949	100.0	110.1	132.8	141.3	191.9	2.48	2.2
Connecticut	159,733	292,672	100.0	113.7	132.0	141.7	183.2	2.42	3.0
Missouri	107,704	195,037	100.0	123.6	142.0	141.3	181.1	2.39	5.4
Massachusetts	438,234	713,836	100.0	111.4	133.4	138.4	162.9	2.34	2.5
Pennsylvania	663,960	1,135,837	100.0	115.0	132.2	139.2	171.1	2.29	2.2
Rhode Island	88,197	139,665	100.0	110.3	128.7	128.6	158.4	1.83	2.8
Georgia	83,336	123,441	100.0	111.3	125.5	125.3	148.1	1.51	2.7
Maryland	94,170	140,342	100.0	100.0	114.6	118.5	149.0	1.30	2.4

Source: Based on manufacturing reports of the United States Bureau of the Census.
* Adjusted to include part of the motion picture industry not covered by the census of 1919.
[a] Includes also the District of Columbia.
[b] Listed according to rank in annual percentage rate of change, 1899–1914.

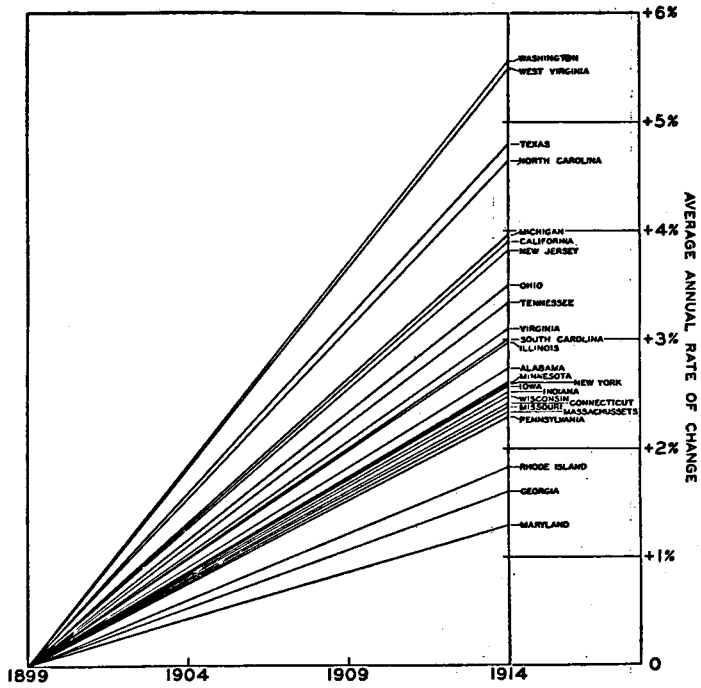
for Pennsylvania was even lower than that for the group of non-industrial states.

Individual Industrial States

Among the 25 industrial states the average annual increase from 1899 to 1914 varied from 1.30 per cent in Maryland to 5.54 per cent in Washington (Table 17 and Chart 19). There was a

CHART 19

AVERAGE ANNUAL RATES OF CHANGE IN THE NUMBER OF MANUFACTURING WAGE EARNERS IN INDUSTRIAL STATES, 1899–1914



tendency for the rates of gain in all the states to concentrate between 2 per cent and 4 per cent, only three rates being below this range and only four above. Manufacturing employment in only seven of the 25 states grew faster than 3.5 per cent per year. Each major industrial section of the country except New England was

TABLE 18

INDEX NUMBERS OF AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN THE UNITED STATES, PENNSYLVANIA, AND 13 LARGE INDUSTRIAL AREAS, 1899–1919, WITH AVERAGE ANNUAL RATES OF CHANGE, 1899–1914

Area	Average Number of Manufacturing Wage Earners		Indexes of Average Number of Manufacturing Wage Earners* (1899 = 100)					Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1899	1919*	1899	1904	1909	1914	1919*	1899–1914	1899–1914
United States	4,712,763	9,099,372	100.0	116.0	140.4	149.3	193.1	2.82%	2.4%
Pennsylvania	663,960	1,135,837	100.0	115.0	132.2	139.2	171.1	2.29	2.2
Total, 13 Large Ind. Areas	1,877,900	3,750,283	100.0	117.7	141.3	152.4	199.7	2.93	2.2
Industrial Areas:[a]									
Los Angeles Area	6,200	64,465	100.0	203.2	348.4	495.2	1,039.8	11.27	9.0
Detroit Area	45,900	264,269	100.0	131.8	200.4	290.0	575.7	7.49	2.6
Cleveland Area	60,800	184,982	100.0	121.4	168.9	196.5	304.2	4.83	3.2
Buffalo Area	45,900	116,633	100.0	131.2	163.0	182.8	254.1	4.14	3.9
Chicago Area	251,400	520,133	100.0	112.6	142.6	158.6	206.9	3.29	2.5
New York City Area	555,900	1,035,836	100.0	122.4	147.7	157.4	186.3	3.15	3.5
Pittsburgh Area	135,100	244,991	100.0	124.6	141.1	152.4	181.3	2.81	3.6
St. Louis Area	80,400	152,911	100.0	132.8	149.5	152.4	190.2	2.80	6.6
Boston Area	236,700	371,374	100.0	111.9	132.2	133.3	156.9	2.08	2.9
San Francisco Area	40,100	105,313	100.0	120.7	116.5	134.4	262.6	1.72	4.1
Philadelphia Area	274,100	465,487	100.0	108.2	124.0	126.4	169.8	1.69	2.1
Cincinnati Area	72,900	112,684	100.0	113.4	125.4	124.4	154.6	1.52	3.4
Baltimore Area	72,500	111,205	100.0	99.9	113.1	117.4	153.4	1.22	2.1

Source: Based on manufacturing reports of the United States Bureau of the Census.
* Adjusted to include part of the motion picture industry not covered by the census of 1919.
[a] Listed according to rank in annual percentage rate of change, 1899–1914.

represented in this group. In other words, there was no tendency for the rapidly growing areas to concentrate in any one section of the country. Of the seven states with the lowest rates of growth, five were located along the North Atlantic seaboard, in the oldest and still the most important industrial section of the country. The states growing at medium rates were mainly southern and western states.

The instability of growth varied more or less directly with the rate of growth itself. In the three industrial states that grew the most rapidly in manufacturing employment—Washington, West Virginia, and Texas—the index of instability is very much greater than that for all industrial states combined; it was at a maximum in Washington. The index of instability in Rhode Island, Georgia, and Maryland, states with rates of growth of less than 2 per cent per year, was relatively small. Yet the most regular growth in manufacturing employment was that in Ohio, where growth was fairly rapid. (For the 20-year period from 1899 to 1919 the correspondence between the rates of growth and their indexes of instability is very much greater than for the period 1899–1914.)

The 13 Large Industrial Areas

The average annual rate of change for the 13 large industrial areas for the period 1899–1914 is 2.93, a rate slightly greater than that for the United States or that for the industrial states (Chart 18). Of the rates for the 13 larger industrial areas, most were in the range between 1 per cent and a little more than 3 per cent, the rates for Los Angeles and Detroit areas being outstanding exceptions (Table 18 and Chart 20). Six of the 13 areas have rates higher than that for the group of industrial states. For the Pittsburgh area the rate was somewhat less than that for all areas combined. The eight areas with the higher rates of growth grew more rapidly in manufacturing employment than did the states in which they were located. For the other five larger areas—Boston, San Francisco, Philadelphia, Cincinnati, and Baltimore—the average annual rates of change were less than the corresponding state rates.

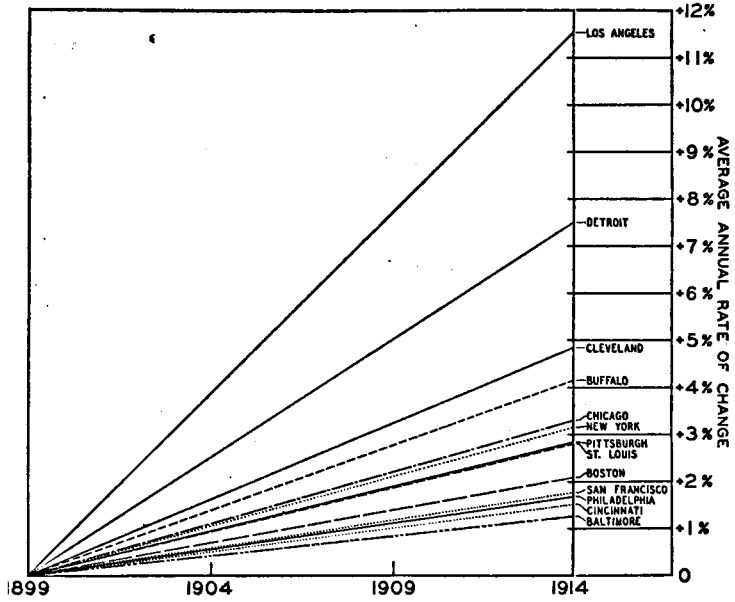
The growth in employment was very stable during the period from 1899 to 1914 in each of the 13 areas. By far the largest index of instability was that for the Los Angeles area.

Average Annual Rates of Change, 1921–1931

From 1919 to 1929 the average number of manufacturing wage earners in the United States decreased from 9,100,000 to 8,800,000, or by about 3 per cent (Table 21). A far greater drop occurred during the recent severe depression, the number falling to 6,500,000 in 1931 and 6,100,000 in 1933. With business recovery, wage em-

CHART 20

Average Annual Rates of Change in the Number of Manufacturing Wage Earners in Each of the 13 Large Industrial Areas, 1899–1914



ployment in manufacturing rose to 7,400,000 in 1935, only about 6 per cent above the 1921 depression level. The average rate of loss from 1919 to 1931 approximated 1 per cent per year. But, as already indicated, this period gives an inadequate approximation of the postwar trend in manufacturing employment. The trend as measured for the period 1921 through 1931 also was downward but much less so. The average annual loss during that 10-year period was 0.41 per cent per year (Table 19 and Chart 21).

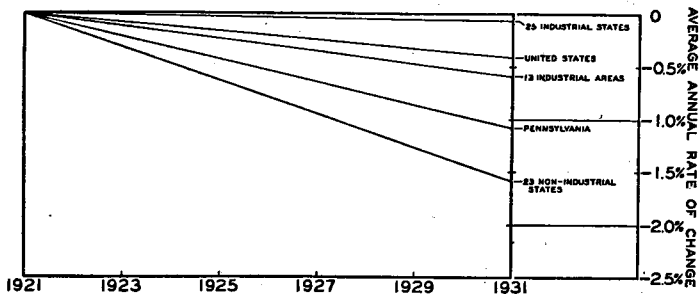
Industrial and Nonindustrial Parts of the United States

From 1921 to 1931 the rate of loss in manufacturing employment in the country was much greater than that for the group of industrial states, for which the average annual decrease was only 0.06 per cent. In nonindustrial states the drop was much more severe, amounting to 1.59 per cent per year or nearly four times the annual decrease for the United States.

The indexes of instability for the two groups of states and for the United States were equal. After the war, variations in manufacturing employment were decidedly more severe than theretofore, the average annual deviation from trend, both for the United

CHART 21

AVERAGE ANNUAL RATES OF CHANGE IN THE NUMBER OF MANUFACTURING WAGE EARNERS IN THE UNITED STATES, GROUPS OF STATES, PENNSYLVANIA, AND THE GROUP OF 13 LARGE INDUSTRIAL AREAS, 1921–1931



States and for the group of industrial states, being more than four times as great in the period 1921–1931 as in the period 1899–1914. This greater variation results partly, no doubt, from the inclusion of more frequent observations (made possible by a biennial instead of a quinquennial census) but perhaps more from the rapid rise in employment from 1921 to 1923 and the severe drop from 1929 to 1931. In terms of the average annual rate of loss from 1921 to 1931, Pennsylvania fared worse than the United States and better than the nonindustrial states (Chart 21).

Individual Industrial States

Among the 25 industrial states the average rates of change for the 10-year postwar period varied from an annual loss of 2.82 per

TABLE 19

INDEX NUMBERS OF AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN THE UNITED STATES, GROUPS OF STATES, AND SELECTED INDUSTRIAL STATES, 1919–1935, WITH AVERAGE ANNUAL RATES OF CHANGE, 1921–1931

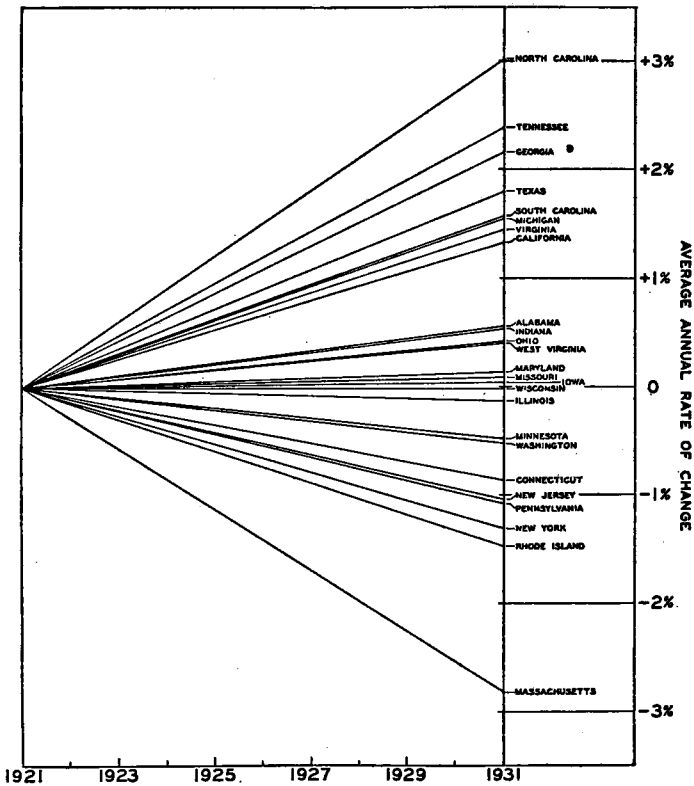
Area	Average Number of Manufacturing Wage Earners		Indexes of Average Number of Manufacturing Wage Earners (1921 = 100)									Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1921	1929	1919*	1921	1923	1925	1927	1929	1931*	1933*	1935*	1921–1931	1921–1931
United States	6,946,570	8,838,743	131.0	100.0	126.4	120.7	120.2	127.2	94.1	87.3	106.4	−0.41%	10.6%
25 Industrial States	6,253,588	8,030,183	131.1	100.0	126.9	121.2	121.4	128.4	95.3	88.4	108.2	−0.06	10.6
23 Nonindustrial States[a]	692,982	808,560	129.9	100.0	121.7	116.3	109.7	116.7	82.9	77.7	90.7	−1.59	10.6
Industrial States:[b]													
North Carolina	135,833	209,826	116.1	100.0	127.9	134.2	150.6	154.5	132.0	147.4	169.0	3.00	9.1
Tennessee	75,446	128,400	126.1	100.0	141.2	142.6	152.4	170.2	122.8	125.8	154.6	2.39	13.5
Georgia	98,264	158,774	125.6	100.0	139.9	143.7	156.9	161.6	121.6	131.0	145.5	2.17	13.5
Texas	88,707	134,498	121.2	100.0	115.4	120.4	131.6	151.6	107.0	103.0	118.1	1.80	9.8
South Carolina	76,251	108,777	104.2	100.0	127.0	131.3	142.9	142.7	114.1	136.8	144.1	1.57	10.5
Michigan	304,471	530,035	154.8	100.0	165.3	167.0	160.6	174.1	121.4	115.0	176.0	1.56	17.9
Virginia	88,555	120,273	134.8	100.0	126.0	126.6	129.8	135.8	116.4	113.7	137.6	1.45	8.0
California	198,334	290,911	124.3	100.0	124.1	125.8	132.5	146.7	107.7	101.3	130.7	1.33	10.5
Alabama	82,748	119,559	129.5	100.0	132.5	140.9	143.9	144.5	102.3	102.7	118.1	0.56	14.3
Indiana	206,534	314,698	134.4	100.0	141.0	135.9	135.9	152.4	103.0	96.3	123.0	0.54	14.4
Ohio	494,288	741,143	147.8	100.0	141.4	136.9	135.4	149.9	102.6	95.6	118.8	0.42	14.4
West Virginia	60,536	85,326	137.2	100.0	141.5	133.3	128.2	141.0	107.0	112.2	128.1	0.41	12.0
Maryland	107,085	131,099	131.1	100.0	120.3	117.4	118.3	122.4	100.8	93.6	111.8	0.14	7.7
Missouri	156,384	202,879	124.7	100.0	125.8	124.5	124.9	129.7	99.3	90.3	103.7	0.09	10.3
Iowa	62,274	81,678	129.3	100.0	125.0	119.2	118.3	131.2	97.9	83.7	95.1	0.04	9.7
Wisconsin	191,770	264,745	137.6	100.0	129.2	129.0	129.2	138.1	95.9	82.8	104.8	−0.01	12.8
Illinois	513,876	691,555	127.1	100.0	125.6	121.1	121.3	134.6	94.2	81.8	104.7	−0.13	11.3
Minnesota	85,804	103,414	134.8	100.0	121.2	117.1	115.2	120.5	94.1	81.2	95.1	−0.48	8.8
Washington	77,518	114,830	171.5	100.0	144.0	136.6	134.8	148.1	91.6	87.4	105.5	−0.52	16.8
Connecticut	210,990	251,861	138.7	100.0	124.8	114.9	114.1	119.4	91.1	86.9	106.2	−0.86	9.4
New Jersey	381,773	442,328	133.2	100.0	117.4	111.4	106.9	115.9	87.8	77.4	98.8	−1.04	8.2
Pennsylvania	863,917	1,014,046	131.5	100.0	126.8	115.7	114.3	117.4	90.1	82.9	97.4	−1.08	9.7
New York	1,000,414	1,105,966	122.8	100.0	115.0	106.6	107.2	110.6	85.1	73.3	89.6	−1.31	8.1
Rhode Island	112,745	126,068	123.9	100.0	119.4	106.7	106.4	111.8	84.6	82.1	89.9	−1.47	8.3
Massachusetts	579,071	557,494	123.3	100.0	115.2	102.1	99.8	96.3	75.0	68.8	76.4	−2.82	7.7

Source: Based on manufacturing reports of the United States Bureau of the Census.
* Adjusted for inclusion of part of the motion picture industry in 1919 and all the motion picture industry in 1931, 1933, and 1935.
[a] Includes also the District of Columbia.
[b] Listed according to rank in annual percentage rate of change, 1921–1931.

cent in Massachusetts to an annual gain of 3.00 per cent in North Carolina (Table 19 and Chart 22). One state, Wisconsin, recorded practically no change in trend. There was no tendency for the rates to concentrate within a narrow range as there had been

CHART 22

AVERAGE ANNUAL RATES OF CHANGE IN THE NUMBER OF MANUFACTURING WAGE EARNERS IN INDUSTRIAL STATES, 1921–1931



in the prewar period. For five states the average annual *loss* was greater than 1 per cent per year; for five other states the loss was less than 1 per cent per year. For seven states the *gain* was less than 1 per cent; for five states the gain was between 1 and 2 per cent; and for three states, greater than 2 per cent.

Of the six states which grew in number of manufacturing wage earners at a rate in excess of 1.5 per cent per year, five were southern states. If the list of states, ranked according to rate of gain, be divided into four approximately equal parts the upper seven states include six southern states and one midwestern state. The next group of six states includes three southern states (of which two are border states), two midwestern states, and one far western state. The next group of six states includes five midwestern states and one far western state. The lowest quarter of the list is made up entirely of New England and Middle Atlantic states. In general then, the rates of growth were the lowest in the old industrial Northeast and the highest in the industrial South.

Rapid growth in the South can be interpreted largely in terms of the southern movement and development of the textile industry in the Southeast and the expansion of the petroleum refining industry in Texas. The occurrence of relatively higher rates of growth in the Midwest than in the Northeast is related to the westward movement of the population, the postwar expansion in the automobile industry, and the continued westward expansion of the electrical machinery and iron and steel industries. On the other hand, the relatively poor showing of the New England and Middle Atlantic states results from a heavy loss in the cotton textile industry and somewhat lesser losses in railroad repair shops and shoe factories.

The 13 Large Industrial Areas

In the group of 13 industrial areas the average annual loss in manufacturing employment from 1921 to 1931 was 0.64 per cent. This loss was greater than that for industrial states and even greater than that for the country as a whole (Chart 21). Only three of the 13 areas—Los Angeles, Detroit, and Cleveland—had positive rates of change during this period (Table 20 and Chart 23).[5] These three also reported the highest rates of gain in the

[5] In the Chicago area the negative rate was exceedingly small, only —0.05 per cent per year. For that area the reader may have noticed that whereas the average annual rate of change is slightly negative for the period 1921–1931, the arithmetic trend for the same period is slightly positively inclined (*cf.* Charts 16 and 23). The apparent contradiction results from the difference between an arithmetic average and a geometric average. Although on the face of it the result may be mathematically puzzling, it is nevertheless economically immaterial, since the trend is essentially horizontal in either case.

TABLE 20

INDEX NUMBERS OF AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN THE UNITED STATES, PENNSYLVANIA, AND 13 LARGE INDUSTRIAL AREAS, 1919–1935, WITH AVERAGE ANNUAL RATES OF CHANGE, 1921–1931

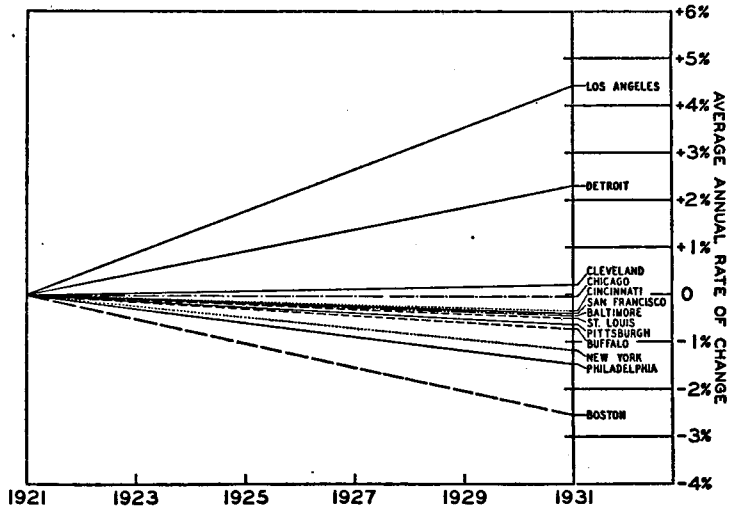
Area	Average Number of Manufacturing Wage Earners		Indexes of Average Number of Manufacturing Wage Earners (1921 = 100)									Annual Percentage Rate of Change	Deviation from Constant Growth
	1921	1929	1919*	1921	1923	1925	1927	1929	1931*	1933*	1935*	1921–1931	1921–1931
United States	6,946,570	8,838,743	131.0	100.0	126.4	120.7	120.2	127.2	94.1	87.3	106.4	−0.41%	10.6%
Pennsylvania	863,917	1,014,046	131.5	100.0	126.8	115.7	114.3	117.4	90.1	82.9	97.4	−1.08	9.7
Total, 13 Large Ind. Areas	2,850,000	3,519,562	131.6	100.0	124.8	117.3	116.3	123.5	92.2	82.1	104.2	−0.64	9.9
Industrial Areas:[a]													
Los Angeles Area	59,300	114,480	108.7	100.0	131.2	137.8	155.2	193.1	147.6	134.2	184.6	4.72	10.1
Detroit Area	165,200	293,252	160.0	100.0	176.1	181.6	163.1	177.5	126.6	122.9	200.7	1.58	19.1
Cleveland Area	121,500	176,840	152.2	100.0	138.2	129.5	128.6	145.5	100.4	93.5	115.3	0.24	13.2
Chicago Area	402,500	550,903	129.2	100.0	127.5	124.0	124.5	136.9	95.1	82.7	106.7	−0.05	11.9
Cincinnati Area	87,600	114,068	128.6	100.0	123.9	118.0	119.2	130.2	91.6	77.9	99.2	−0.40	10.9
St. Louis Area	124,500	154,321	122.8	100.0	127.3	119.8	121.4	124.0	95.0	82.2	93.7	−0.46	10.2
San Francisco Area	77,900	93,797	135.2	100.0	114.1	110.1	110.0	120.4	90.6	85.9	101.0	−0.46	7.9
Baltimore Area	85,700	99,601	129.8	100.0	118.8	113.4	111.6	116.2	95.2	84.8	100.5	−0.47	7.2
Pittsburgh Area	163,300	227,221	150.0	100.0	153.6	135.1	132.6	139.1	97.4	87.8	109.8	−0.63	15.2
Buffalo Area	87,300	115,212	133.6	100.0	131.5	124.2	120.4	132.0	90.1	79.9	95.5	−0.77	12.7
New York City Area	835,900	918,206	123.9	100.0	112.1	105.2	104.9	109.8	85.8	74.4	93.4	−1.18	6.8
Philadelphia Area	344,700	376,009	135.0	100.0	117.8	105.4	105.4	109.1	85.1	75.9	91.7	−1.47	7.5
Boston Area	294,600	285,652	126.1	100.0	115.5	101.0	100.1	97.0	77.4	68.9	78.2	−2.56	7.0

Source: Based on manufacturing reports of the United States Bureau of the Census.
* Adjusted for inclusion of the motion picture industry in 1919 and all the motion picture industry in 1931, 1933, and 1935.
• Listed according to rank in annual percentage rate of change, 1921–1931.

prewar period (Chart 20) and ranked in the same order in both periods. Six of the 13 areas suffered losses not far from 0.5 per cent per year. Seven of the areas reported rates which exceeded the corresponding state rates. The Boston area, which on the average lost relatively the most in manufacturing employment per year, reported a lower rate of loss than that for Massachusetts.

CHART 23

AVERAGE ANNUAL RATES OF CHANGE IN THE NUMBER OF MANUFACTURING WAGE EARNERS IN EACH OF THE 13 LARGE INDUSTRIAL AREAS, 1921–1931



It has been noted above that the index of instability of growth is much greater for the postwar years than for the prewar period. Among the 13 major areas the fluctuations in manufacturing employment between 1921 and 1931, as measured by this index, were the greatest in the Detroit and Pittsburgh areas. Both these areas are dominated to a large degree by a single industry: Pittsburgh by a producers' goods industry, and Detroit by a durable consumers' goods industry.

The index of manufacturing employment based on the average number of wage earners in 1921 was much higher for the Detroit and Los Angeles areas in 1935 than for any of the other large

areas. For Detroit the index was 200.7, for Pittsburgh 109.8, and for Boston only 78.2 (Table 20).

Comparative Growth in Manufacturing Employment in the United States, Groups of Areas, Pennsylvania, and Pennsylvania Areas

The number of manufacturing wage earners in the United States (including hand trades, building trades, and neighborhood industries) increased steadily from 2,053, 996 in 1869 to 5,321,389 in 1899 (Table 21 and Chart 24). In that year the scope of the census was revised to include only manufacturing activity in factories, with the result that the number of wage earners was changed to 4,712,763. During the next 20 years the upward movement in manufacturing employment continued, reaching an all-time peak (for census years) of 9,099,372 wage earners in 1919. Since 1919, however, the tendency has been clearly downward, even if no consideration is given to the 1929–1933 decline. The number of manufacturing wage earners was considerably less than nine million in 1929 and less than seven and a half million in 1935. The downward trend in the postwar years has resulted primarily from the development of mechanization in most manufacturing industries, since the trend in quantity of production over this period was rising.[6] Up to 1919, changes in the number of wage earners gave a fairly good approximation of changes in quantity output in manufacturing areas, but since 1919 the significance of the number of manufacturing wage earners as an indicator of the importance of manufacturing is less clear. It is probable, however, that differences in the extent of mechanization among the industrial areas have not been sufficient to vitiate comparisons of rank on the basis of number of manufacturing wage earners.

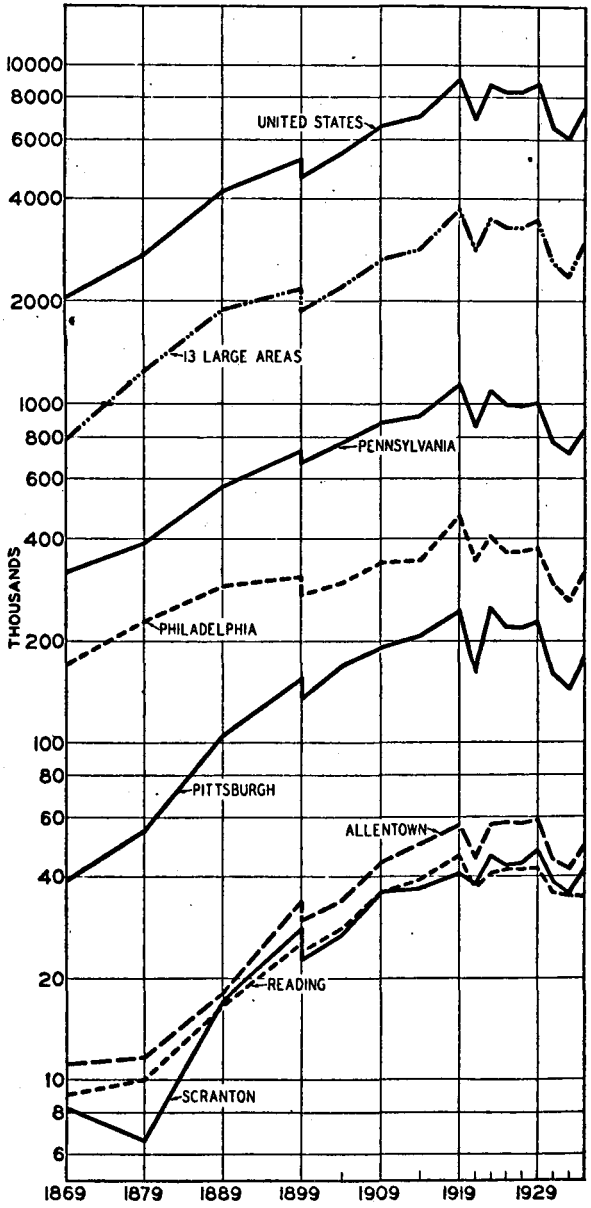
Groups of Industrial Areas

Manufacturing employment in the 33 industrial areas grew from 1,094,861 in 1869 to 3,050,707 in 1899 (revised to 2,605,100 in

[6] The index of the Bureau of the Census for output of manufactured goods in the United States, with 1899 as 100, rose from 218 in 1919 to 330 in 1929. See also Table 1 and Chart 1.

CHART 24

AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN THE UNITED STATES, THE GROUP OF 13 LARGE INDUSTRIAL AREAS, PENNSYLVANIA, AND EACH OF THE INDUSTRIAL AREAS LOCATED IN PENNSYLVANIA, 1869–1935



that year on the basis of the change in census coverage). It rose to 5,291,129 in 1919, decreased to 4,963,875 in 1929 and 3,306,590 in 1933, and rose to 4,105,662 in 1935.

The relative importance of the 33 areas reached a maximum in 1879, when these areas included three-fifths of the national total (Table 22). Although the relative importance of the 33 areas had risen sharply from 1869 to 1879, the tendency after 1879 was for it to fall. In prosperity years the rise in manufacturing employment in these areas was usually greater than that in the country as a whole. For the 13 large industrial areas the percentage importance reached a peak in 1879 also and tended to decrease in much the same manner. The 13 areas, however, gained somewhat with respect to the country from 1899 to 1919.

During the 60-year period under discussion the proportion of the national population in the 33 industrial areas rose sharply—from less than one-fourth to more than one-third. The fact that from 1879 to 1899 and again from 1919 to 1929 relatively fewer wage earners were included in these areas indicates the spread of manufacturing activity to the balance of the country and—when considered in conjunction with population gains which exceeded those for the country—indicates also the rapidly rising importance of other occupations in industrial areas. Relatively high increases in manufacturing employment in the 33 industrial areas from 1899 to 1919 were in great measure a result of the war boom in certain industries concentrated in those areas, for example, in iron and steel, shipbuilding, munitions, and clothing. In general, war requirements were assigned to plants located in the industrial Northeast; all but four of the 33 areas are located north of the Ohio River-Potomac River line and east of the Mississippi River (or on these boundaries). The three Pacific Coast areas also were greatly affected by the war boom, primarily by shipbuilding activity. The importance of war activity in the group of 33 areas is also suggested by the greater decrease in number of manufacturing wage earners from 1919 to 1929 in these areas than in the country —decreases of 6.3 per cent and 2.9 per cent, respectively (Table 23). Severe losses occurred in the Seattle, Boston, and Philadelphia areas—all important shipbuilding centers. For the full 30-year period from 1899 to 1929, however, the group of 33 areas

TABLE 21

AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN THE UNITED STATES, PENNSYLVANIA, AND INDUSTRIAL AREAS, 1869–1935*

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**												
	1869	1879	1889	1899	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#	1933#φ	1935#
United States	2,053,996	2,732,595	4,251,613	5,321,289	4,712,763	5,468,383	6,615,046	7,036,247	9,099,372	6,946,570	8,778,156	8,384,261	8,349,755	8,838,743	6,533,806	6,066,513	7,393,762
Pennsylvania	319,487	387,072	570,393	733,834	663,960	763,282	877,543	924,478	1,135,837	863,917	1,095,057	999,460	987,414	1,014,046	788,835	716,598	841,234
Total, 33 Industrial Areas	1,094,861	1,660,410	2,534,621	3,050,707	2,605,100	a	a	a	5,291,129	a	a	a	4,670,527	4,963,875	3,680,065	3,306,590	4,105,662
Total, 13 Large Industrial Areas	789,490	1,226,778	1,888,902	2,192,410	1,877,900	2,210,700	2,653,800	2,861,000	3,750,283	2,850,000	3,556,600	3,343,600	3,313,523	3,519,562	2,628,491	2,338,476	2,968,884
Industrial Areas:[b]																	
New York City Area[c]	205,931	380,835	549,550	654,417	555,900	680,300	820,800	875,100	1,035,836	835,900	937,100	879,700	876,986	918,206	716,940	622,114	780,986
Chicago Area[c]	36,481	88,841	207,026	297,738	251,400	283,100	358,400	398,700	520,123	402,500	513,000	499,300	501,146	550,903	382,852	332,862	429,517
Philadelphia Area[c]	170,766	228,312	290,603	310,638	274,100	296,700	339,800	346,400	465,487	344,700	406,200	363,400	363,479	376,009	293,409	261,599	315,940
Detroit Area[c]	14,765	19,657	38,370	54,252	45,900	60,500	92,000	133,100	264,269	165,200	290,900	300,000	269,466	293,252	209,188	202,950	331,505
Boston Area[c]	160,075	198,854	255,774	264,230	236,700	264,800	312,800	315,500	371,374	294,600	340,300	297,500	294,927	285,652	228,134	203,064	230,277
Pittsburgh Area[c]	39,071	55,283	103,889	154,927	135,100	168,400	190,600	205,900	244,991	163,300	250,900	220,600	216,594	227,221	159,116	143,421	179,320
Providence Area	59,148	82,858	114,762	148,214	133,000	a	a	a	220,734	a	a	a	186,732	184,895	142,017	136,648	142,661
Cleveland Area[c]	11,314	23,722	47,983	67,755	60,800	73,800	102,700	119,500	184,982	121,500	167,900	157,400	156,241	176,840	121,962	113,611	140,090
St. Louis Area[c]	45,138	49,529	90,283	100,474	80,400	106,800	120,200	122,500	152,911	124,500	158,500	149,200	151,088	154,321	118,334	102,354	116,683
Milwaukee Area	10,920	25,539	44,902	64,526	56,100	a	a	a	136,085	a	a	a	131,151	144,760	96,014	80,041	101,734
Bridgeport Area	37,150	54,112	74,231	94,270	75,400	a	a	a	163,623	a	a	a	130,179	136,147	102,026	97,748	123,074
Buffalo Area[c]	15,757	22,922	53,752	56,948	45,900	60,200	74,800	83,900	116,633	87 300	114,800	108,400	105,074	115,212	78,614	69,744	83,378
Los Angeles Area[c]	621	706	4,264	9,365	6,200	12,600	21,600	30,700	64,465	59,300	77,800	81,700	92,044	114,480	87,534	79,553	109,469
Cincinnati Area[c]	42,622	64,152	105,017	84,394	72,900	82,700	91,400	90,700	112,684	87,600	108,500	103,400	104,384	114,008	80,264	68,257	86,941
Baltimore Area[c]	33,182	62,048	81,339	85,452	72,500	72,400	82,000	85,100	111,205	85,700	101,800	97,200	95,650	99,601	81,576	72,634	86,088
San Francisco Area[c]	13,767	31,817	47,142	51,820	40,100	48,400	46,700	53,900	105,313	77,900	88,900	85,800	86,444	93,797	70,568	66,313	78,600
Worcester Area	47,184	55,776	64,114	75,117	60,200	a	a	a	102,740	a	a	a	84,226	83,620	65,111	63,523	72,827
Youngstown Area	8,154	11,244	16,193	26,837	25,200	a	a	a	84,159	a	a	a	75,118	78,903	50,335	54,322	61,326
Akron Area	3,427	3,905	6,585	11,191	10,200	a	a	a	71,050	a	a	a	60,986	67,298	42,995	43,921	49,898
Hartford Area	19,106	20,951	25,456	37,632	33,100	a	a	a	70,090	a	a	a	61,545	65,482	48,521	43,379	55,225
Minneapolis Area	4,466	11,491	46,233	46,296	34,300	a	a	a	66,588	a	a	a	61,023	65,148	52,340	42,991	49,791
Rochester Area	11,549	17,007	31,841	35,687	30,000	a	a	a	67,553	a	a	a	62,506	63,248	47,117	37,864	44,903
Albany Area	31,721	53,935	59,695	62,157	54,200	a	a	a	63,815	a	a	a	58,686	63,112	45,042	34,000	40,210
Allentown Area	11,110	11,627	18,185	33,924	29,700	34,000	44,000	50,000	56,891	45,000	57,000	58,000	57,373	58,483	44,809	42,230	48,818
Springfield Area	17,119	25,030	32,067	37,796	33,600	a	a	a	62,235	a	a	a	54,731	54,208	39,048	34,824	40,537

TABLE 21 (*Continued*)

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**											
	1869	1879	1889	1899	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#	1933#φ	1935#
Industrial Areas:[b]—*Continued*																	
Toledo Area	2,204	7,079	9,744	15,596	12,900	a	a	a	44,713	a	a	a	41,599	53,996	31,990	26,657	37,917
Indianapolis Area	6,167	10,470	17,367	25,873	21,300	a	a	a	52,142	a	a	a	45,838	51,117	35,293	31,286	36,828
Kansas City Area	4,365	4,746	21,311	27,981	20,700	a	a	a	47,298	a	a	a	40,950	48,332	37,433	33,648	38,787
Seattle Area	157	304	9,450	14,966	9,600	a	a	a	37,202	a	a	a	43,297	47,449	30,816	26,386	31,879
Reading Area	8,991	10,008	16,531	25,379	22,600	27,000	36,000	37,000	41,072	38,000	46,000	43,000	43,418	47,350	38,726	35,745	42,338
Wheeling Area	9,328	14,349	20,204	27,390	24,700	a	a	a	43,791	a	a	a	43,075	45,906	34,342	28,132	47,807
Dayton Area	4,873	6,692	12,593	19,209	16,500	a	a	a	33,085	a	a	a	32,903	42,591	31,770	29,739	34,336
Scranton Area	8,232	6,609	17,165	28,256	23,900	28,000	36,000	39,000	45,980	37,000	41,000	42,000	41,668	42,268	35,829	35,030	34,882
Birmingham District[d]	44	301	7,926	14,076	12,500	a	a	a	28,909	a	a	a	34,396	31,544	22,228	18,425	22,471

Source: Totals compiled from manufacturing reports of the United States Bureau of the Census.

* The returns made by manufacturing establishments canvassed at the regular decennial United States censuses from 1870 to 1900, inclusive, covered either the preceding calendar year or some other 12-month period which ended within the census year. (The census year for this period was from May 31 to May 31.) For subsequent manufacturing censuses the returns related to the calendar year of the date listed in the body of this table or to the business year which corresponded most nearly thereto.

** Manufacturing statistics for the period 1869–1919, inclusive, covered all establishments reporting a value of products of $500 or more. Data from 1921 through 1935 covered all establishments reporting a value of products of $5,000 or more. This change in the size of establishment enumerated does not materially affect the comparability of manufacturing statistics except those for the number of establishments.

† After the census of 1900 the scope of the United States Census of Manufactures was revised to include only manufacturing activity in factory industries. To make possible a comparison with the data compiled prior to this revision, the Bureau of the Census republished most of the figures for 1899, excluding statistics for hand, building, and neighborhood industries. This was not done, however, for county data. Therefore, the figures for the industrial areas are partially estimated to adjust for the small number of wage earners engaged in hand, building, and neighborhood industries located in the area but outside the cities for which statistics were given.

‡ Figures for the industrial areas are partially estimated for 1904, 1909, 1914, 1921, 1923, and 1925, because county data were not published by the United States Bureau of the Census for these years. Only those areas were estimated for which sufficient data were available. See text, pp. 13, 15, and 17.

§ In 1919 the Census of Manufactures covered only part of the motion picture industry. To adjust for this deficiency, estimates of 3,000 wage earners and 2,800 wage earners were added to the totals for the United States and the Los Angeles area, respectively. Corresponding additions of $25 million and $24 million have been made to the totals for value added by manufacture given in Table 31.

Data for the motion picture industry are added to the 1931, 1933, and 1935 totals to preserve comparability with prior censuses. This industry was not considered a manufacturing industry at the censuses of 1931, 1933, and 1935, but because of its importance separate reports were compiled by the United States Bureau of the Census.

φ Two industries were dropped from the Census of Manufactures in 1933 and were not again included in 1935. These were "coffee and spices, roasting and grinding" and "peanuts, walnuts, and other nuts, processed or shelled." In terms of number of wage earners these industries were of very minor importance in each area. In terms of value added, however, coffee and spices, roasting and grinding, accounted for 1.4 per cent of the 1929 total for the San Francisco area and 3.5 per cent of the 1931 total.

[a] Data are not available.

[b] The industrial areas are listed in order of rank in number of manufacturing wage earners in 1929. For full name and definition of areas, see Table 4.

[c] These are the 13 large industrial areas.

[d] The Birmingham district is not included in the total for 33 industrial areas. It is shown here to compare with an industrial center in the South.

TABLE 22

PERCENTAGE OF THE UNITED STATES TOTAL NUMBER OF MANUFACTURING WAGE EARNERS IN PENNSYLVANIA AND INDUSTRIAL AREAS, 1869–1935*

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**												
	1869	1879	1889	1899	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#φ	1933#	1935#
United States	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Pennsylvania	15.55	14.16	13.42	13.79	14.09	13.96	13.27	13.14	12.48	12.44	12.47	11.92	11.83	11.47	11.92	11.81	11.38
Total, 33 Industrial Areas	53.30	60.76	59.62	57.33	55.28	a	a	a	58.15	a	a	a	55.94	56.16	56.32	54.51	55.53
Total, 13 Large Ind. Areas	38.44	44.89	44.43	41.20	39.85	40.43	40.12	40.66	41.21	41.03	40.52	39.88	39.68	39.82	40.23	38.55	40.15
Industrial Areas:[b]																	
New York City Area[c]	10.03	13.94	12.93	12.30	11.80	12.44	12.41	12.44	11.38	12.03	10.68	10.49	10.50	10.39	10.97	10.25	10.56
Chicago Area[c]	1.78	3.25	4.87	5.60	5.33	5.18	5.42	5.67	5.72	5.79	5.84	5.96	6.00	6.23	5.86	5.49	5.81
Philadelphia Area[c]	8.31	8.36	6.84	5.84	5.82	5.43	5.14	4.92	5.12	4.96	4.63	4.33	4.35	4.25	4.49	4.31	4.27
Detroit Area[c]	0.72	0.72	0.90	1.02	0.97	1.11	1.39	1.89	2.90	2.38	3.31	3.58	3.23	3.32	3.20	3.35	4.48
Boston Area[c]	7.79	7.28	6.04	4.97	5.02	4.84	4.73	4.48	4.08	4.24	3.88	3.55	3.53	3.23	3.49	3.35	3.11
Pittsburgh Area[c]	1.90	2.02	2.44	2.91	2.87	3.08	2.88	2.93	2.69	2.35	2.86	2.63	2.59	2.57	2.44	2.36	2.43
Providence Area	2.88	3.03	2.70	2.79	2.82	a	a	a	2.43	a	a	a	2.24	2.09	2.17	2.25	1.93
Cleveland Area[c]	0.55	0.87	1.13	1.27	1.29	1.35	1.55	1.70	2.03	1.75	1.91	1.88	1.87	2.00	1.87	1.87	1.89
St. Louis Area[c]	2.20	1.81	2.12	1.89	1.71	1.95	1.82	1.74	1.68	1.79	1.81	1.78	1.81	1.75	1.81	1.69	1.58
Milwaukee Area	0.53	0.93	1.06	1.21	1.19	a	a	a	1.50	a	a	a	1.57	1.64	1.47	1.32	1.38
Bridgeport Area	1.81	1.98	1.75	1.77	1.60	a	a	a	1.80	a	a	a	1.56	1.54	1.56	1.61	1.66
Buffalo Area[c]	0.77	0.84	1.26	1.07	0.97	1.10	1.13	1.19	1.28	1.26	1.31	1.29	1.26	1.30	1.20	1.15	1.13
Los Angeles Area[c]	0.03	0.03	0.10	0.18	0.13	0.23	0.33	0.44	0.71	0.85	0.89	0.97	1.10	1.30	1.34	1.31	1.48
Cincinnati Area[c]	2.08	2.35	2.47	1.59	1.55	1.51	1.38	1.29	1.24	1.26	1.24	1.23	1.25	1.29	1.23	1.13	1.18
Baltimore Area[c]	1.62	2.27	1.91	1.61	1.54	1.32	1.24	1.21	1.22	1.23	1.16	1.16	1.15	1.13	1.25	1.20	1.16

TABLE 22 (*Continued*)

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**												
	1869	1879	1889	1899	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#φ	1933#	1935#
Industrial Areas:[b]—*Continued*																	
San Francisco Area[c]	0.67	1.16	1.11	0.97	0.85	0.89	0.71	0.77	1.16	1.12	1.01	1.02	1.04	1.06	1.08	1.09	1.06
Worcester Area	2.30	2.04	1.51	1.41	1.28	a	a	a	1.13	a	a	a	1.01	0.95	1.00	1.05	1.00
Youngstown Area	0.40	0.41	0.38	0.50	0.53	a	a	a	0.92	a	a	a	0.90	0.89	0.77	0.90	0.83
Akron Area	0.17	0.14	0.15	0.21	0.22	a	a	a	0.78	a	a	a	0.73	0.76	0.66	0.72	0.67
Hartford Area	0.93	0.77	0.60	0.71	0.70	a	a	a	0.77	a	a	a	0.74	0.74	0.74	0.73	0.75
Minneapolis Area	0.22	0.42	1.09	0.87	0.73	a	a	a	0.73	a	a	a	0.73	0.74	0.80	0.71	0.67
Rochester Area	0.56	0.62	0.75	0.67	0.64	a	a	a	0.74	a	a	a	0.75	0.72	0.72	0.62	0.61
Albany Area	1.54	1.97	1.40	1.17	1.15	a	a	a	0.70	a	a	a	0.70	0.71	0.69	0.56	0.54
Allentown Area	0.54	0.43	0.43	0.64	0.63	0.62	0.67	0.71	0.63	0.65	0.65	0.69	0.69	0.66	0.69	0.70	0.66
Springfield Area	0.83	0.92	0.75	0.71	0.71	a	a	a	0.68	a	a	a	0.66	0.61	0.60	0.57	0.55
Toledo Area	0.11	0.26	0.23	0.29	0.27	a	a	a	0.49	a	a	a	0.50	0.61	0.49	0.44	0.51
Indianapolis Area	0.30	0.38	0.41	0.49	0.45	a	a	a	0.57	a	a	a	0.55	0.58	0.54	0.52	0.50
Kansas City Area	0.21	0.17	0.50	0.53	0.44	a	a	a	0.52	a	a	a	0.49	0.55	0.57	0.55	0.52
Seattle Area	0.01	0.01	0.22	0.28	0.20	a	a	a	0.74	a	a	a	0.52	0.54	0.47	0.43	0.43
Reading Area	0.44	0.37	0.39	0.48	0.48	0.49	0.54	0.53	0.45	0.55	0.52	0.51	0.52	0.54	0.59	0.59	0.57
Wheeling Area	0.45	0.53	0.48	0.51	0.52	a	a	a	0.48	a	a	a	0.52	0.52	0.53	0.63	0.65
Dayton Area	0.24	0.24	0.30	0.36	0.35	a	a	a	0.36	a	a	a	0.39	0.48	0.49	0.49	0.46
Scranton Area	0.40	0.24	0.40	0.53	0.51	0.51	0.54	0.55	0.51	0.53	0.47	0.50	0.50	0.48	0.55	0.58	0.47
Birmingham District[d]	•	0.01	0.19	0.26	0.27	a	a	a	0.32	a	a	a	0.41	0.36	0.34	0.30	0.30

Source: Based on manufacturing reports of the United States Bureau of the Census.
For footnotes other than the following, see Table 21.
• Less than 0.005 per cent.

TABLE 23

Percentage Change in Average Number of Manufacturing Wage Earners for the United States, Pennsylvania, and Industrial Areas, during Specified Periods, 1869–1935*

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**														
	1869 to 1879	1879 to 1889	1889 to 1899	1869 to 1899	1899† to 1904‡	1904‡ to 1909‡	1909‡ to 1914‡	1914‡ to 1919σ	1919σ to 1921‡	1921‡ to 1923‡	1923‡ to 1925‡	1925‡ to 1927	1927 to 1929	1929 to 1931#	1931# to 1933#	1933# to 1935#	1899† to 1919σ	1919σ to 1929	1869 to 1929##
United States	33.0%	55.6%	25.2%	159.1%	16.0%	21.0%	6.4%	29.3%	−23.7%	26.4%	−4.5%	−0.4%	5.9%	−26.1%	−7.2%	21.9%	93.1%	−2.9%	385.9%
Pennsylvania	21.2	47.4	28.7	129.7	15.0	15.0	5.3	22.9	−23.9	26.8	−8.7	−1.2	2.7	−22.2	−9.2	17.4	71.1	−10.7	250.8
Total, 33 Industrial Areas	51.7	52.7	20.4	178.6	a	a	a	a	a	a	a	a	6.3	−25.9	−10.1	24.2	103.1	−6.3	430.9
Total, 13 Large Ind. Areas	55.4	54.0	16.1	177.7	17.7	20.0	7.8	31.1	−24.0	24.8	−6.0	−0.9	6.2	−25.3	−11.0	27.0	99.7	−6.3	420.5
Industrial Areas:b																			
New York City Areac	84.9	44.3	19.1	217.8	22.4	20.7	6.6	18.7	−19.3	12.1	−6.1	−0.3	4.7	−21.9	−13.2	25.5	86.3	−11.6	424.9
Chicago Areac	143.5	133.0	43.8	716.1	12.6	26.6	11.2	30.5	−22.6	27.5	−2.7	0.4	9.9	−30.5	−13.1	29.0	106.9	5.9	1,688.5
Philadelphia Areac	33.7	27.3	6.9	81.9	8.2	14.5	1.9	34.4	−25.9	17.8	−10.5	b	3.4	−22.0	−10.8	20.8	69.8	−19.2	149.5
Detroit Areac	33.1	95.2	41.4	267.4	31.8	52.1	44.7	98.5	−37.5	76.1	3.1	−10.2	8.8	−28.7	−3.0	63.3	475.7	11.0	2,247.5
Boston Areac	24.2	29.1	2.9	65.1	11.9	18.1	0.9	17.7	−20.7	15.5	−12.6	−0.9	−3.1	−20.1	−11.0	13.4	56.9	−23.1	99.2
Pittsburgh Areac	41.5	87.9	49.1	296.5	24.6	13.2	8.0	19.0	−33.3	53.6	−12.1	−1.8	4.9	−30.0	−9.9	25.0	81.3	−7.3	566.9
Providence Area	40.1	38.5	29.1	150.6	a	a	a	a	a	a	a	a	−1.0	−23.2	−3.8	4.4	66.0	−16.2	248.4
Cleveland Areac	109.7	102.3	41.2	498.9	21.4	39.2	16.4	54.8	−34.3	38.2	−6.3	−0.7	13.2	−31.0	−6.8	23.3	204.2	−4.4	1,641.8
St. Louis Areac	9.7	82.3	11.3	122.6	32.8	12.5	1.9	24.8	−18.6	27.3	−5.9	1.3	2.1	−23.3	−13.5	14.0	90.2	0.9	327.2
Milwaukee Area	133.9	75.8	43.7	490.9	a	a	a	a	a	a	a	a	10.4	−33.7	−16.6	27.1	142.6	6.4	1,424.8
Bridgeport Area	45.7	87.2	27.0	153.8	a	a	a	a	a	a	a	a	4.6	−25.1	−4.2	25.9	117.0	−16.8	358.2
Buffalo Areac	45.5	134.5	5.9	261.4	31.2	24.3	12.2	39.0	−25.1	31.5	−5.6	−3.1	9.6	−31.8	−11.3	19.5	154.1	−1.2	807.2
Los Angeles Areac	13.7	504.0	119.6	1,408.1	103.2	71.4	42.1	110.0	−8.0	31.2	5.0	12.7	24.4	−23.5	−9.1	37.6	939.8	77.6	27,754.0
Cincinnati Areac	50.5	63.7	−19.6	98.0	13.4	10.5	−0.8	24.2	−22.3	23.9	−4.7	1.0	9.3	−29.6	−15.0	27.4	54.6	1.2	209.8
Baltimore Areac	87.0	31.1	5.1	157.5	−0.1	13.3	3.8	30.7	−22.9	18.8	−4.5	−1.6	4.1	−18.1	−11.0	18.5	53.4	−10.4	253.8

TABLE 23 (*Continued*)

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**													
	1869 to 1879	1879 to 1889	1889 to 1899	1869 to 1899	1899† to 1904‡	1904‡ to 1909‡	1909‡ to 1914‡	1914‡ to 1919o	1919o to 1921‡	1921‡ to 1923‡	1923‡ to 1925‡	1925‡ to 1927	1927 to 1929	1929 to 1931#	1931# to 1933#	1933# to 1935#	1899† to 1919o	1919o to 1929	1869 to 1929##
Industrial Areas:[b]—*Continued*																			
San Francisco Area[c]	131.1	48.2	9.9	276.4	20.7	−3.5	15.4	95.4	−26.0	14.1	−3.5	0.8	8.5	−24.8	−6.0	18.7	162.6	−10.9	780.5
Worcester Area	18.2	14.9	17.2	59.2	a	a	a	a	a	a	a	a	−0.7	−22.1	−2.4	16.2	70.7	−18.6	121.1
Youngstown Area	37.9	44.0	65.7	229.1	a	a	a	a	a	a	a	a	5.0	−36.2	7.9	12.9	234.0	− 6.2	930.5
Akron Area	13.9	68.6	69.9	226.6	a	a	a	a	a	a	a	a	10.3	−36.1	2.2	13.6	596.6	−5.3	2,054.2
Hartford Area	9.7	21.5	47.8	97.0	a	a	a	a	a	a	a	a	6.4	−25.9	−10.6	27.3	111.8	−6.6	289.7
Minneapolis Area	157.3	302.3	0.1	936.6	a	a	a	a	a	a	a	a	6.8	−19.7	−17.9	15.8	94.1	−2.2	1,868.8
Rochester Area	47.3	87.2	12.1	209.0	a	a	a	a	a	a	a	a	1.2	−25.5	−19.6	18.6	125.2	−6.4	551.4
Albany Area	70.0	10.7	4.1	95.9	a	a	a	a	a	a	a	a	7.5	−28.6	−24.5	18.3	17.7	−1.1	128.2
Allentown Area	4.7	56.4	86.5	205.3	14.5	29.4	13.6	13.8	−20.9	26.7	1.8	−1.1	1.9	−23.4	−5.8	15.6	91.6	2.8	501.2
Springfield Area	46.2	28.1	17.9	120.8	a	a	a	a	a	a	a	a	−1.0	−28.0	−10.8	16.4	85.2	−12.9	256.2
Toledo Area	221.2	37.6	60.1	607.6	a	a	a	a	a	a	a	a	29.8	−40.8	−16.7	42.2	246.6	20.8	2,861.9
Indianapolis Area	69.8	65.9	49.0	319.5	a	a	a	a	a	a	a	a	11.5	−31.0	−11.4	17.7	144.8	−2.0	906.8
Kansas City Area	8.7	349.0	31.3	541.0	a	a	a	a	a	a	a	a	18.0	−22.6	−10.1	15.3	128.5	2.2	1,396.8
Seattle Area	93.6	3,008.6	58.4	9,432.5	a	a	a	a	a	a	a	a	9.6	−35.1	−14.4	20.8	600.0	−29.4	46,879.2
Reading Area	11.3	65.2	53.5	182.3	19.5	33.3	2.8	11.0	−7.5	21.1	−5.5	1.0	9.1	−18.2	−7.7	18.4	81.7	15.3	491.4
Wheeling Area	53.8	40.8	35.6	193.6	a	a	a	a	a	a	a	a	6.6	−25.2	11.0	25.4	77.3	4.8	445.7
Dayton Area	37.3	88.2	52.5	294.2	a	a	a	a	a	a	a	a	29.4	−25.4	−6.4	15.5	100.5	28.7	917.5
Scranton Area	−19.7	159.7	64.6	243.2	17.2	28.6	8.3	17.9	−19.5	10.8	2.4	−0.8	1.4	−15.2	−2.2	−0.4	92.4	−8.1	507.0
Birmingham District[d]	584.1	2,533.2	77.6	31,890.9	a	a	a	a	a	a	a	a	−8.3	−29.5	−17.1	22.0	131.3	9.1	80,782.1

Source: Based on manufacturing reports of the United States Bureau of the Census.
For footnotes other than the following, see Table 21.
These percentages were computed from adjusted figures for 1869. In order to eliminate hand trades, the 1869 figure for each area was lowered according to the extent of hand trades in 1899.

grew slightly more rapidly in manufacturing employment than did the country.[7]

Pennsylvania and the Philadelphia and Pittsburgh Areas

The importance of Pennsylvania in manufacturing employment, as a proportion of the national total, decreased from 15.55 per cent in 1869 to 11.47 per cent in 1929 (Table 22). For the Philadelphia area the drop was even more severe, with the result that the area was relatively only half as important at the end of the period as at the beginning (Table 4). The Pittsburgh area gained steadily with respect to the national total up to 1904, since which year the trend in the national importance of the area has been downward. Comparable changes occurred in the position of the area in each of the two groups of industrial areas. As a percentage of the state total the Pittsburgh area gained rapidly up to 1904; since 1904 the district has maintained much the same position, accounting in the past 30 years for somewhat more than one-fifth of the total number of manufacturing wage earners in the state.

The relative importance of the Pittsburgh Industrial Area in manufacturing employment in the United States, Pennsylvania, and the two groups of areas has varied as follows:

---

[7] The Bureau of the Census indicates a slightly less rapid growth from 1899 to 1929 in the group of areas than in the country, but its conclusion is based on unrevised data for 1899, that is, on the data including workers in hand, building, and neighborhood industries. *Manufactures, 1929*, Vol. I, p. 241. The Bureau of the Census revised the 1899 data for states and cities but not the data for counties.

For individual areas the relative gain in number of manufacturing wage earners from 1899 to 1929 is greatly understated in another Census Bureau publication, *Location of Manufactures, 1899–1929*, a study of the tendencies toward concentration and toward dispersion of manufactures, prepared by Tracy E. Thompson. The understatements result from the use of unrevised data for 1899. For the Pittsburgh Industrial Area the percentage gain from 1899 to 1929 is given as 46.7 per cent, whereas estimated revision of the 1899 data indicates that it should be 68.2 per cent. Moreover, to obtain figures for the part of the area outside the central city, Thompson subtracted revised city totals from unrevised area totals. The use of such differences understates the growth of manufactures in the suburban section of the area. Thus, for that section of the Pittsburgh area the relative gain from 1899 to 1929 is given as 99.3 per cent, whereas estimated revision of the 1899 data indicates that it should be 161.8 per cent. Likewise, the errors affected the measurement of the relative importance of the central city in its area. In terms of number of manufacturing wage earners, the relative importance of Pittsburgh in the Pittsburgh area is stated to fall from 46.3 per cent in 1899 to 27.1 per cent in 1929, whereas estimated revision of the 1899 data indicates a drop from 53.1 per cent to 27.1 per cent.

Year	Percentage of United States Total	Percentage of Pennsylvania Total	Percentage of 33-Area Total	Percentage of 13-Area Total
1869	1.90%	12.23%	3.57%	4.95%
1879	2.02	14.28	3.33	4.51
1889	2.44	18.21	4.10	5.50
1899	2.91	21.11	5.08	7.07
1899 (Revised)	2.87	20.35	5.19	7.19
1904	3.08	22.06	—	7.62
1909	2.88	21.72	—	7.18
1914	2.93	22.27	—	7.20
1919	2.69	21.57	4.63	6.53
1921	2.35	18.90	—	5.73
1923	2.86	22.91	—	7.05
1925	2.63	22.07	—	6.60
1927	2.59	21.94	4.64	6.54
1929	2.57	22.41	4.58	6.46
1931	2.44	20.43	4.32	6.05
1933	2.36	20.01	4.34	6.13
1935	2.43	21.32	4.37	6.04

Average Annual Rates of Growth

An approximation of the average annual gain in manufacturing employment in the United States from 1869 to 1929 indicates that during the period (and especially up to 1919) the rate of growth in manufacturing employment exceeded the rate of growth in population; the rates were about 2¾ per cent for manufacturing employment and less than 2 per cent for population. On the other hand, in the 13 areas the rate of growth was approximately 2¾ per cent in each instance. In Pennsylvania the rate was greater for manufacturing employment than for population—2⅓ per cent and 1¾ per cent, respectively. The same relationship applied to the Pittsburgh area, where the rate for manufacturing employment was 3¼ per cent and that for population 2¾ per cent. In the Philadelphia area the opposite was true, population growing somewhat faster than manufacturing employment—1⅞ per cent in comparison with 1½ per cent.

Intercensal Percentage Changes in Pennsylvania Areas

Percentage changes in manufacturing employment in the Pennsylvania industrial areas for each intercensal period are contained in Table 23. Below are presented relative changes for important segments of the period from 1869 to 1935:

Area	1869 to 1899	1899 to 1919	1919 to 1929	1929 to 1933	1933 to 1935
Philadelphia Area	81.9%	69.8%	−19.2%	−30.4%	20.8
Pittsburgh Area	296.5	81.3	− 7.3	−36.9	25.0
Allentown Area	205.3	91.6	2.8	−27.8	15.6
Reading Area	182.3	81.7	15.3	−24.5	18.4
Scranton Area	243.2	92.4	− 8.1	−17.1	− 0.4

The severity of the cyclical swings since 1929 in the Pittsburgh area is notable. Moreover, attention should be directed to the slight decrease from 1933 to 1935 in the Scranton area. It was the only area to report a drop in manufacturing employment between these two years.

Each Pennsylvania area gained less rapidly from 1899 to 1919 than did the all-area total. The gain was unusually low in Philadelphia, the oldest of the Pennsylvania areas. From 1919 to 1929, only Reading and Allentown reported gains. The percentage increase in the Reading area was outstanding; in fact, in the entire country only three other areas reported gains which exceeded it.

Major Postwar Changes among Manufacturing Industries in Pennsylvania Areas

Manufacturing employment in the Reading area increased by about 6,300 from 1919 to 1929 (Table 21). This gain, almost unique for an eastern area, resulted from expansion in the textile industries, notably knit goods. Employment in these industries increased approximately 8,000 during the decade. This increase was partially offset by losses in iron and steel and tobacco industries. The growth of the textile industry in this area was a part of the transfer of activity in this industry from heavily populated districts to smaller cities. In this instance, part of the industry preferred to move into the less densely populated sections of eastern Pennsylvania rather than to move to the South. The primary incentive probably was to obtain cheaper labor.

In the Allentown area also there was a notable proportional gain in employment in textile industries, about 7,000 from 1919 to 1929. Since there were considerable losses in the iron and steel, the clay, glass, and stone, and the tobacco industries, the net gain for the district was somewhat less than 2,000. The loss in employment in

the Scranton district during this period was somewhat less than 4,000; the decrease in iron and steel industries alone exceeded that figure.

The Pittsburgh Industrial Area employed 17,770 fewer manufacturing wage earners in 1929 than in 1919. In Allegheny County alone the loss was greater than this—18,187. There was a gain of approximately 4,000 in Beaver County and losses of around 1,000 and 2,000 in Washington and Westmoreland counties, respectively. In Allegheny County the loss in employment in steelworks and rolling mills was almost equal to the total loss. The changes in the other industries approximately balanced each other, the gains in the food and the paper and printing industries offsetting the losses in chemical, clay products, textile, and lumber industries.

The Philadelphia Industrial Area during the postwar decade lost about 90,000 manufacturing wage earners. This decrease was concentrated in three counties: Philadelphia, 34,000; Delaware, 37,000; and Camden, 15,000. By far the greatest part of the loss was accounted for by decreases in shipbuilding. Indeed, there were approximately 59,000 fewer men employed in this industry in 1929 than in 1919. The loss in the woolen and worsted goods industry, confined entirely to the city, was approximately 6,000. The remaining decrease of 25,000 was scattered over a great variety of industries.

Comparative Growth in Manufacturing Employment in Iron and Steel Areas

Iron and steel production is the leading manufacturing industry, or a very important one, in eight of the 33 industrial areas and in the Birmingham district. These nine areas accounted for nearly two-thirds of all wage earners employed in iron and steelworks and rolling mills in the nation in 1929. The Pittsburgh area contributed one-fifth of the total and the Chicago and Youngstown areas each more than one-tenth. The importance of the iron and steel industry relative to total local manufacturing was greatest in the Youngstown area; more than half of all manufacturing wage earners there were employed in that industry in 1929. Table 24 presents figures for the 16 leading iron and steel areas and districts, the most important not treated in the following discussion being the Canton district.

TABLE 24

AVERAGE NUMBER OF WAGE EARNERS IN THE IRON AND STEEL INDUSTRY: SELECTED DATA FOR SPECIFIED INDUSTRIAL AREAS AND DISTRICTS, 1929

Area	Average Number of Wage Earners in the Iron and Steel Industry* 1929	Percentage of the United States Total Accounted for by Each Area 1929	Percentage Ratio of Iron and Steel Wage Earners to Total Manufacturing Wage Earners, for Each Area 1929
United States	419,534	100.0%	4.7%
Pittsburgh Industrial Area[a]	85,600	20.4	37.7
Chicago Industrial Area[a]	49,300	11.8	8.9
Youngstown Industrial Area	44,915	10.7	56.9
Cleveland Industrial Area	20,952	5.0	11.8
Wheeling Industrial Area	18,790	4.5	40.9
Canton District[a b]	13,900	3.3	43.2
Buffalo Industrial Area[a]	13,800	3.3	12.0
Philadelphia Industrial Area	13,438	3.2	3.6
Baltimore Industrial Area[a]	11,300	2.7	11.3
Allentown Industrial Area[a]	10,500	2.5	18.0
St. Louis Industrial Area[a]	10,400	2.5	6.7
Johnstown District[a c]	9,800	2.3	71.7
Birmingham District[a d]	9,700	2.3	30.8
Harrisburg District[a e]	6,300	1.5	32.1
Cincinnati Industrial Area	6,000	1.4	5.3
Milwaukee Industrial Area	5,248	1.2	3.6
Remainder of the United States[a]	89,591	21.4	—

Source: Based on manufacturing reports of the United States Bureau of the Census.
* Blast furnaces and steelworks and rolling mills.
[a] Partly estimated.
[b] Stark County, Ohio.
[c] Cambria County, Pennsylvania.
[d] Jefferson County, Alabama. Much of the pig iron produced in the Birmingham district is used in the manufacture of cast-iron pipe instead of steel. Cast-iron pipe in 1929 accounted for about 6,000 wage earners.
[e] Dauphin County, Pennsylvania.

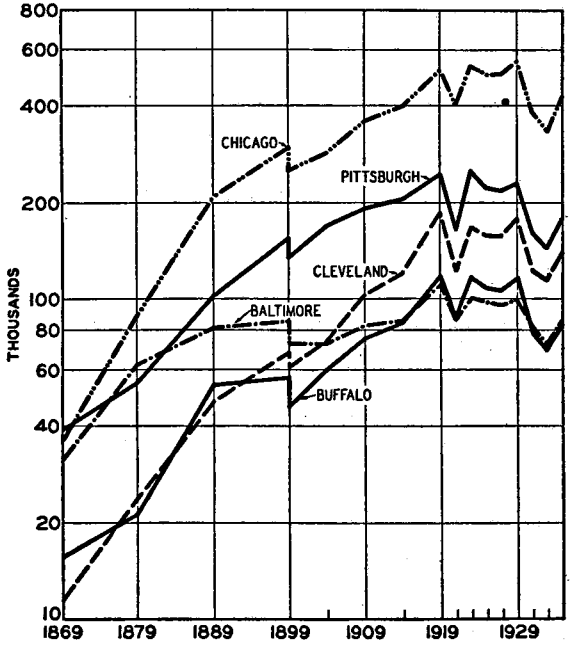
Among iron and steel areas in 1869 the Pittsburgh Industrial Area gave employment in all manufacturing to the largest number of wage earners.[8] Ten years later the Pittsburgh area placed below the Chicago and Baltimore areas, but by 1889 it had passed the Baltimore area and since then has ranked second among iron and steel districts, on the basis of the average number of wage earners in all manufacturing industries combined. Manufacturing

[8] It should be pointed out that the district tributary to Philadelphia, not considered in this section because it is not now an important steel area, was in 1869 the leading section in the country in the production and rolling of iron and that it accounted for many more manufacturing wage earners in all industries in that year than did the Pittsburgh area.

employment in the Chicago area grew from 36,481 in 1869 (including various hand trades) to a peak of 550,903 in 1929 (Table 21). At the same time, employment in the Pittsburgh area rose from 39,071 to 227,221; the peak, however, had been reached in 1923, when 250,900 wage earners were employed in the area.

CHART 25

AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN FIVE IRON AND STEEL INDUSTRIAL AREAS, 1869–1935



Manufacturing employment grew faster in the Chicago area than in the Pittsburgh area throughout the period after 1869; note the degree to which the Chicago curve pulls away from the Pittsburgh curve in Chart 25.[9] The Cleveland area grew less rapidly than the

[9] The chart presents curves for only five of the nine areas; the curve for the Allentown area, given in Chart 24, could have been included here, but totals for missing census years for the Youngstown, Birmingham, and Wheeling areas could not be readily estimated.

Chicago area up to 1889, more rapidly from that year up to 1919, and slightly less rapidly again after 1919. This area, however, gained on the Pittsburgh area throughout the period; in fact, Baltimore is the only area plotted in Chart 25 which did not gain relatively to Pittsburgh. This Maryland area grew very slowly from 1879 to 1914 and even up to 1929. During the twenties it ranked below the Buffalo area; but since 1929 it has suffered much less than that area and in each of the three following biennial years has reported higher factory employment.

The relative gain in manufacturing employment from 1869 to 1899 was far greater in Birmingham than in any other iron and steel area. The smallest gain came in the Baltimore area, which was not of importance in the iron and steel industry until the end of the period. Among the steel areas of earlier importance, Wheeling reported the smallest gain. In the 30-year period ending with 1929, the greatest gain came in the Youngstown area, primary beneficiary from the growing demand for automobile sheets; the smallest gain was made by Baltimore, although the gains in Pittsburgh and Wheeling also were comparatively small. Wheeling was the only steel area to report a gain from 1929 to 1935.

During the 60-year period from 1869 to 1929, all nine areas increased far more rapidly in manufacturing employment than in population, especially during the first half of the period. The degree by which the rate of growth in number of manufacturing wage earners exceeded that in population was the greatest in Birmingham and the least in Pittsburgh. Among the nine steel areas, Pittsburgh, Baltimore, and Chicago were the only ones in which the rates for manufacturing employment were not at least double the corresponding rates for population.

Average Annual Rates of Change

Among large iron and steel areas the highest annual rate of gain in manufacturing employment from 1869 to 1929 was that for Chicago. After the usual adjustment for the change in the scope of the census in 1899, the annual rate for that area approximated 5 per cent. For the Birmingham district, which is both newer and smaller, the rate was about 12 per cent. The rate for the Pittsburgh area was 3¼ per cent. The rate for each area in this group

follows:

Birmingham	12%	Pittsburgh	3¼%
Chicago	5¼	Allentown	3
Cleveland	5	Wheeling	2¾
Youngstown	4	Baltimore	2
Buffalo	3¾		

Intercensal Percentage Changes in Iron and Steel Areas

The percentage changes in number of manufacturing wage earners in iron and steel areas for all intercensal periods since 1869 are given in Table 23. The following figures indicate relative gains or losses for longer intervals:

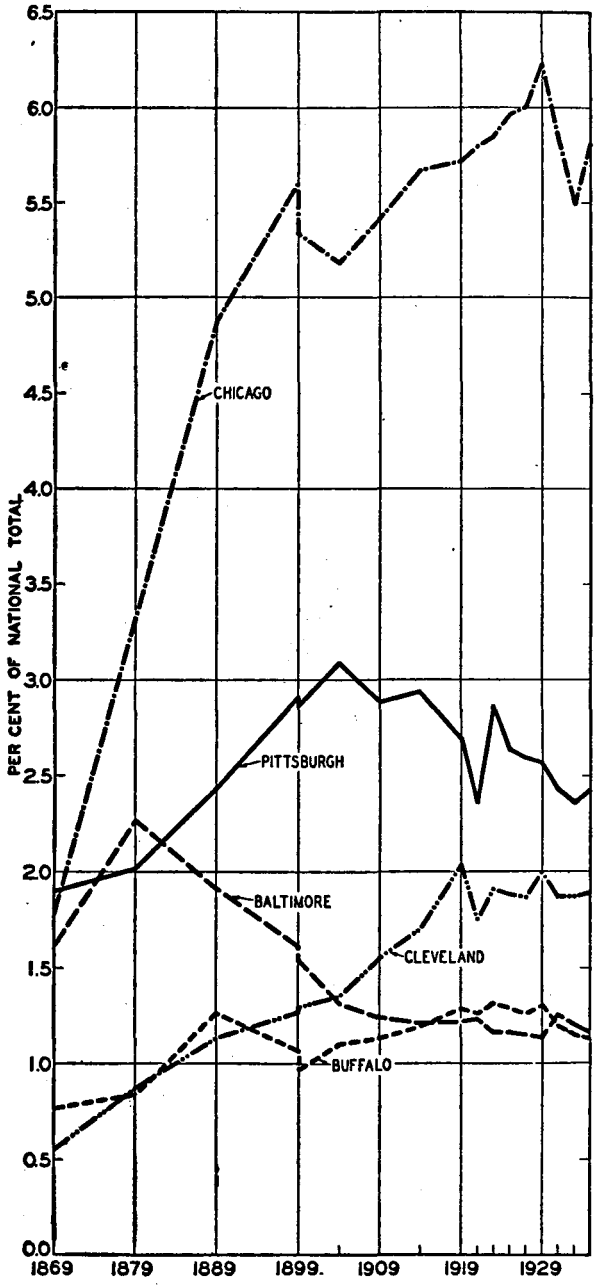
Area	1869 to 1899	1899 to 1919	1919 to 1929	1929 to 1933	1933 to 1935
Chicago Area	716.1%	106.9%	5.9%	−39.6%	29.0%
Pittsburgh Area	296.5	81.3	−7.3	−36.9	25.0
Cleveland Area	498.9	204.2	−4.4	−35.8	23.3
Buffalo Area	261.4	154.1	−1.2	−39.5	19.5
Baltimore Area	157.5	53.4	−10.4	−27.1	18.5
Youngstown Area	229.1	234.0	−6.2	−31.2	12.9
Birmingham District	31,890.9	131.3	9.1	−41.6	22.0
Wheeling Area	193.6	77.3	4.8	−16.9	25.4
Allentown Area	205.3	91.6	2.8	−27.8	15.6

Growth Relative to That for the United States

Of the five major steel areas, Chicago has gained by far the most since 1869 in the national total (Chart 26). In that year the Chicago area included 1.78 per cent of all manufacturing wage earners in the country (Table 22). The area's share of the national total rose very rapidly up to 1899, when it stood at 5.60 per cent. The 1899 adjustment lowered this percentage somewhat, because of the unusual importance of the various hand trades in that district; but after 1904 the Chicago area again began to attain greater and greater national importance. The peak was reached in 1929, when 6.23 per cent of the nation's manufacturing workers were included in that area. By contrast, the Pittsburgh area grew rather slowly in comparison with the country from 1869 to 1879; but from 1879 to 1904 its relative importance gained steadily, the percentage rising from 1.90 in 1869 to 3.08 in 1904. Since 1904 the trend in the Pittsburgh share has been downward. The Cleveland area gained rapidly in the national total up to 1919; since then

CHART 26

PERCENTAGE OF THE UNITED STATES TOTAL NUMBER OF MANUFACTURING WAGE EARNERS IN FIVE IRON AND STEEL INDUSTRIAL AREAS, 1869–1935



its relative position has been maintained at nearly 2 per cent. Of the other two areas, Buffalo gained somewhat in the total over the full period under consideration and Baltimore lost considerably.

The year 1904 [10] has special significance in comparisons of the proportions of the national total in the Chicago and Pittsburgh areas. Most of the present number of blast furnaces in the Pittsburgh district had been constructed by 1904. Additional construction between 1906 and 1911 in part explains the small rise from 1909 to 1914 in the national importance of the district. But a smaller percentage of all manufacturing wage earners in the country was included in the district in 1914 than in 1904. The Chicago area, on the other hand, fell somewhat in national importance between 1899 and 1904 but, partly as a result of the development of the Gary-Indiana Harbor steel district, rose rapidly during the following decade. Important changes in the national position of the other three steel areas also occurred around 1904. A few years before, large-scale developments in the steel industry at Buffalo had been followed by a reversal of the downward movement in the relative size of that area. An acceleration in the growth of employment in Cleveland took place at this time; and Baltimore, after a long period of relatively slow growth, began to grow at about the same rate as the country.

Patterns of Percentage Gains in Subperiods

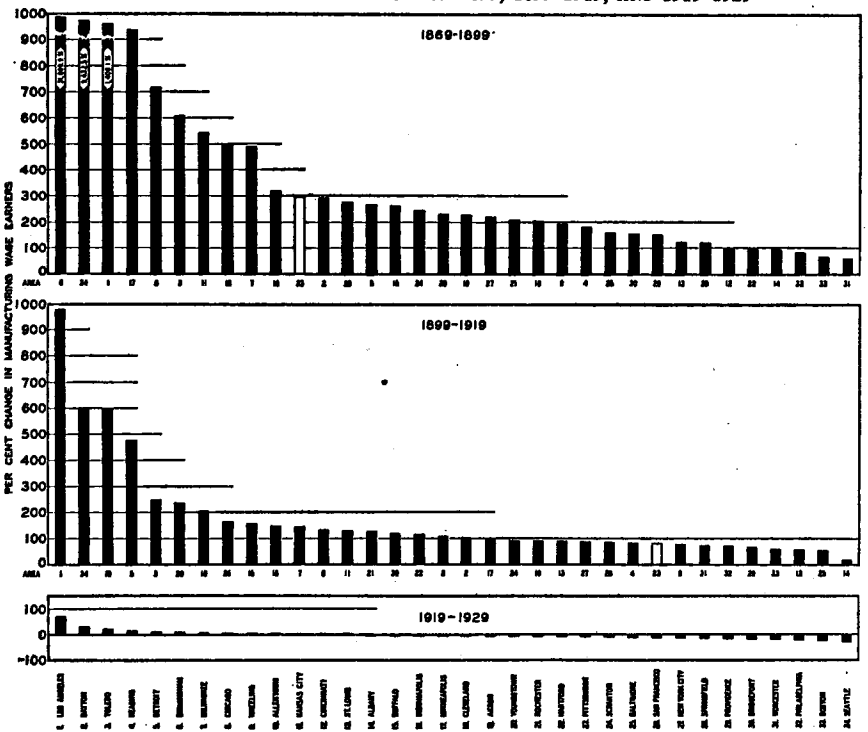
In percentage growth of manufacturing employment there was a tendency for the areas to rank in roughly the same order in the period 1899–1919 [11] as in the period 1869–1899. Los Angeles and Seattle placed at or near the top in both periods and Albany, Boston, and Worcester at or near the bottom (Chart 27). The tendency, however, was not so significant as that for rank in relative gain in population to be about the same in the two periods discussed in the corresponding section of Chapter 2. In manufac-

[10] The ratio of pig iron production in the western half of Pennsylvania to that in the United States reached a peak in 1904 at 38.7 per cent. In 1929, western Pennsylvania accounted for 27.5 per cent of the national output; and, in 1933, for only 24.4 per cent. *Industrial Databook for the Pittsburgh District* (University of Pittsburgh, Bureau of Business Research Statistical Handbooks, Number 2), p. 29.

[11] Because of the sharp break in the upward trend in manufacturing employment after 1919, the period 1899–1919 is used here rather than the period 1899–1929, which would be roughly comparable with the period used in the corresponding section of Chapter 2.

CHART 27

PERCENTAGE CHANGES IN AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN INDUSTRIAL AREAS FOR THE PERIODS 1869–1899, 1899–1919, AND 1919–1929



turing employment as in population, Akron, Hartford, Youngstown, and Detroit ranked much higher in the last period; Minneapolis, much higher in the first period.

The pattern of percentage gains was about the same in the two periods, although in the second the average level was much lower and the highest gains were not so extreme. The Pittsburgh area ranked eleventh in relative gain in the first period and twenty-sixth in the second; this was one of the greatest losses in rank—Minneapolis also fell 15 positions—and is related to the flattening out of the growth curve for iron and steel production in the district.

From 1919 to 1929, only 13 of the 34 areas gained in manufacturing employment. Only five areas gained more than 10 per cent, and only one more than 30 per cent. As far as rank in relative gain is concerned, there was only slight similarity between this period and the period 1899–1919; the greatest change in rank occurred in the Seattle area, which dropped from second to thirty-fourth position. Pittsburgh ranked twenty-third, approximately in the middle of the group of areas that lost in number of manufacturing wage earners.

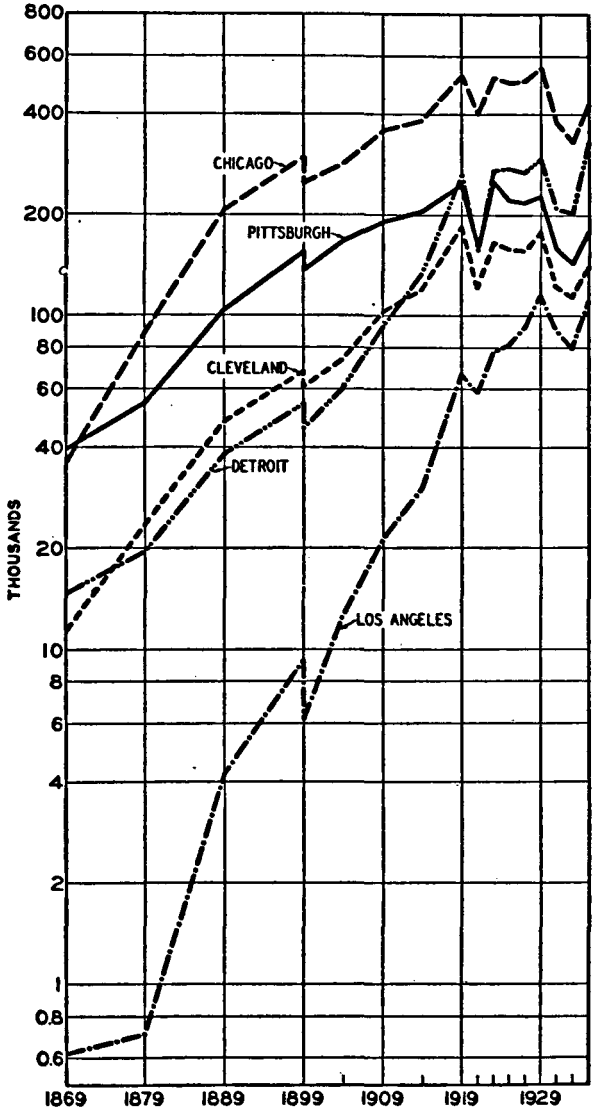
Areas with High Rates of Growth

Four of the 13 areas for which adequate manufacturing statistics are available fall in the group of areas with high rates of growth: the areas centering in Chicago, Detroit, Cleveland, and Los Angeles (Chart 28, which includes the Pittsburgh area curve for purposes of comparison). Five smaller areas also belong in this group. Even though census data are fragmentary, they are sufficient to indicate that, over the period 1869–1929, manufacturing employment grew at relatively high rates in the Birmingham, Seattle, Toledo, Akron, and Minneapolis areas (Table 23). Chart 28 indicates that the Pittsburgh area does not belong in this group of rapidly growing areas, since the slope of the Pittsburgh curve is less steep than the slope of any of the other curves.

Of all areas, the Birmingham district registered by far the greatest relative gain over the 60-year period (Tables 21 and 23). Manufacturing activity was practically nonexistent in that district in 1869. Great booms occurred in the Seattle and Birmingham areas between 1879 and 1889; the relative gains in manufacturing employment far exceeded those recorded by any other area in any census decade since 1869.

CHART 28

AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN INDUSTRIAL AREAS WITH HIGH RATES OF GROWTH, 1869–1935
(The Pittsburgh area is included for comparison)



Of the four large areas in this group, Los Angeles far outdistanced the other three areas in relative gains from 1869 to 1929 in number of manufacturing wage earners as well as in population; but it should be noted that the Los Angeles area was of little importance during the first half of the period and that not until 1904 did it employ as many as 10,000 manufacturing wage earners. With respect to growth in manufacturing employment as well as in population, the astonishing thing is that the early rates of growth during the period of industrial infancy should have been maintained after the area became of important size. Nationally, however, the area has always been and still remains less important in manufacturing employment than in population. The curve for the Detroit area indicates growth at an increasing rate from 1869 to 1919, somewhat the same change as that revealed in the population curve for the area. The Detroit and Cleveland areas went through much the same stages of development and grew at analogous rates up through 1899; but, with the developing importance of the automobile industry, Detroit began to gain on the Cleveland area, which had ranked considerably above it in 1899. By 1914 Detroit was in the lead. The development of the bodies and parts sections of the automobile industry helps to account for the considerable growth in the Cleveland area.

The high rank of the Toledo area in percentage gains from 1919 to 1929 was entirely a result of the cyclical upswing from 1927 to 1929; indeed, of all areas this area reported the greatest rise between those two years and the greatest fall from 1929 to 1931. As a group these rapidly growing areas gained much more in the 1927–1929 boom in manufacturing employment and lost much more in the subsequent recession than did the group of all areas.

Causes of High Gains in Manufacturing Employment

Each of the nine areas with high rates of growth grew much more rapidly in manufacturing employment than in population. The difference between the two rates was the greatest in the Birmingham and Toledo areas. In the first, manufacturing developed in an agricultural district; in the second, in an old trading community. For the entire group, population shifts and the development of new industries are largely responsible for the rapid growth in manufacturing activity. (The same factors account also for the high rates in the Milwaukee and Kansas City areas, which rank

just below the nine areas in relative gains in manufacturing employment from 1869 to 1929.)

In four of the areas, manufacturing activity was greatly stimulated by the expansion of the automobile industry. Another four areas, including Chicago, were essentially frontier communities in 1869, and the subsequent growth in manufacturing resulted from the westward movement of population. The ninth area, Birmingham, grew rapidly upon the development of the iron and steel industry in that district.

From 1899 to 1919 the high rates of gain in two of the areas, Seattle and Los Angeles, in part resulted from wartime expansion in the shipbuilding industry. During the same period the Youngstown area experienced a rapid growth, in part a result of increased sales of automobile steel. The Dayton area ranked second in percentage gains in manufacturing wage earners during the postwar decade, 1919–1929; the development of a new industry, mechanical refrigeration production, was largely responsible for the unusual growth.

Areas with Low Rates of Growth

The larger areas with low rates of growth include three tidewater areas—Philadelphia, Boston, and Baltimore—and two midwestern areas—St. Louis and Cincinnati (Table 23). These five areas also exhibited very low rates of population growth. The three areas first mentioned probably achieved their highest relative importance in manufacturing in the nation long before 1869 (early data are not available); at any rate, these areas have been losing in relative importance since 1879. Moreover, the relative position of the two midwestern areas reached a maximum as early as 1889 (Table 22). The curves for manufacturing employment in the Philadelphia, Boston, and Baltimore areas indicate a moderate rate of growth up to 1889, slight growth during the next decade, then more rapid gains up to 1914, and a marked rise from 1914 to an all-time high in 1919 (Chart 29). Peaks in manufacturing employment in 1923 and in 1929 were successively lower. On the other hand, the St. Louis and Cincinnati curves indicate rapid growth up to 1889 and somewhat less rapid growth between 1899 and 1914, with peak employment coming in 1929. The Cincinnati area reached its maximum national importance in 1889; during the 1880's it was the national manufacturing center for the

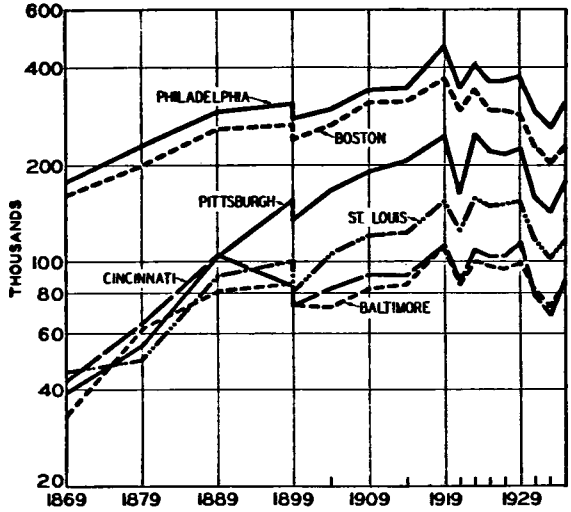
production of agricultural implements and carriages and wagons. Between 1889 and 1899, three important industries in the Cincinnati area began to shift elsewhere—the agricultural implement industry to the Chicago area, the men's clothing industry to Cleveland, and the carriage and wagon industry to northern Indiana and northern Illinois.

Five other areas are properly placed in the classification of those having low rates of growth—the Worcester, Albany, Providence,

CHART 29

AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN INDUSTRIAL AREAS WITH LOW RATES OF GROWTH, 1869–1935

(The Pittsburgh area is included for comparison)



Springfield, and Hartford areas. These are all very old industrial areas located in the extreme northeastern section of the country. Manufacturing employment, even after adjustments for the exclusion of hand trades in 1869, failed to double between 1869 and 1929 in the Boston area and little more than doubled in the Worcester and Albany areas.

Each of the 10 areas in this group lost in national importance during all or nearly all of the full period. The relative loss was the greatest in the Albany area, which fell from 1.97 per cent in

1879 to around 0.56 per cent in 1933. On the other hand, the number of points by which the percentage dropped was the greatest for the Boston area, for which the percentage of the United States total fell from 7.79 in 1879 to 3.35 in 1933 and to 3.11 in 1935.

The Pittsburgh area grew much more rapidly between 1869 and 1919 than the 10 areas in this group; and though it exhibits some similarity with most of these areas after 1919, it is properly included in the group having medium rates of growth, considered later.

Manufacturing employment failed to grow as rapidly as population over the full period considered here in only five of the 33 areas—namely, the Philadelphia, Boston, Providence, Worcester, and Springfield areas. All these are areas with low rates of growth. The other five areas in this group grew somewhat more rapidly in manufacturing employment than in population. From this and the preceding section, it may be concluded: first, that the rankings in terms of relative gains in population and those in terms of manufacturing employment were similar; and, second, that among areas with high rates the relative gains in manufacturing employment far exceeded those in population, whereas among areas with low rates the gains in manufacturing employment were less or only slightly greater.

Relation of Low Rates of Growth to Type of Industry

Attempts to explain why the 10 areas have ranked low in relative growth in manufacturing employment disclose the facts that with the exceptions of St. Louis and Hartford these areas are old centers of the textile or clothing industries and that the slow rates of growth, or after 1919 the losses, in these two industries have been of primary significance in acounting for the slow rise in total manufacturing employment in these areas down to 1919 and the great drop since then. These changes are to a considerable degree the reflection of the rapid development of the textile industry in the South.

From 1919 to 1929, major decreases in number of manufacturing wage earners occurred in four other areas—Seattle, Bridgeport, New York City, and San Francisco. Indeed, the loss in Seattle was greater than that in Boston, the textile area which suffered the most during the postwar decade. The collapse of the shipbuilding boom was the major reason for postwar losses in the

Seattle and San Francisco areas and was an important factor contributing to losses in the New York City, Philadelphia, and Baltimore areas. The great decrease in manufacturing employment in the Bridgeport area after the war resulted from the closing down of munition factories and other plants which were still working on government contracts in 1919.

Areas with Medium Rates of Growth

Four of the 13 large industrial areas—the areas centering in New York City, Pittsburgh, Buffalo, and San Francisco—have been classified as areas in which the number of manufacturing wage earners increased from 1869 to 1929 at moderate rates (Table 23). These areas are more similar with respect to industrial age than with respect to types of manufactured products. All are comparatively old manufacturing centers, except the San Francisco area, which is, however, the oldest industrial district in the Far West. The New York City and San Francisco areas are important manufacturing districts for consumers' goods; the Pittsburgh and Buffalo areas, for producers' goods. The producers' goods areas show wider swings between good and bad years than do the consumers' goods areas (Chart 30). (Note, however, the effect of the San Francisco earthquake and fire in 1906 on the growth of that area.) Thus, the 1921–1923 rise is much more pronounced in the Pittsburgh and Buffalo areas than in the other two areas. The rise was unusually great in the Pittsburgh area because of the sharp increase in the demand for structural steel.

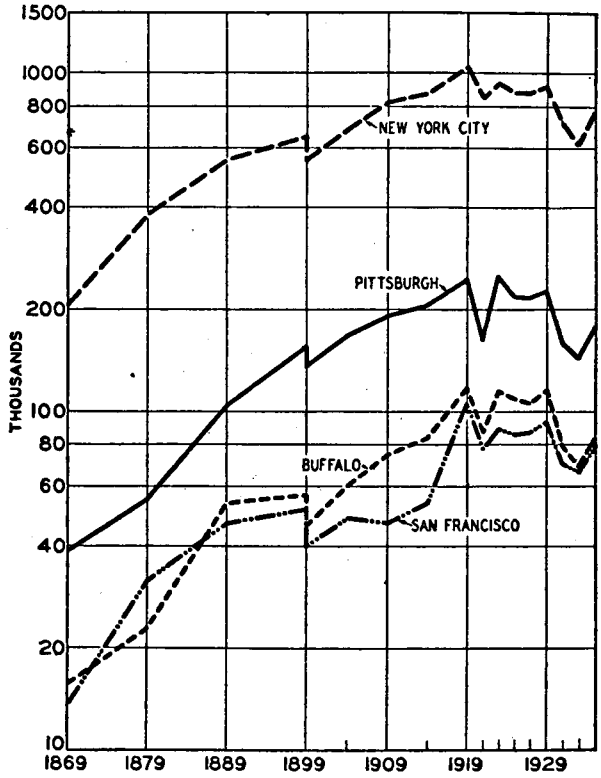
Also in this group should be included five smaller areas—Rochester, Scranton, Allentown, Reading, and Wheeling. In relative gain over the entire period up to 1929, these areas ranked just below the Pittsburgh area. They, like the larger areas having medium rates of growth, are older manufacturing districts and, like three of the larger areas in this group, are located in or adjacent to the Middle Atlantic section of the country.

Prior to 1919 the areas in this group were gaining faster in number of manufacturing wage earners than in population, but during the 1920's population continued to grow and manufacturing employment began to decline. The same conditions applied to most other industrial areas. Up to 1919, manufacturing was a rapidly expanding occupational field, whereas since that year the service occupations have been growing much more rapidly.

Growth in number of wage earners in manufacturing prior to 1899 was slightly greater in the Pittsburgh area than in the 13 large areas as a group; after 1899 the opposite was true. The same relationships held with respect to population growth. In

CHART 30

AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN INDUSTRIAL AREAS WITH MEDIUM RATES OF GROWTH, 1869–1935



terms of the percentage of gain in number of manufacturing wage earners over the entire 60-year interval ending in 1929, Pittsburgh ranked almost exactly in the middle of the list of all areas; the gain, however, was materially above that for the 33-area total. There is less similarity between the manufacturing employment curves for the New York City and the Pittsburgh areas than be-

tween the population curves for the two areas. The employment curve for the New York City area closely parallels that for the 13-area total.

Relation between Rate of Growth in Manufacturing Employment and Size of Area

In each half of the 60-year period from 1869 to 1929 the greatest relative gains in manufacturing employment occurred in industrial areas which, at the beginning of the respective subperiods, were comparatively small in population. Of the seven areas—including Birmingham—which grew the most rapidly in manufacturing employment from 1869 to 1899, all but one ranked lower than twenty-fourth in population in 1870. The exception was the Chicago area, which ranked fourth in population in 1870 and fifth in gain in number of manufacturing workers during this period. The Chicago area, however, was a frontier community in 1870; even though it was the metropolis of the Midwest, it was located on the edge of a section that was only partially settled.

Of the eight areas which gained relatively the most in manufacturing employment from 1899 to 1929, two of them were middle-sized population centers. These were the Cleveland and Detroit areas, which ranked twelfth and seventeenth, respectively, in population in 1900. The other six areas ranked twenty-second or lower.

Relation between Rate of Growth in Manufacturing Employment and Location of Area

If the 34 industrial areas (including the Birmingham district) are ranked according to relative gain in manufacturing employment from 1869 to 1899 and divided into three roughly equal groups, significant relationships between rates of growth and location of these areas are apparent (Chart 27). Of the 10 areas that gained the most, seven were midwestern areas, two were Pacific Coast areas, and one was located in the South. Of the middle 12 areas, six were Middle Atlantic areas; five were East North Central areas; and one, a Pacific Coast area. Of the 12 areas in the lower third of the list, six were New England areas; three, Middle Atlantic areas; two, midwestern areas; and one, a southern area. Briefly, there is a tendency for the rate of gain to rise the farther the area is located to the west of New England.

The same relationship between rate of growth and location of area characterizes the second half of the 60-year period. From 1899 to 1929 the areas which ranked in the upper third of the list in manufacturing employment were with one exception located in East North Central or Pacific Coast states. Those in the middle third of the list were scattered throughout several sections of the country, though there was a tendency for the areas to concentrate in the eastern part of the East North Central district and in the Middle Atlantic states. Of the areas in the lower third of the list, most were either New England areas or areas located in the eastern part of the Middle Atlantic section.

The relationship between rate of growth and location of area probably results primarily from the fact that the population settlement in this country proceeded from east to west. During the second half of the period, another factor of probably greater importance in accounting for the large gains in manufacturing employment in areas located in the East North Central section was the rapid expansion in the automobile industry and related industries. It happened that these industries were for the most part concentrated in that section of the country.

Changes in Rank in Manufacturing Employment among the 33 Areas

The New York City area ranked first in number of manufacturing wage earners throughout the period from 1869 to 1935. This area is the only one which did not change in rank between these two years (Table 25). (It will be remembered that the New York City area also maintained first rank in population during the period 1870–1930.) The Philadelphia area changed position only twice: in 1909 it dropped from second place to third place, being surpassed by the Chicago area; and in 1935 it fell to fourth position, below the Detroit area. A few other areas maintained approximately the same comparative position throughout the period, notably the Boston area, which ranked third up to 1899 and fourth since, except in 1925, 1929, and 1935, when it was preceded by the Detroit area.

In 1869 the larger industrial areas were concentrated in the northeastern part of the country. The first five areas were all east of the Susquehanna River and north of the Mason and Dixon's line. The Providence and Worcester areas ranked fourth

TABLE 25

THE 33 INDUSTRIAL AREAS RANKED ACCORDING TO THE AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS, 1869–1935

Industrial Area*	Rank by Average Number of Manufacturing Wage Earners																
	1869	1879	1889	1899*	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#	1933#	1935#
New York City Area	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chicago Area	10	4	4	3	3	3	2	2	2	2	2	2	2	2	2	2	2
Philadelphia Area	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4
Detroit Area	16	19	18	16	16	14	10	7	5	6	5	4	5	4	5	5	3
Boston Area	3	3	3	4	4	4	4	4	4	4	4	5	4	5	4	4	5
Pittsburgh Area	8	9	7	5	5	5	5	5	6	7	6	6	6	6	6	6	6
Providence Area	4	5	5	6	6	6	6	6	7	5	7	7	7	7	7	7	7
Cleveland Area	19	16	14	12	11	10	9	10	8	9	8	8	8	8	8	8	8
St. Louis Area	6	12	8	7	7	7	7	8	10	8	9	9	9	9	9	9	10
Milwaukee Area	21	14	17	13	13	12	12	11	11	11	11	11	10	10	11	11	12
Bridgeport Area	9	10	10	8	8	8	8	9	9	10	10	10	11	11	10	10	9
Buffalo Area	15	17	13	15	15	15	15	14	12	13	12	12	12	12	15	14	15
Los Angeles Area	32	32	33	33	33	a	a	a	23	a	17	17	15	13	12	12	11
Cincinnati Area	7	6	6	10	9	9	11	12	13	12	13	13	13	14	14	15	13
Baltimore Area	11	7	9	9	10	11	13	13	14	14	14	14	14	15	13	13	14

TABLE 25 (*Continued*)

Industrial Area*	Rank by Average Number of Manufacturing Wage Earners																
	1869	1879	1889	1899*	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#	1933#	1935#
San Francisco Area	17	13	15	17	17	17	17	17	15	15	16	15	16	16	16	16	16
Worcester Area	5	8	11	11	12	13	14	15	16	16	15	16	17	17	17	17	17
Youngstown Area	25	24	28	26	23	a	a	a	17	17	a	a	18	18	19	18	18
Akron Area	30	31	32	32	31	a	a	a	18	a	a	a	22	19	24	20	20
Hartford Area	13	18	21	20	20	a	a	a	19	a	a	a	20	20	20	21	19
Minneapolis Area	28	23	16	18	18	a	a	a	22	a	a	a	21	21	18	19	21
Rochester Area	18	20	20	21	21	a	a	a	20	a	a	a	19	22	21	24	24
Albany Area	12	11	12	14	14	16	16	16	24	a	a	a	23	23	22	28	27
Allentown Area	20	22	24	22	22	a	a	a	26	a	a	a	24	24	23	22	22
Springfield Area	14	15	19	19	19	a	a	a	25	a	a	a	25	25	25	25	26
Toledo Area	31	27	30	30	30	a	a	a	30	a	a	a	31	26	31	32	29
Indianapolis Area	26	25	25	27	27	a	a	a	27	a	a	a	26	27	29	30	30
Kansas City Area	29	30	22	24	28	a	a	a	28	a	a	a	32	28	27	29	28
Seattle Area	33	33	31	31	32	a	a	a	21	a	a	a	28	29	33	33	33
Reading Area	23	26	27	28	26	a	a	a	32	a	a	a	27	30	26	26	25
Wheeling Area	22	21	23	25	24	a	a	a	31	a	a	a	29	31	30	23	23
Dayton Area	27	28	29	29	29	a	a	a	33	a	a	a	33	32	32	31	32
Scranton Area	24	29	26	23	25	a	a	a	29	a	a	a	30	33	28	27	31

Source: Based on manufacturing reports of the United States Bureau of the Census. For footnotes other than the following, see Table 21.
* The industrial areas are listed in order of rank in 1929. For full name and definition of areas, see Table 4.
a The rank for these years cannot be determined, but it is below 17.

and fifth in manufacturing employment in that year. St. Louis was the outstanding midwestern manufacturing area in 1869, ranking sixth in the country; Chicago ranked tenth. All the areas which ranked as the first five in 1869, except the New York City area, have since lost rank.

The Pittsburgh area ranked eighth in 1869, just below the Cincinnati area and just above the Bridgeport and Chicago areas. Pittsburgh dropped to ninth position in 1879, and the Chicago area jumped from tenth place in 1869 to fourth place in 1879. By 1899, however, the Pittsburgh area outranked four additional areas and stood fifth. This position was maintained until 1919, when Pittsburgh fell below the Detroit area into sixth position, where it has stayed except in 1921. In 1933 the number of manufacturing wage earners in the area was considerably below that in the Boston and Detroit areas. The Pittsburgh Industrial Area is not likely, in the near future, to rise above sixth place, because manufacturing employment in the area in the prosperous year of 1929 was one-fifth below that of the Boston area (next above it).

The greatest gain in comparative position was made by the Los Angeles area, which rose from thirty-second in manufacturing employment in 1869 to eleventh in 1935. The Detroit area rose 13 positions in rank and the Cleveland area 11 positions during the same period. Other marked gains were made by the Akron and Milwaukee areas. The Albany area declined farthest in comparative position; it ranked twelfth in 1869 and twenty-seventh in 1935. The Worcester area fell from fifth position in 1869 to seventeenth position in 1935; the Springfield area, from fourteenth position to twenty-sixth. The Scranton, Cincinnati, and Hartford areas also fell considerably in rank.

Suburban Movement of Manufacturing

Within each of the large industrial areas the dominance of the major city in manufacturing employment has tended to lessen significantly since 1879. A great expansion in factory employment, particularly since 1899, has occurred in suburban districts either in smaller communities or in previously unsettled districts where satellite manufacturing centers have grown up. It is the purpose of this section to indicate the degree to which 13 of the industrial areas have been less and less dominated by the respective central manufacturing cities.

From 1879 to 1889 the great expansion of manufacturing employment rather generally resulted in greater gains in large manufacturing cities than in the balance of the districts in which these cities were located. Nine of 12 central cities for which 1879 data are available increased in relative importance in their respective areas (Table 26). Pittsburgh was one of the three exceptions. Moreover, the increase in the relative importance of the central city was characteristic also of other important metropolitan manufacturing districts in Ohio, New York, and New Jersey. The 1890's witnessed a sharp reversal of that tendency. During that decade all the 13 central cities here considered failed to grow as rapidly as the areas in which they were located. Among the 13 areas the suburban movement of manufacturing during the 20 years leading up to 1899 was by far the most pronounced in the Pittsburgh area.

From 1899 to 1919 the proportion of the area total of manufacturing employment concentrated in the major city fell in all but one of the 13 areas here considered. The exception was Boston, where the growth of manufacturing was less in outlying textile cities than in Boston itself. Great losses in the relative importance of the leading city occurred in the San Francisco and Pittsburgh areas. The scarcity of industrial sites forced many new plants to locate in suburban districts. In 1879, Pittsburgh included over three-fourths of all manufacturing workers in the 4-county area, in 1899 somewhat more than half,[12] and in 1919 only one-third. This is a far greater change than that taking place in any other large industrial area.

In the decade following 1919 the relative importance of the central city rose in only four of the 13 areas. In three of these areas, Philadelphia, San Francisco, and Boston, an important explanation was the collapse of the shipbuilding industry, a large part of which was carried on outside the major city. In the Boston area the increased prominence of the metropolis resulted also from greater losses in number of manufacturing workers in textile cities, especially Lowell and Fall River. In the Detroit area the increase in the share of manufacturing employment accounted for by the city was related to the unusually rapid expansion of the automobile industry within the city limits. Among the 13 large areas, however, the outstanding movement during the postwar

[12] See second paragraph of note, p. 104.

TABLE 26

AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN THE CENTRAL CITY AS A PERCENTAGE OF AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN THE CORRESPONDING INDUSTRIAL AREA, 1879–1935

Central City	Based on Factory, Hand, Building, and Neighborhood Industries			Based on Factory Industries Only												
	1879	1889	1899	1899	1904	1909	1914	1919	1921	1923	1925	1927	1929	1931	1933	1935
New York City	73.9%	75.6%	70.7%	69.9%	68.3%	67.5%	66.9%	61.7%	64.2%	61.8%	61.3%	63.0%	61.3%	66.0%	63.1%	62.3%
Chicago	89.4	92.1	88.2	88.0	85.5	82.0	78.7	77.7	77.3	75.2	74.1	74.2	73.6	73.8	74.8	73.9
Philadelphia	76.6	80.7	79.3	78.4	77.1	74.1	72.5	60.4	65.6	67.5	67.9	67.0	65.7	65.1	63.8	63.8
Detroit	82.0	90.0	84.2	83.6	80.1	88.1	74.8	63.2	57.7	58.8	57.6	70.4	75.6	65.1	62.4	58.6
Boston	29.7	30.6	27.3	22.3	22.3	22.3	25.0	23.9	23.9	24.4	26.0	26.2	26.6	25.4	23.1	22.7
Pittsburgh	78.5	62.4	55.0	53.1	42.5	35.4	33.8	34.0	35.1	30.6	29.7	28.6	27.1	26.5	24.7	23.8
Cleveland	91.6	95.7	86.8	91.0	86.8	82.5	86.5	85.3	85.1	84.4	84.4	83.9	83.1	82.9	83.8	81.5
St. Louis	84.4	91.8	82.3	80.6	77.4	72.7	69.4	70.6	71.2	71.5	70.4	72.4	70.6	71.7	69.1	70.8
Buffalo	78.6	85.4	76.2	74.7	72.4	68.7	64.9	65.1	62.5	61.1	60.9	60.5	59.8	60.5	60.1	59.7
Los Angeles	—	90.8	85.9	83.4	82.7	80.2	77.3	70.5	71.1	71.3	71.0	72.4	66.4	66.1	75.2	58.4
Cincinnati	85.0	80.1	74.9	75.4	70.8	65.9	66.0	61.8	65.4	60.5	61.6	59.9	56.1	56.9	57.9	58.0
Baltimore	90.8	94.0	92.1	91.8	89.8	87.1	86.7	88.0	89.2	88.6	88.2	87.8	86.0	86.0	83.9	82.2
San Francisco	89.3	88.6	81.0	81.2	79.4	60.5	58.9	46.1	47.4	49.1	48.6	48.5	48.5	48.9	46.6	43.7

Source: Percentages are based on reports of the United States Bureau of the Census. Data for cities are published figures, adjusted wherever necessary for changes in city boundaries. Data for areas, together with explanatory footnotes, are given in Table 21.

decade was a continued decrease in the relative importance of the major city. The greatest loss occurred in Pittsburgh. In 1929 the city accounted for little more than one-fourth of the area's manufacturing employment. There was also a significant drop in the percentage importance of Los Angeles in its area. The Pittsburgh area, moreover, was the only area in which the relative importance of the central city fell in each census year from 1879 to 1929, and by far the greatest loss in the relative importance of the central city characterized this area. Furthermore, in the Pittsburgh area the major city continued to lose relatively in each of the three biennial censuses following 1929.

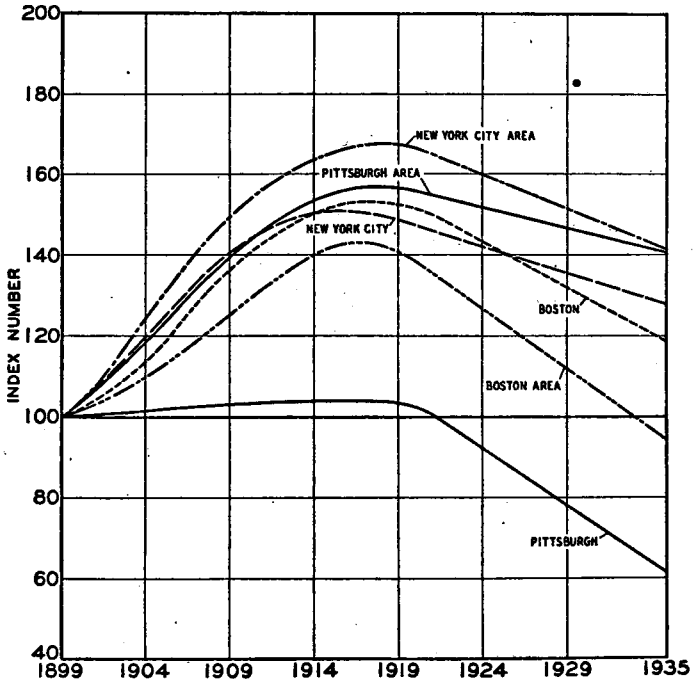
In the Pittsburgh area the spread of manufacturing activity to the suburbs and other outlying sections has proceeded so rapidly that a wide difference has arisen between the trend in manufacturing employment in the city and the corresponding trend for the area (Chart 30-A). The moderately steep upward trend in the area from 1899 to 1918 had practically no counterpart in the city. Moreover, during the twenties the trend in manufacturing employment fell much less rapidly in the area than in the city. In other areas the city trend comes much nearer to approximating the area trend. Note the curves for New York City and the New York City area in Chart 30-A. On the other hand, in at least one major area, Boston, the trend in manufacturing employment after 1899 was more favorable in the city than in the area. At all events, city trends give very unreliable indication of area trends, owing to the varying degree to which manufacturing activity has spread outside the central city.

The relative importance of the central city may be subject to cyclical variation. The changes from 1927 to 1929 and from 1929 to 1933 suggest this influence, though it is possible that some of the variations which occurred between these two periods resulted from corporate decisions not related to cyclical changes. The proportional importance of the city may be expected to vary with the phase of the business cycle if high-cost plants tend to be concentrated inside or outside the city or if the consumers' goods industries are mainly inside or outside the city. In all but five areas the change in relative number of manufacturing wage earners in the city from 1929 to 1931 was the opposite of the change from 1927 to 1929. This reversal may be interpreted to mean that the less efficient plants had been put into operation by the peak demand of

1929 and then closed down again. In the Detroit area the sharp rise in the relative importance of the city in 1929 and the even greater drop in 1931 probably were related to readjustments in the policies of the two major motor companies and did not necessarily mean that the plants in Detroit in 1929 were high-cost plants

CHART 30–A

TRENDS IN AVERAGE NUMBER OF MANUFACTURING WAGE EARNERS IN THE NEW YORK CITY, BOSTON, AND PITTSBURGH INDUSTRIAL AREAS AND IN THE CORRESPONDING MAJOR CITIES, 1899–1935



relative to plants located just outside the city. There were five areas in which the relative number of wage earners employed in the city continued to fall from 1929 to 1931 as it had from 1927 to 1929; the fall from 1929 to 1931, however, was much less than the fall from 1927 to 1929. Perhaps, when considered in connection with the downward trend in the city's importance, this fact

also indicates that the city's percentage of the total is subject to cyclical influences.

A significant explanation of the fall in the relative importance of the central city from 1927 to 1929 in nearly all 13 areas lies in the fact that the outside territory was dominated by capital goods industries in which the upswing in production and employment was marked. In the Boston area, in which the outside territory is dominated by consumers' goods industries, there was a drop in the city's percentage of the total employment in the area. During the business recession after 1929 the decreases in activity were greater in industries making equipment than in those making goods for personal consumption; there was an accompanying tendency for the relative size of the central city to rise, or to fall less than previously. This tendency is more apparent when measured in terms of value added rather than employment, owing to extensive work-sharing among employes of large industrial plants making capital goods (see page 188).

SUMMARY WITH RESPECT TO THE PITTSBURGH INDUSTRIAL AREA

1. Manufacturing employment in the Pittsburgh Industrial Area grew most rapidly during the eighties, although the rate of growth remained high in 1904. The 1909 census demonstrated that the rate of growth had begun to slow down, although the peak in manufacturing employment was not reached until 1918. Since 1923 there has been a definite downward trend. The growth in manufacturing employment in the area is similar to that in population throughout the period up to 1919; since then the growth in population has greatly exceeded that of manufacturing employment.

2. The rate of increase in manufacturing employment in the Pittsburgh area throughout the 60-year period was somewhat greater than that for the group of 33 areas. During the first half of the period manufacturing employment multiplied by four in the Pittsburgh area and by only 2¾ in the 33 areas combined. But from 1899 to 1919 the Pittsburgh area grew less rapidly than all areas combined, and from 1919 to 1929 it decreased more rapidly. Naturally, the percentage decrease from 1929 to 1933 in the Pittsburgh area was greater than the average, because of the dominating importance of industries making capital goods. From 1933 to 1935 the recovery was also greater than average.

3. Among the Pennsylvania industrial areas, the Pittsburgh area grew fastest in manufacturing employment prior to 1899; since then, however, the rate of gain has been greater in the three smaller Pennsylvania areas (Scranton, Reading, and Allentown).

4. Among the iron and steel areas, total manufacturing employment increased more rapidly between 1869 and 1899 in the Chicago and Cleveland areas than in the Pittsburgh area, the ratios of the totals in 1899 to those in 1869 being, respectively, about eight, six, and four. During the nineties, however, the rate of growth was more rapid in the Pittsburgh area. From 1899 to 1919, manufacturing employment grew more rapidly in the Cleveland, Buffalo, and Chicago areas (in that order) than in the Pittsburgh area, and less rapidly in the Baltimore area than in the Pittsburgh area. Only Chicago, of the five steel areas, gained in manufacturing employment during the twenties; the losses were the greatest in the Baltimore and Pittsburgh areas. The severity of the depression, as it is reflected in the 1929–1933 decline in manufacturing employment, was approximately the same in four of the areas, being less severe in the Baltimore area, where the iron and steel industry is somewhat less important locally. Of the nine steel areas, Chicago, Wheeling, and Pittsburgh experienced the greatest recovery from 1933 to 1935. Indeed, the Wheeling figure for 1935 was the highest ever reported for that area.

5. A comparison of the rates of growth in manufacturing employment in the Pittsburgh area with those in other areas indicates that this area should be included in the group of areas which have grown at average rates. The Pittsburgh area has much the same relative position in changes in manufacturing employment as it has in changes in population. The curves for the New York City and Pittsburgh areas are closely analogous.

6. Manufacturing employment in the Pittsburgh area, as a percentage of the national total, reached a peak in 1904, when the area accounted for slightly more than 3 per cent of the national total. Since that year the expansion in employment in manufacturing industries in the Pittsburgh district has been considerably less rapid than that in the nation. The district's share of the national total of manufacturing employment was 2.57 per cent in 1929, 2.36 per cent in 1933, and 2.43 per cent in 1935.

CHAPTER 4

VALUE ADDED BY MANUFACTURE, 1869–1935

The Pittsburgh Industrial Area accounted in 1929 for a value added by manufacture of $856,661,000. This figure represents the excess of value of output over the cost of materials, fuel, purchased electric energy, and containers. Among the 33 major industrial areas of the country the Pittsburgh area ranked sixth in 1929, being outranked by the New York City, Chicago, Philadelphia, Detroit, and Boston areas, in that order. The Pittsburgh area held the same relative position in terms of value added as it did in manufacturing employment throughout the postwar decade. After the onset of the great depression, however, the area dropped in rank; it fell to seventh position in 1931 and to ninth position in 1933. In part, this decrease in rank resulted from the comparatively severe depression in the producers' goods industries, which dominate local industrial activity. In 1933, value added by manufacture in the area amounted to only $270,031,000, or less than one-third of the 1929 total. This drop reflects a decrease in average price per unit as well as a decrease in output. In 1935 the Pittsburgh area reported a value added of $457,423,000 and ranked seventh.

This chapter is presented for the purpose of comparing American industrial areas on the basis of values created in the manufacturing process. These values give a very significant indication of the relative importance of the manufacturing process, since they are affected by quality as well as by quantity of output. Thus, the measure is not disturbed by variations among regions in output per worker. The number of manufacturing wage earners indicates roughly the extent of the area's ability to support a population on the basis of manufacturing operations. Value added by manufacture, on the other hand, serves to approximate the contribution which factories in an area make both to total income created locally and to national income from manufacturing. The measure includes wages, salaries, rent, interest, and profit as well as depreciation, insurance, taxes, and other miscellaneous expense items.

Naturally, the working population supported and the income created are related.[1]

Changes in value added by manufacture suggest at first glance a much more rapid growth in manufacturing operations during the last several decades than that indicated by changes in the number of manufacturing wage earners. The explanation of this difference lies in part in mechanization or other measures raising production per worker; but, in some periods, especially between prewar years and postwar years, change in value added was very much affected by change of prices. From 1869 to 1914 the value added by manufacture per worker increased comparatively little. The very great increase in value added during the war period resulted primarily from inflation, although increased output per worker was also a contributing factor. Since 1919, however, the rapid introduction of machinery and improvement in management have led to a very sharp increase in the added values in manufacturing per wage earner; rising output has accompanied falling employment.

General Trends in Value Added by Manufacturing

From 1899 to about 1912 the trend in value added in the United States was slightly upward; from about 1912 to about 1919 the trend moved upward very sharply (Chart 31). Since the World War, the United States and most sections of the country have been characterized by a continued, but a much less rapid, upward movement.

Trends in Industrial and Nonindustrial States

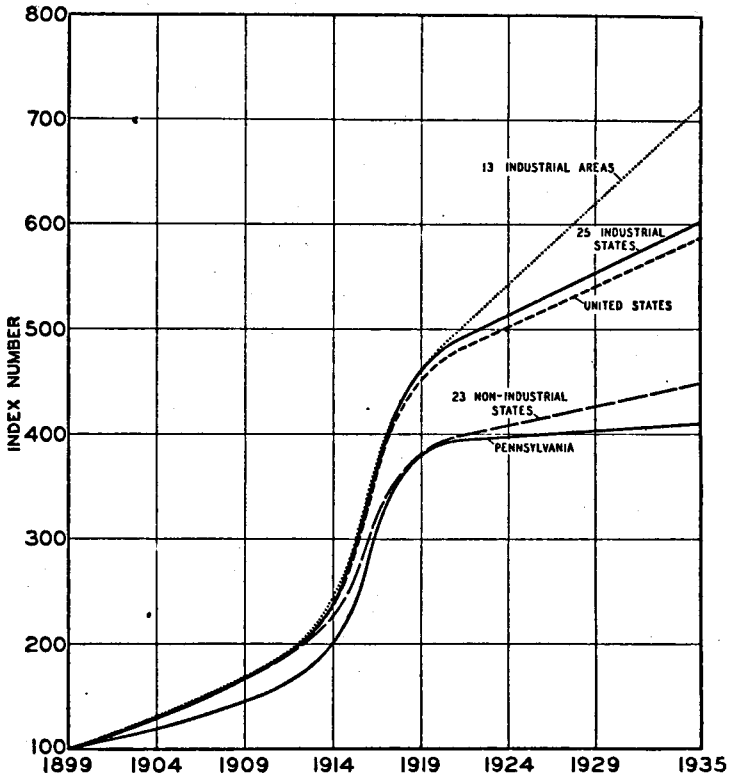
Throughout the period from 1899 to 1935 the trend in value added in the 25 major industrial states combined was above that

[1] Between years as far apart as 1899 and 1929, during which period many changes occurred in the utilization of machine methods, in the length of the working day, and in comparative prices of different commodities, the *relative* industrial growth of the several major manufacturing regions is much the same whether the yardstick used be number of manufacturing wage earners or value added in the manufacturing process, although by the latter measure the growth is on the average four times as great. The relationship between percentage gain in number of wage earners and percentage gain in value added from 1899 to 1929 in 34 industrial areas (including the Birmingham district) yields a coefficient of correlation of 0.99. If the five areas with unusually high percentage changes be excluded because these high percentages unduly influence the degree of relationship, the coefficient of correlation becomes 0.93. Perfect relationship yields a coefficient of 1.00.

for the United States, and the trend for the 23 nonindustrial states combined was below that for the United States—the trend values being expressed as index numbers with an 1899 base (Chart 31). Until about 1914 these three trends were very similar.

CHART 31

TRENDS IN VALUE ADDED BY MANUFACTURE IN THE UNITED STATES, GROUPS OF STATES, PENNSYLVANIA, AND THE GROUP OF 13 LARGE INDUSTRIAL AREAS, 1899–1931



After 1914, however, the growth indicated for the nonindustrial states was much less than that for the United States, and the recent trend level for these states lies considerably below that of the country as a whole (Chart 31). The trend for the 13 major industrial areas indicates still greater growth, and the recent trend

level for these areas lies above that for the 25 industrial states, although the two trends are nearly identical up to 1920. The trend for Pennsylvania lies far below that for the 25 industrial states, of which it is one, and even lies below that for the 23 non-industrial states. Moreover, since 1920 the trend for these non-industrial states has been more sharply upward than that for Pennsylvania. The trend point for Pennsylvania for 1935, in comparison with that for 1899, is only about two-thirds as high as that for the 25 industrial states.

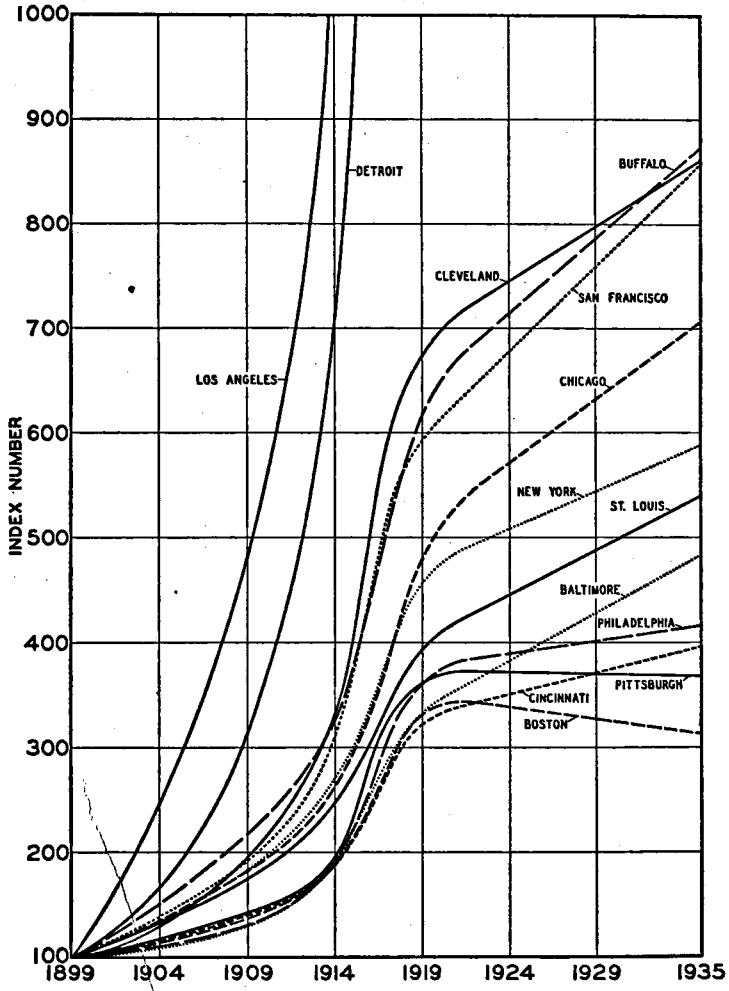
Trends in the 13 Large Industrial Areas

Trends in value added by manufacture for the 13 major industrial areas are of about the same shape as the trend for the country, although in a few of the areas the trend rises very much more rapidly from the beginning of the period starting in 1899 (Charts 32 and 33). These curves are all of the "S," or ogive, type. The upward trend in the Los Angeles area far exceeds that in any other area, although the trend for the Detroit area also moves up sharply. Only two of the areas indicate a downward trend during any part of the period from 1899 to 1935. These are the Boston and Pittsburgh areas, in both of which the value added by manufacturing is characterized by a downward trend since about 1921. The 1935 trend points as percentages of the corresponding 1899 trend values are the highest for the Los Angeles and Detroit areas and the lowest for the Pittsburgh and Boston areas. All the 1935 trend indexes except those for Detroit and Los Angeles fall between 300 and 900. The 1935 trend indexes for Buffalo, Cleveland, and San Francisco, it will be noted, are each approximately 850. The first of the area trends to begin to bend after the war was that for the Pittsburgh area. The upward rate of growth was falling very rapidly in this area in 1919. By 1922 the trends for all the areas had begun to rise less steeply. Among areas with upward trends since the war, that for the Philadelphia area is rising the least. That area is still growing in terms of added values, whereas the Pittsburgh area apparently is not.

The comparatively unfavorable trend in the Pittsburgh area between 1921 and 1931 is in part explained by the severe 1931 depression in the local iron and steel industry and perhaps by an understatement of the value added by manufacture in 1929 in the iron and steel industry, which dominates the area. Value added

CHART 32

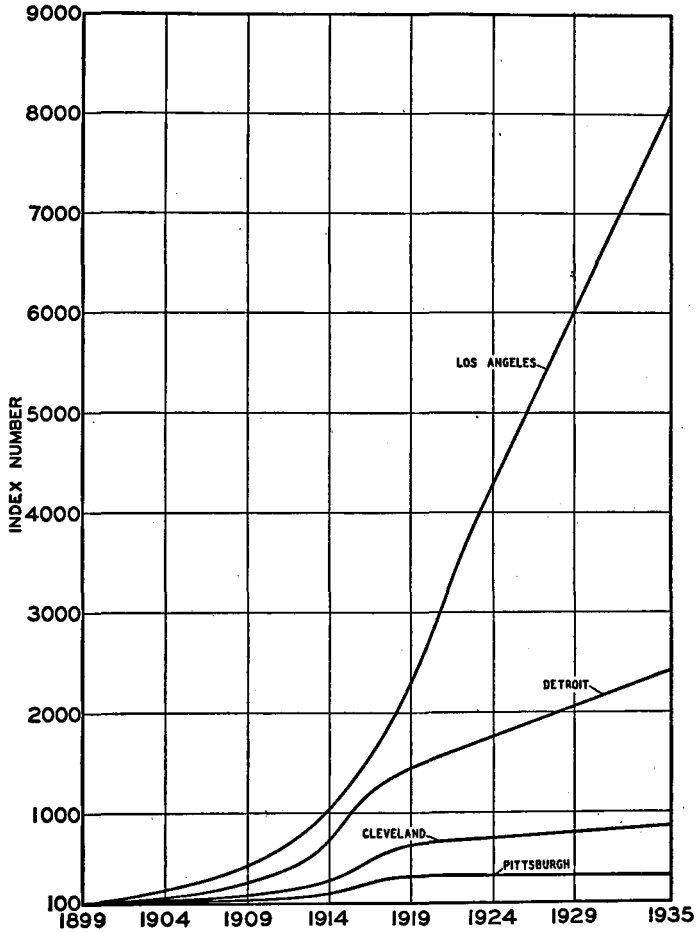
TRENDS IN VALUE ADDED BY MANUFACTURE IN EACH OF THE 13 LARGE INDUSTRIAL AREAS, 1899–1931



is simply the difference between the total value of product and cost of raw materials, fuel, purchased power, and containers. If these costs are set unduly high with reference to market price, value added is correspondingly reduced. The raw materials of

CHART 33

TRENDS IN VALUE ADDED BY MANUFACTURE IN THE LOS ANGELES, DETROIT, CLEVELAND, AND PITTSBURGH AREAS, 1899–1931



the iron and steel industry, that is, ore and coal, are for the most part not purchased by the steel companies at market values but are taken from reserves owned by the companies and are at least in part evaluated on the basis of a pro rata amortization of invest-

ments in reserves. Since many of these reserves were acquired prior to 1920 and since prices declined afterwards, it is possible that the prices which the iron and steel companies charged their furnace departments in 1929 were greater than the market price.[2] Consequently, for a district in which iron and steel production is important, value added by manufacture may possibly understate somewhat the rate of growth in production in the postwar decade.

Average Annual Rates of Change, 1899–1914

Industrial and Nonindustrial Parts of the United States

In the period from 1899 to 1914 the increase in value added by manufacture in the United States was equivalent to an annual average gain of a little more than 5 per cent (Table 27 and Chart 34). The rate of growth for the 25 industrial states was approximately the same. On the other hand, for the group of 23 nonindustrial states the rate of growth was somewhat less than 5 per cent per year. In the group of 13 large industrial areas, net manufacturing values grew slightly more rapidly than in the group of industrial states.

In Pennsylvania the average rate of growth during this 15-year period was much less than the rate for the group of industrial states in which Pennsylvania was included; the rate for Pennsylvania was 3.58 per cent and that for the 25 industrial states 5.04 per cent. Moreover, the rate for the Pittsburgh Industrial Area was much less than the average rate for the 13 industrial areas —3.35 per cent in comparison with 5.12 per cent. The rate for the Pittsburgh area was even less than that for Pennsylvania, the rate for the Pittsburgh area being especially affected by the severe depression in the capital goods industries in 1914.

For the group of 13 industrial areas the growth in value added was comparatively regular. The average deviation from a constant annual rate of change was slightly more than 2 per cent. The growth in the United States and in the 25 industrial areas was only slightly more irregular. For the group of 23 nonindustrial states the average deviation was 5.5 per cent.

The war period, 1914–1919, was not used in computing average annual rates of change. The positions in relative growth during

[2] William N. Mitchell, *Trends in Industrial Location in the Chicago Region since 1920*, p. 55; also American Iron and Steel Institute, *Annual Statistical Report for 1929*, p. 103.

TABLE 27

INDEX NUMBERS OF VALUE ADDED BY MANUFACTURE IN THE UNITED STATES, GROUPS OF STATES, AND SELECTED INDUSTRIAL STATES, 1899–1919, WITH AVERAGE ANNUAL RATES OF CHANGE, 1899–1914

Area	Value Added by Manufacture (Thousands of Dollars)		Indexes of Value Added by Manufacture (1899 = 100)					Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1899	1919*	1899	1904	1909	1914	1919*	1899–1914	1899–1914
United States	$4,831,075	$25,066,698	100.0	130.3	176.5	204.5	518.9	5.02%	3.0%
25 Industrial States	4,358,484	22,909,671	100.0	130.0	175.7	205.3	525.6	5.04	2.7
23 Nonindustrial States[a]	472,591	2,157,027	100.0	132.7	184.2	196.7	456.4	4.83	5.5
Industrial States:[b]									
Michigan	143,726	1,546,945	100.0	138.5	220.2	343.3	1,076.3	8.68	2.9
Washington	32,554	366,445	100.0	192.5	316.0	334.0	1,125.7	8.57	15.1
North Carolina[a]	40,420	326,902	100.0	156.5	234.5	295.6	808.8	7.59	5.4
Texas	38,506	298,825	100.0	153.0	246.0	280.8	776.0	7.41	23.2
West Virginia	29,779	201,030	100.0	149.8	231.9	280.3	675.1	7.31	5.4
California	92,492	786,346	100.0	163.8	221.1	286.9	850.2	7.17	5.8
New Jersey	218,280	1,401,592	100.0	139.2	194.9	239.7	642.1	6.10	3.1
Iowa	47,092	225,232	100.0	122.6	188.0	223.6	478.3	5.85	4.8
Tennessee	38,190	211,486	100.0	153.5	199.5	232.1	553.8	5.74	6.9
Ohio	339,368	2,188,361	100.0	127.6	180.8	224.5	644.8	5.71	2.4
Virginia[a]	49,285	257,971	100.0	132.3	191.2	220.6	523.4	5.64	4.1
South Carolina	22,850	153,467	100.0	128.7	205.2	209.5	671.6	5.52	8.0

TABLE 27 (*Continued*)

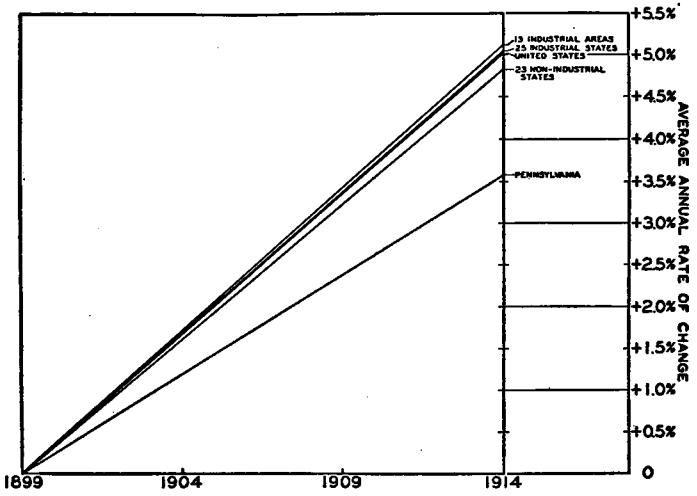
Area	Value Added by Manufacture (Thousands of Dollars)		Indexes of Value Added by Manufacture (1899 = 100)					Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1899	1919*	1899	1904	1909	1914	1919*	1899–1914	1899–1914
Industrial States:[b]—*Continued*									
Indiana	141,909	723,803	100.0	122.2	172.4	216.3	510.0	5.46	2.6
Minnesota	73,394	335,040	100.0	132.6	174.1	213.2	456.5	5.22	2.0
Alabama	34,112	192,067	100.0	142.8	183.3	209.3	563.0	5.05	5.6
Illinois	439,418	1,936,974	100.0	129.8	172.6	206.4	440.8	5.04	2.0
Georgia	45,176	252,747	100.0	149.2	190.1	206.3	559.5	4.95	8.0
New York	853,454	3,924,791	100.0	133.5	177.2	199.9	459.9	4.84	4.2
Wisconsin	141,058	719,709	100.0	130.4	172.9	196.9	510.2	4.74	3.4
Missouri	132,115	537,751	100.0	141.8	166.3	188.7	407.0	4.21	5.6
Connecticut	145,434	706,494	100.0	122.2	160.2	176.7	485.8	4.04	3.1
Massachusetts	408,971	1,750,468	100.0	121.7	161.3	173.6	428.0	3.95	3.8
Maryland	81,722	324,597	100.0	114.2	142.7	169.8	397.2	3.69	1.5
Pennsylvania	691,581	3,105,294	100.0	117.5	151.0	165.3	449.0	3.58	2.8
Rhode Island	77,598	331,334	100.0	115.0	157.4	150.9	427.0	3.15	6.4

Source: Based on manufacturing reports of the United States Bureau of the Census.
* Adjusted to include part of the motion picture industry not covered by the census of 1919.
[a] Includes also the District of Columbia.
[b] Listed according to rank in annual percentage rate of change, 1899–1914.
[c] The internal revenue taxes on tobacco products included in value added by manufacture for the tobacco industries prior to 1933 have been deducted from the value added totals for North Carolina and Virginia for 1919. Similar corrections for years from 1899 to 1914 would lead to somewhat lower annual percentage rates of growth during that period.

this period, however, were generally the same as those during the previous 15 years; for example, the nonindustrial states continued to grow more slowly than the industrial states. There were two important differences: the rate of gain in Pennsylvania was greater than that in the group of 23 nonindustrial states, and the relative growth in the Pittsburgh area exceeded that for the 13 large industrial areas combined. War demand led to a boom in the steel

CHART 34

AVERAGE ANNUAL RATES OF CHANGE IN VALUE ADDED BY MANUFACTURE IN THE UNITED STATES, GROUPS OF STATES, PENNSYLVANIA, AND THE GROUP OF 13 LARGE INDUSTRIAL AREAS, 1899–1914



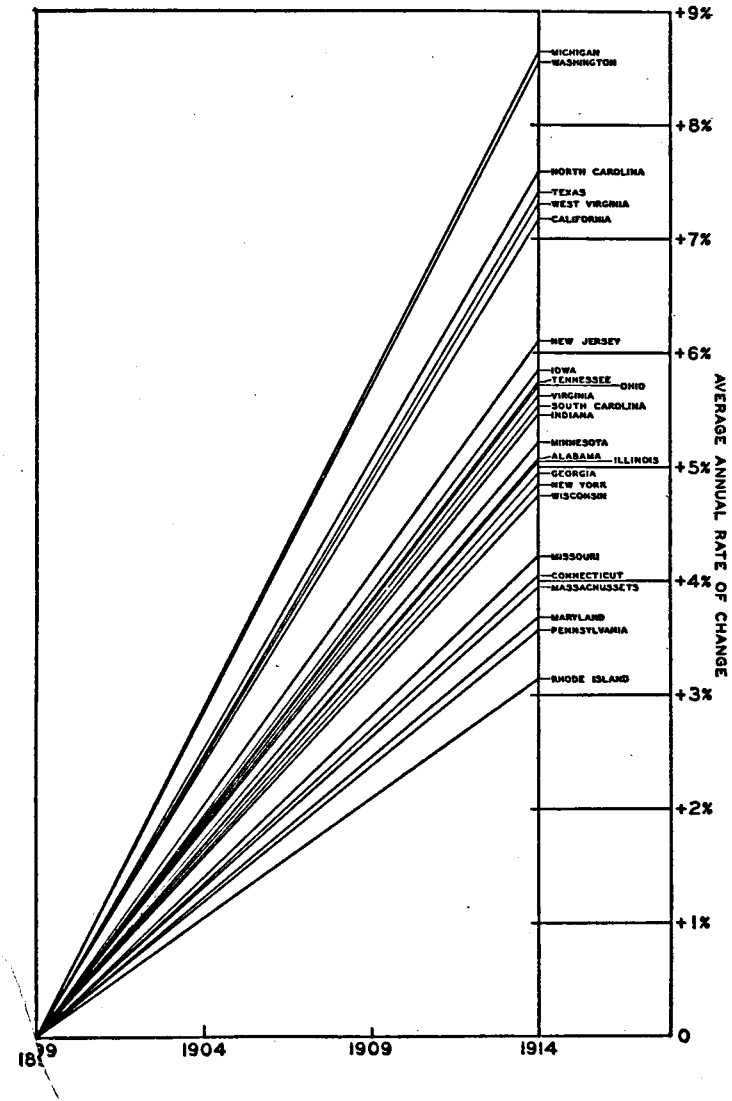
industry at Pittsburgh and to an even greater boom in the shipbuilding industry at Philadelphia.

Individual Industrial States

Among industrial states the average annual rate of gain in value added by manufacture from 1899 through 1914 varied from 8.68 per cent in Michigan to 3.15 per cent in Rhode Island (Table 27 and Chart 35). Pennsylvania ranked just above Rhode Island. The rates for most of the states, however, fell within the range between 4 per cent and 6 per cent. Most of the states with high rates of gain were western, southern, or midwestern states, whereas

CHART 35

AVERAGE ANNUAL RATES OF CHANGE IN VALUE ADDED BY MANUFACTURE IN INDUSTRIAL STATES, 1899–1914



many of those with low rates were located in New England or the Middle Atlantic section. The upper half of the group of states, in terms of percentage increase, averaged a much smaller amount of value added by manufacture in 1899 than did the lower half of the list (Table 27); in other words, states which were relatively small in 1899 tended to grow more rapidly than the states which were relatively large.

The growth in net values was most irregular in Texas, which ranked near the top of the list in average annual rate of change. The average annual deviation from a constant rate of growth was the least in Maryland, which ranked close to the bottom of the list in terms of the annual rate of change. There was, however, no very significant tendency for the rapidly growing states to vary more widely than the slowly growing states from the average percentage growth lines.

In terms of percentage gains from 1914 to 1919, the states rank in approximately the same order as in terms of the average gain from 1899 through 1914 (see the index numbers for 1919 on the 1899 basis in Table 27).

The 13 Large Industrial Areas

Among the 13 industrial areas there was a great variation in the average annual rate of growth from 1899 to 1914 (Table 28 and Chart 36). The rate for the Los Angeles area was 14.62 per cent, whereas that for the Cincinnati area at the bottom of the list was 3.32 per cent. This range was far greater than that for the industrial states.

The six industrial areas at the top of the list, in terms of the annual rate, were on the average far younger in industrial age than the remaining seven areas; moreover, the first five areas on the list reported a comparatively small amount of value added in 1899. The rate of change for the Pittsburgh area was practically the same as that for the Cincinnati area (Table 28).

Among the 13 areas, growth in value added was the most irregular in the Los Angeles area and the least irregular in the Baltimore area. (For industrial states the growth was the most nearly constant in Maryland.) There was a definite tendency for the rapidly growing areas to be characterized by great irregularity of growth and for the slowly growing areas to be characterized by a greater constancy.

TABLE 28

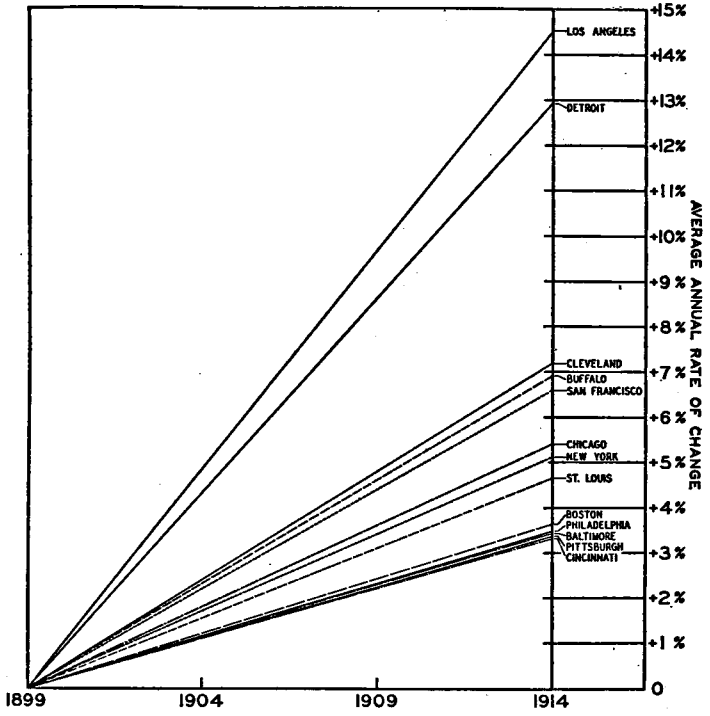
INDEX NUMBERS OF VALUE ADDED BY MANUFACTURE IN THE UNITED STATES, PENNSYLVANIA, AND 13 LARGE INDUSTRIAL AREAS, 1899–1919, WITH AVERAGE ANNUAL RATES OF CHANGE, 1899–1914

Area	Value Added by Manufacture (Thousands of Dollars)		Indexes of Value Added by Manufacture (1899 = 100)					Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1899	1919*	1899	1904	1909	1914	1919*	1899–1914	1899–1914
United States	$4,831,075	$25,066,698	100.0	130.3	176.5	204.5	518.9	5.02%	3.0%
Pennsylvania	691,581	3,105,294	100.0	117.5	151.0	165.3	449.0	3.58	2.8
Total, 13 Large Ind. Areas	2,247,600	11,756,412	100.0	129.2	173.7	206.8	523.1	5.12	2.2
Industrial Areas:[a]									
Los Angeles Area	8,000	199,200	100.0	245.0	481.2	776.2	2,490.0	14.62	10.5
Detroit Area	47,500	956,441	100.0	151.6	294.3	614.7	2,013.6	13.00	8.0
Cleveland Area	68,000	577,933	100.0	125.3	210.7	267.2	849.9	7.18	5.8
Buffalo Area	51,600	346,627	100.0	156.8	237.2	266.5	671.8	6.94	8.4
San Francisco Area	49,200	352,715	100.0	152.2	198.2	263.2	716.9	6.54	3.4
Chicago Area	332,500	1,670,149	100.0	128.2	173.8	217.0	502.3	5.40	1.4
New York City Area	719,800	3,533,370	100.0	133.9	181.0	207.8	490.9	5.12	3.9
St. Louis Area	106,100	451,711	100.0	144.3	167.3	202.5	425.7	4.63	4.4
Boston Area	241,900	949,262	100.0	123.9	159.7	167.0	392.4	3.65	4.3
Philadelphia Area	279,200	1,304,034	100.0	115.0	147.4	162.5	467.1	3.47	2.6
Baltimore Area	68,700	274,287	100.0	114.6	138.6	165.4	399.3	3.46	1.0
Pittsburgh Area	181,800	803,556	100.0	117.8	148.0	160.5	442.0	3.35	2.6
Cincinnati Area	93,300	337,127	100.0	124.0	152.1	161.0	361.3	3.32	4.0

Source: Based on manufacturing reports of the United States Bureau of the Census.
* Adjusted to include part of the motion picture industry not covered by the census of 1919.
[a] Listed according to rank in annual percentage rate of change, 1899–1914.

CHART 36

AVERAGE ANNUAL RATES OF CHANGE IN VALUE ADDED BY MANUFACTURE IN EACH OF THE 13 LARGE INDUSTRIAL AREAS, 1899–1914



AVERAGE ANNUAL RATES OF CHANGE, 1921–1931

Industrial and Nonindustrial Parts of the United States

From 1921 to 1931 the value added by manufacture in the United States averaged an annual gain of 1.58 per cent (Table 29 and Chart 37). This annual rate is a little less than one-third the rate for the 15-year period ending with 1914. The difference between these rates indicates the extent to which growth in industrial activity slowed down after the war. For the 25 industrial states the postwar rate was 1.69 per cent per year, and for the remaining, nonindustrial states the rate was only 0.25 per cent. The difference between the industrial states and the nonindustrial states with

TABLE 29

INDEX NUMBERS OF VALUE ADDED BY MANUFACTURE IN THE UNITED STATES, GROUPS OF STATES, AND SELECTED INDUSTRIAL STATES, 1919–1935, WITH AVERAGE ANNUAL RATES OF CHANGE, 1921–1931

Area	Value Added by Manufacture (Thousands of Dollars)		Indexes of Value Added by Manufacture (1921 = 100)									Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1921	1929	1919*	1921	1923	1925	1927	1929	1931*	1933*	1935*	1921–1931	1921–1931
United States	$18,316,666	$31,885,284	136.9	100.0	141.1	146.2	150.6	174.1	109.1	79.9	107.3	1.58%	16.5%
25 Industrial States	16,806,562	29,455,261	136.3	100.0	141.5	146.5	151.9	175.3	110.4	80.2	108.3	1.69	16.4
23 Nonindustrial States[a]	1,510,104	2,430,023	142.8	100.0	137.3	143.0	136.4	160.9	95.0	76.5	96.1	0.25	17.1
Industrial States:[b]													
North Carolina[c]	198,772	447,690	164.5	100.0	157.3	171.0	200.5	225.2	193.2	160.6	190.1	6.68	12.9
Virginia[c]	166,182	307,804	155.2	100.0	130.1	143.8	159.8	185.2	157.9	124.3	157.9	5.05	8.7
Tennessee	148,087	322,898	142.8	100.0	149.3	164.4	177.3	218.0	143.5	116.8	153.7	4.40	16.6
California	663,502	1,349,191	118.5	100.0	140.4	145.9	164.1	203.3	134.1	104.0	146.3	3.93	14.6
Michigan	900,485	2,067,344	171.8	100.0	179.0	211.7	210.8	229.6	139.0	104.5	176.4	3.47	24.2
Georgia	137,357	294,649	184.0	100.0	162.1	181.6	181.8	214.5	133.2	123.3	142.3	3.29	20.2
Alabama	116,401	258,125	165.0	100.0	187.3	195.1	200.1	221.8	129.8	97.5	131.3	2.65	24.3
Maryland	250,705	422,097	129.5	100.0	133.4	142.7	151.3	168.4	121.3	95.9	126.2	2.49	13.0
Indiana	551,375	1,136,463	131.3	100.0	152.6	157.3	168.0	206.1	115.6	85.3	130.8	2.44	19.9
Ohio	1,381,603	2,889,804	158.4	100.0	161.9	167.8	170.3	209.2	114.1	82.5	121.7	2.08	21.8
Missouri	433,827	777,497	124.0	100.0	139.0	144.5	152.2	179.2	112.1	88.3	105.5	2.00	16.1
Iowa	182,742	323,820	123.3	100.0	139.9	141.3	149.1	177.2	112.1	76.9	100.9	1.92	15.6

TABLE 29 (*Continued*)

Area	Value Added by Manufacture (Thousands of Dollars)		Indexes of Value Added by Manufacture (1921 = 100)									Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1921	1929	1919*	1921	1923	1925	1927	1929	1931*	1933*	1935*	1921–1931	1921–1931
Industrial States:[b]—*Cont.*													
Wisconsin	486,920	949,842	147.8	100.0	147.6	159.1	168.5	195.1	108.9	76.0	112.1	1.90	20.4
South Carolina	94,519	159,351	162.4	100.0	147.3	140.8	160.4	168.6	115.7	123.3	123.3	1.82	15.6
Illinois	1,606,630	2,930,038	120.6	100.0	139.8	149.1	153.4	182.4	108.2	74.7	105.1	1.76	17.5
New Jersey	1,071,808	1,771,430	130.8	100.0	126.6	135.5	136.3	165.3	108.2	75.3	99.3	1.73	13.1
West Virginia	139,547	251,615	144.1	100.0	157.9	150.4	145.0	180.3	116.7	96.3	124.1	1.63	16.6
Connecticut	428,318	806,214	164.9	100.0	157.7	154.6	160.8	188.2	109.9	83.5	117.7	1.50	19.6
Texas	272,396	460,307	109.7	100.0	121.8	144.2	133.5	169.0	100.2	87.1	112.6	1.32	15.2
New York	3,270,361	4,973,920	120.0	100.0	128.3	130.4	140.5	152.1	104.4	73.4	92.0	1.12	12.9
Washington	188,479	367,149	194.4	100.0	162.6	152.0	152.8	194.8	103.5	85.2	110.3	1.03	21.1
Minnesota	264,973	404,995	126.4	100.0	119.1	125.0	128.4	152.8	98.8	76.1	97.7	1.03	12.1
Pennsylvania	2,098,250	3,430,606	148.0	100.0	145.9	143.5	142.4	163.5	94.9	69.3	93.5	0.10	18.3
Rhode Island	239,425	324,078	138.4	100.0	132.3	115.6	116.6	135.4	88.3	69.9	82.0	−0.78	12.5
Massachusetts	1,408,378	1,710,729	124.3	100.0	123.2	115.9	116.4	121.5	81.1	61.6	72.4	−1.54	12.3

Source: Based on manufacturing reports of the United States Bureau of the Census.

* Adjusted for inclusion of part of the motion picture industry in 1919 and all the motion picture industry in 1931, 1933, and 1935.

[a] Includes also the District of Columbia.

[b] Listed according to rank in annual percentage rate of change, 1921–1931.

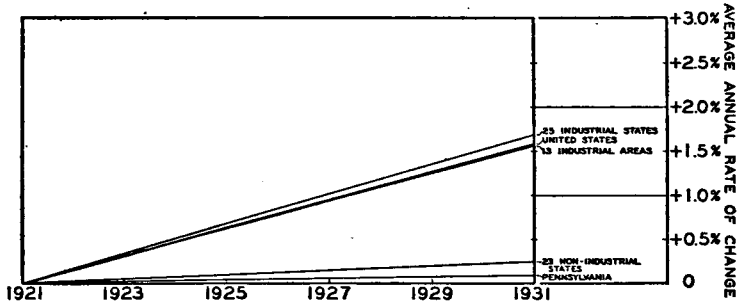
[c] The internal revenue taxes on tobacco products included in value added by manufacture for the tobacco industries prior to 1933 have been deducted from the value added totals for North Carolina and Virginia for the period 1919–1931. Corresponding corrections, however, have not been made for the totals for other states, for the totals for the United States, or for groups of states.

respect to growth of industrial activity was much greater in the postwar period than in the prewar period. In the group of 13 large industrial areas, values added in the manufacturing process grew a little less rapidly than in the group of industrial states—just the reverse of what had occurred in the prewar period.

In Pennsylvania the annual rate of gain after the war was very small. On the average, each year between 1921 and 1931 witnessed an increase in value added of only 0.1 per cent. Pennsylvania again ranked very low in terms of rate of gain among the industrial states. Indeed, only Rhode Island and Massachusetts

CHART 37

AVERAGE ANNUAL RATES OF CHANGE IN VALUE ADDED BY MANUFACTURE IN THE UNITED STATES, GROUPS OF STATES, PENNSYLVANIA, AND THE GROUP OF 13 LARGE INDUSTRIAL AREAS, 1921–1931

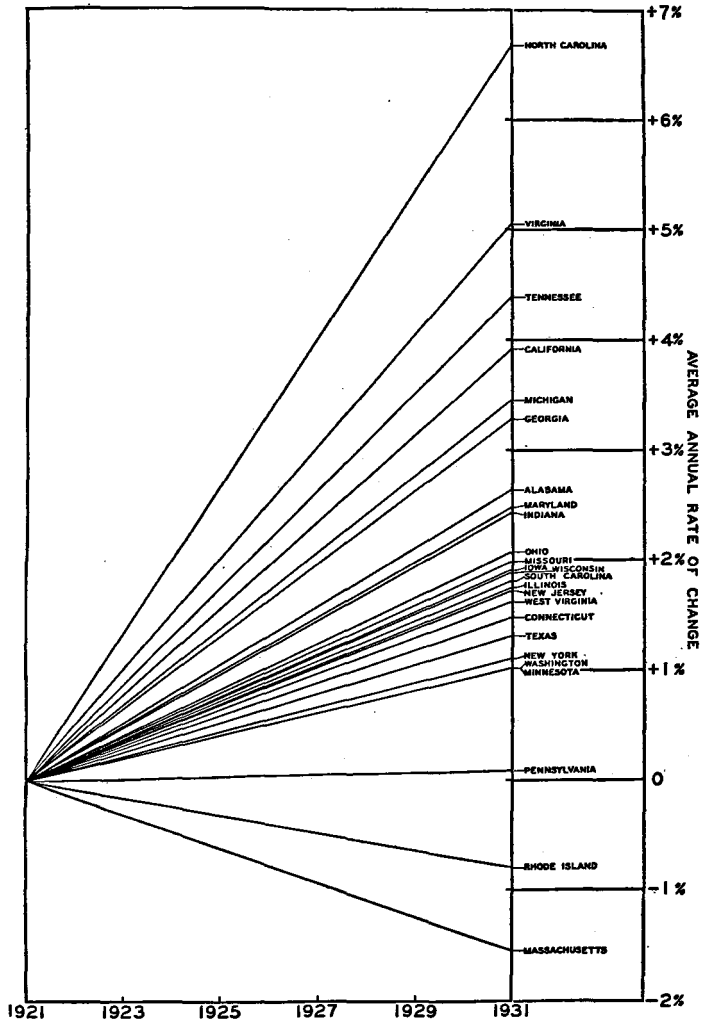


had more unfavorable rates, and in these two New England states the growth was negative, i.e., there was a net decline of trend. For the Pittsburgh area the rate was negative. On the average, each year of the decade from 1921 to 1931 resulted in a decrease in value added of nearly 0.4 per cent. The Pittsburgh area ranked next to the last in the list of industrial areas in both prewar and postwar years.

The growth in net manufacturing values after the war was far more irregular than before (Table 29). The average deviation from constant growth for the United States, for example, amounted to 16.5 per cent for biennial years from 1921 to 1931. During the earlier period the average deviation had been only 3.0 per cent. This great difference, which characterized all the divisions of the United States, was in part the result of more violent fluctuations in economic activity during the postwar period and in

CHART 38

AVERAGE ANNUAL RATES OF CHANGE IN VALUE ADDED BY MANUFACTURE IN INDUSTRIAL STATES, 1921–1931



part the result of more frequent manufacturing censuses. Between 1899 and 1919, censuses were taken only every five years and thus missed many of the years in which business was abnormally high or abnormally low. During the postwar decade the average deviation from a constant growth was approximately the same for the industrial states, the nonindustrial states, and the United States. For the 13 industrial areas the irregularity of growth was somewhat greater; for Pennsylvania, somewhat less (Tables 29 and 30). The average deviation from trend in the Pittsburgh area was 25.9 per cent, much greater even than the percentage for Pennsylvania.

Individual Industrial States

Among industrial states the average annual rate of gain in net manufacturing values from 1921 to 1931 varied from 6.68 per cent to —1.54 per cent (Table 29 and Chart 38). About half of the industrial states, however, grew at rates between 1 per cent and 2 per cent. As in the prewar period the states with the higher rates of growth tended to fall in the South or, to a lesser extent, in the Midwest, whereas most of the states with very low rates of growth were in New England or in the Middle Atlantic section of the country. North Carolina ranked at the top of the list and Massachusetts at the bottom. The states with high rates of growth were on the average less important in manufacturing activity in 1921 than the states with lower rates of growth.

The most regular growth occurred in Virginia, for which the increase in manufacturing was next to the most rapid, but very irregular growth occurred in Alabama and Michigan, for which the average annual gain also was comparatively high. Yet, more of the states with great irregularity of growth were states with high average annual gains, and more of the states with small deviations from constant growth were states with low average annual gains.

The 13 Large Industrial Areas

Among the 13 large industrial areas the variation in average annual rate of gain from 1921 to 1931 was about the same as the variation among industrial states. For the large areas the rate varied from 8.01 per cent in the Los Angeles area to —0.88 per cent in the Boston area (Table 30 and Chart 39). Most of the industrial areas, however, reported percentages ranging from 0.5 per cent to 2.5 per cent. Only the Pittsburgh and Boston areas

TABLE 30

INDEX NUMBERS OF VALUE ADDED BY MANUFACTURE IN THE UNITED STATES, PENNSYLVANIA, AND 13 LARGE INDUSTRIAL AREAS, 1919–1935, WITH AVERAGE ANNUAL RATES OF CHANGE, 1921–1931

Area	Value Added by Manufacture (Thousands of Dollars)		Indexes of Value Added by Manufacture (1921 = 100)									Annual Percentage Rate of Change	Average Percentage Deviation from Constant Growth
	1921	1929	1919*	1921	1923	1925	1927	1929	1931*	1933*	1935*	1921–1931	1921–1931
United States	$18,316,666	$31,885,284	136.9	100.0	141.1	146.2	150.6	174.1	109.1	79.9	107.3	1.58%	16.5%
Pennsylvania	2,098,250	3,430,606	148.0	100.0	145.9	143.5	142.4	163.5	94.9	69.3	93.5	0.10	18.3
Total, 13 Large Ind. Areas	8,937,400	15,256,838	131.5	100.0	138.5	142.0	147.4	170.7	108.9	77.6	106.0	1.57	15.6
Industrial Areas:[a]													
Los Angeles Area	220,400	609,048	90.4	100.0	137.6	171.7	206.1	276.3	186.5	139.4	212.7	8.01	14.9
Detroit Area	525,700	1,229,694	181.9	100.0	182.7	209.2	196.8	233.9	144.5	110.5	197.4	3.67	23.0
Baltimore Area	205,500	343,016	133.5	100.0	131.9	139.1	149.6	166.9	120.2	91.4	126.0	2.45	12.6
San Francisco Area	266,000	463,059	132.6	100.0	133.7	131.9	145.5	174.1	116.2	91.4	110.9	2.37	13.2
Buffalo Area	260,600	493,502	133.0	100.0	152.9	157.1	160.6	189.4	115.8	87.7	105.6	2.01	18.4
Chicago Area	1,368,600	2,548,490	122.0	100.0	137.3	150.1	157.0	186.2	108.8	74.1	106.1	1.99	17.7
St. Louis Area	342,700	623,081	131.8	100.0	144.2	147.6	155.5	181.8	112.8	85.9	101.5	1.95	16.9
New York City Area	2,931,900	4,510,597	120.5	100.0	130.3	129.5	138.6	153.8	108.5	74.3	94.4	1.40	12.2
Cleveland Area	354,800	735,276	162.9	100.0	167.8	164.9	160.4	207.2	106.0	76.7	114.4	1.29	22.9
Cincinnati Area	272,100	439,058	123.9	100.0	119.2	127.1	134.2	161.4	93.3	64.5	94.5	0.88	14.7
Philadelphia Area	971,600	1,431,487	134.2	100.0	124.9	129.2	130.1	147.3	96.7	70.9	88.6	0.48	13.1
Pittsburgh Area	440,200	856,661	182.5	100.0	182.9	162.8	157.8	194.6	91.8	61.3	103.9	−0.39	25.9
Boston Area	777,300	973,869	122.1	100.0	123.6	116.8	120.5	125.3	87.1	65.8	75.9	−0.88	11.5

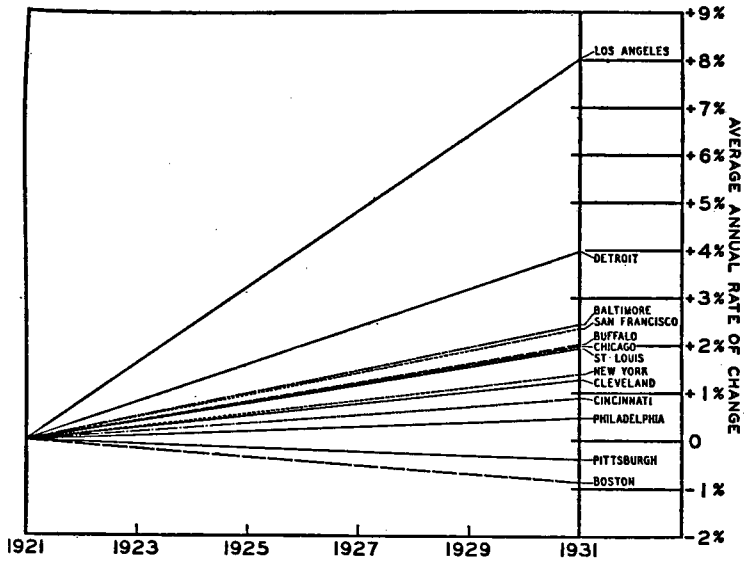
Source: Based on manufacturing reports of the United States Bureau of the Census.
* Adjusted for inclusion of part of the motion picture industry in 1919 and all the motion picture industry in 1931, 1933, and 1935.
[a] Listed according to rank in annual percentage rate of change, 1921–1931.

reported negative rates of change. The highest and the lowest rates of change occurred in areas which in 1921 were medium-sized in terms of manufacturing activity.

Irregularity of growth was greatest in the Pittsburgh area. The violent fluctuations in Pittsburgh are related to the great importance of the capital goods industries in this area and to the abnormally great fluctuations in this branch of industrial activity. During the postwar period the average deviations from constant growth were also high in the Detroit and Cleveland areas. The least irregular growth was that in the Boston area, for which, however, the average deviation was greater than 11 per cent.

CHART 39

AVERAGE ANNUAL RATES OF CHANGE IN VALUE ADDED BY MANUFACTURE IN EACH OF THE 13 LARGE INDUSTRIAL AREAS, 1921–1931



COMPARATIVE GROWTH IN VALUE ADDED BY MANUFACTURE IN THE UNITED STATES, GROUPS OF AREAS, PENNSYLVANIA, AND PENNSYLVANIA AREAS

Actual Growth

In the United States the values added in the manufacturing process (including building and other hand trades) increased from

$1,743,898,000 in 1869 to $5,678,286,000 in 1899 (Table 31 and Chart 40). In the latter year, hand trades were excluded from the census of manufacturing operations, and the value added by manufacture was reduced by this elimination to $4,831,075,000. In 1919 the value added exceeded $25 billion and in 1929 the figure reached almost $32 billion; in other words, the postwar trend was significantly upward. The severity of the 1933 depression is indicated by the virtual halving of the 1929 figure. In 1935 there was a recovery to roughly $20 billion.

In the 33 industrial areas, value added by manufacture grew from slightly more than $1 billion in 1869 to nearly $16 billion in 1919 and to $20 billion in 1929. The gains after 1919 were relatively about the same as those for the country. For the 13 industrial areas the rapid postwar expansion resulted in an increase from less than $12 billion in 1919 to more than $15 billion in 1929. In Pennsylvania the gains in the same decade were only sufficient to increase the figure from slightly more than $3 billion to nearly $3.5 billion.

Actual production figures for the Pittsburgh area indicate that value added did not decline from 1869 to 1879 as it did in Pennsylvania and in the Philadelphia area. Value added grew rapidly from 1879 to 1899 in the Pittsburgh area, approximately doubling in each of these two decades. During the first 20 years after the turn of the century, gains in value added continued to be important. After the war, however, the rate of growth slowed down markedly; the peak in 1919 was only 6 per cent below the peak in 1929. Throughout the period from 1869 to 1919 the Pittsburgh area gained relatively to the Philadelphia area (Chart 40).

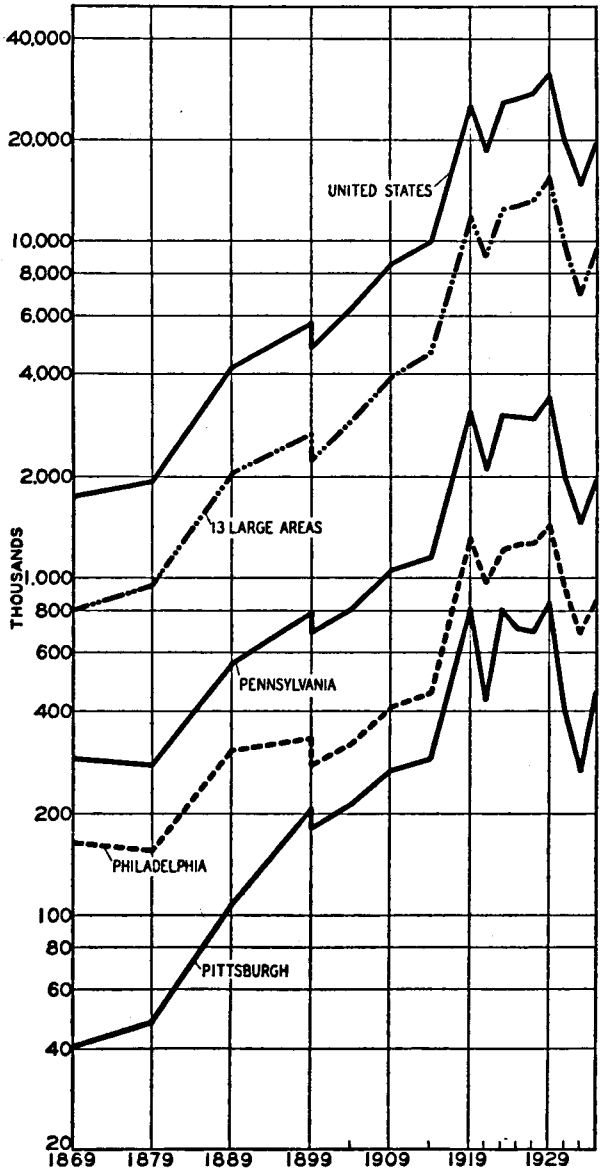
After 1919 the increase in the Philadelphia area was relatively small (Table 31). A comparatively large increase in value added by manufacture occurred in the Reading area. Gains in the Allentown and Scranton areas also were important.

Relative Importance of Groups of Areas

The national importance of the group of 33 areas, in terms of value added, was less in 1869 than in any subsequent census year (Table 32). In that year the 33 areas included three-fifths of the United States total, somewhat more than the corresponding share of manufacturing employment. In 1889 the national importance of the group reached a maximum. After 1919 the 33 areas in-

CHART 40

VALUE ADDED BY MANUFACTURE IN THE UNITED STATES, PENNSYLVANIA, THE GROUP OF 13 LARGE INDUSTRIAL AREAS, PHILADELPHIA AREA, AND PITTSBURGH AREA, 1869–1935



cluded a slightly rising proportion of value added in the country but a narrowing share of manufacturing employment. Although this contrast may have resulted from the comparative inefficiency in 1919 of employing large numbers in districts outside industrial areas, a more likely cause was the more rapid introduction of mechanization in the 33 areas than in the balance of the country. Indeed, the general upward trend in the relative importance of the areas in value added throughout the period since 1869 and the general downward trend in the relative importance in these areas in manufacturing employment tend to show a greater move toward mechanization in the industrial areas proper than in the balance of the country.

The relative importance of the 13 major industrial areas in the national total was at a maximum in 1889, a secondary peak coming in 1921 and another in 1931 (Table 32). For this group the percentage followed much the same course as that for the 33 areas. The percentages for both groups of areas tended to increase in depression years. Yet from 1931 to 1933 the percentage importance of the two groups of areas fell. In other words, the full force of the recent depression was felt later in these industrial areas, considered together, than in the rest of the country.

Relative Importance of Pennsylvania and the Philadelphia Area

The position of Pennsylvania, in terms of values created in the manufacturing process, tended to weaken during the entire period. The adjustment in 1899 in the elimination of building and other hand trades increased the relative importance of the state somewhat. This increase was to be expected, for at that time Pennsylvania included relatively less building activity than the balance of the country. Changes in the national importance of the Philadelphia area and that of Pennsylvania are roughly analogous. At no time since 1869 was the importance of the Philadelphia area as great as in that year. Indeed, in 1929 the area was much less than half as important. This decline, however, was greater than that experienced by the state of Pennsylvania as a whole.

Relative Importance of the Pittsburgh Area

The relative importance of the Pittsburgh area in the national total increased sharply from 2.32 per cent in 1869 to 3.67 per cent in 1899 (Table 32). The percentage in the latter year, exclusive

TABLE 31

VALUE ADDED BY MANUFACTURE IN THE UNITED STATES, PENNSYLVANIA, AND INDUSTRIAL AREAS, 1869–1935*
(Expressed in Thousands of Dollars)

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**												
	1869	1879	1889	1899	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#φ	1933#@	1935#
United States	1,743,898	1,972,756	4,210,393	5,678,286	4,831,075	6,293,695	8,529,261	9,878,346	25,066,698	18,316,666	25,850,300	26,778,066	27,585,210	31,885,284	19,989,000	14,631,208	19,655,198
Pennsylvania	290,697	279,798	558,060	792,356	691,581	812,609	1,044,182	1,143,429	3,105,294	2,098,250	3,061,178	3,011,248	2,987,502	3,430,606	1,991,215	1,454,489	1,960,950
Total, 33 Industrial Areas	1,048,419	1,260,452	2,766,779	3,538,244	2,972,800	•	•	•	15,878,290	•	•	•	17,355,305	20,211,316	12,651,461	9,084,843	12,381,030
Total, 13 Large Ind. Areas	800,458	954,275	2,158,051	2,683,656	2,247,600	2,904,800	3,903,400	4,648,200	11,756,412	8,937,400	12,381,700	12,691,700	13,176,151	15,256,838	9,734,350	6,936,917	9,473,733
Industrial Areas:[b]																	
New York City Area[c]	230,803	312,061	681,927	870,973	719,800	963,500	1,302,600	1,495,700	3,533,370	2,931,900	3,821,400	3,796,800	4,062,526	4,510,597	3,179,747	2,178,457	2,766,606
Chicago Area[c]	36,221	79,851	272,511	394,073	332,500	426,300	577,800	721,600	1,670,149	1,368,600	1,879,200	2,054,500	2,148,679	2,548,490	1,488,673	1,014,555	1,452,739
Philadelphia Area[c]	163,012	154,420	309,763	336,474	279,200	321,000	411,500	453,800	1,304,034	971,600	1,213,100	1,254,900	1,264,185	1,431,487	939,780	689,237	861,005
Detroit Area[c]	11,422	14,153	89,158	55,511	47,500	72,000	139,800	292,000	956,441	525,700	960,300	1,100,000	1,034,607	1,229,694	759,538	580,645	1,037,974
Boston Area[c]	136,425	145,611	259,864	278,165	241,900	299,700	386,400	403,900	949,262	777,300	960,500	907,700	936,996	973,869	677,198	511,487	589,737
Pittsburgh Area[c]	40,426	48,015	108,045	208,235	181,800	214,200	269,000	291,700	803,556	440,200	805,000	716,700	694,484	856,661	404,143	270,031	457,423
Providence Area	46,112	57,109	92,562	127,599	113,300	•	•	•	497,915	•	•	•	400,096	436,835	280,322	227,620	257,790
Cleveland Area[c]	10,928	18,574	49,930	77,433	68,000	85,200	143,300	181,700	577,933	354,800	595,200	585,100	569,112	735,276	376,017	272,254	405,732
St. Louis Area[c]	75,886	45,750	114,337	132,491	106,100	153,100	177,500	214,900	451,711	342,700	494,200	505,700	533,065	623,081	386,682	294,473	347,788
Milwaukee Area	9,335	18,776	47,606	74,511	65,700	•	•	•	409,184	•	•	•	475,621	550,269	284,484	195,416	294,733
Bridgeport Area	34,049	40,015	70,889	92,704	80,800	•	•	•	401,137	•	•	•	378,309	444,400	269,261	201,594	290,146
Buffalo Area[c]	14,043	18,855	52,499	62,666	51,600	80,900	122,400	137,500	346,627	260,600	398,500	409,400	418,585	493,502	301,692	228,674	275,175
Los Angeles Area[c]	430	657	5,202	12,002	8,000	19,600	38,500	62,100	199,200	220,400	303,300	378,400	454,158	609,048	411,082	301,212	468,760
Cincinnati Area[c]	39,346	50,083	128,848	107,169	93,300	115,700	141,900	150,200	337,127	272,100	324,400	345,800	365,169	439,058	253,885	175,489	257,050
Baltimore Area[c]	23,076	33,899	72,141	83,589	68,700	78,700	95,200	113,600	274,287	205,500	271,000	285,900	307,468	343,016	246,912	187,782	258,864

TABLE 31 (*Continued*)

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**												
	1869	1879	1889	1899	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#φ	1933#@	1935#
Industrial Areas:[b]—*Continued*																	
San Francisco Area[s]	18,440	32,346	63,826	64,875	40,200	74,900	97,500	129,500	352,715	266,000	355,600	350,800	387,117	463,059	309,001	232,029	294,880
Worcester Area	30,448	35,289	50,757	67,257	59,500	a	a	a	238,524	a	a	a	222,212	243,517	149,755	122,282	155,515
Youngstown Area	7,459	7,988	16,003	34,613	32,400	a	a	a	274,470	a	a	a	246,897	319,505	128,893	97,312	164,777
Akron Area	4,154	8,943	9,423	12,636	11,600	a	a	a	261,175	a	a	a	278,643	281,393	190,310	135,897	173,887
Hartford Area	17,497	16,108	23,987	38,385	31,200	a	a	a	171,900	a	a	a	192,280	228,728	118,098	88,930	135,444
Minneapolis Area	3,893	11,413	52,140	54,086	41,200	a	a	a	211,255	a	a	a	230,897	274,836	185,210	138,488	174,974
Rochester Area	9,289	11,354	33,998	39,162	32,300	a	a	a	195,916	a	a	a	241,079	252,737	174,555	114,389	155,708
Albany Area	24,942	33,129	47,275	53,984	45,600	a	a	a	157,684	a	a	a	156,340	187,722	113,043	78,827	116,005
Allentown Area	9,619	9,374	14,249	20,428	25,600	a	a	a	158,808	a	a	a	161,699	191,019	102,422	71,563	98,344
Springfield Area	12,259	16,673	30,114	35,710	30,500	a	a	a	172,435	a	a	a	164,281	179,824	118,569	77,828	100,481
Toledo Area	1,998	4,478	9,886	15,638	12,800	a	a	a	125,667		a	a	155,928	212,838	96,280	69,519	127,283
Indianapolis Area	6,866	8,570	16,038	26,847	21,000	a	a	a	135,701	a	a	a	149,485	180,018	117,784	87,737	112,848
Kansas City Area	5,763	4,578	27,663	37,182	25,100	a	a	a	128,960	a	a	a	163,389	220,900	134,421	103,265	125,747
Seattle Area	182	313	12,927	18,885	12,100	a	a	a	104,856	a	a	a	131,762	161,956	89,006	68,950	89,019
Reading Area	5,597	7,117	11,782	22,912	20,400	a	a	a	81,335	a	a	a	101,140	124,831	70,421	52,200	68,882
Wheeling Area	7,747	9,730	17,140	20,628	26,500	a	a	a	120,456	a	a	a	93,060	140,067	88,438	67,242	102,226
Dayton Area	4,827	5,997	12,937	21,040	18,700	a	a	a	100,619	a	a	a	180,339	211,429	138,202	94,955	121,518
Scranton Area	7,975	4,243	14,352	22,386	17,900	a	a	a	83,881	a	a	a	85,797	92,759	67,037	53,837	59,020
Birmingham District[s]	29	396	7,682	12,166	11,800	a	a	a	62,540	a	a	a	106,020	111,211	62,734	36,373	60,304

Source: Totals compiled from manufacturing reports of the United States Bureau of the Census.
For footnotes other than the following, see Table 21.
@ Beginning in 1933, the amount of the internal revenue taxes on tobacco products is no longer included in the value added by manufacture of the tobacco industries. Previously these taxes had constituted part of the difference between cost of materials, supplies, and the like and value of finished products in those industries. In 1931, these taxes amounted to $422,027 thousand for the United States. See Table 29, note *c*.

TABLE 32

PERCENTAGE OF THE UNITED STATES TOTAL VALUE ADDED BY MANUFACTURE IN PENNSYLVANIA AND INDUSTRIAL AREAS, 1869–1935[1]

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**												
	1869	1879	1889	1899	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#φ	1933#@	1935#
United States	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Pennsylvania	16.67	14.18	13.25	13.95	14.31	12.91	12.24	11.58	12.39	11.46	11.84	11.25	10.83	10.76	9.96	9.94	9.98
Total, 33 Industrial Areas	60.12	63.89	65.71	62.31	61.53	a	a	a	63.34	a	a	a	62.92	63.39	63.29	62.09	62.99
Total, 13 Large Ind. Areas	45.90	48.37	51.26	47.26	46.52	46.15	45.76	47.05	46.90	48.79	47.90	47.40	47.77	47.85	48.70	47.41	48.20
Industrial Areas:[b]																	
New York City Area[c]	13.23	15.82	16.20	15.34	14.90	15.31	15.27	15.14	14.10	16.01	14.78	14.18	14.73	14.15	15.91	14.89	14.08
Chicago Area[c]	2.08	4.05	6.47	6.94	6.88	6.77	6.77	7.30	6.66	7.47	7.27	7.67	7.79	7.99	7.45	6.93	7.39
Philadelphia Area[c]	9.35	7.83	7.36	5.93	5.78	5.10	4.82	4.59	5.20	5.30	4.69	4.69	4.58	4.49	4.70	4.71	4.38
Detroit Area[c]	.65	.72	.93	.98	.98	1.14	1.64	2.98	3.82	2.87	3.71	4.11	3.75	3.86	3.80	3.97	5.28
Boston Area[c]	7.82	7.38	6.17	4.90	5.01	4.76	4.53	4.09	3.79	4.24	3.72	3.39	3.40	3.05	3.39	3.50	3.00
Pittsburgh Area[c]	2.32	2.43	2.57	3.67	3.76	3.40	3.15	2.95	3.21	2.40	3.11	2.68	2.52	2.69	2.02	1.85	2.33
Providence Area	2.64	2.89	2.20	2.25	2.35	a	a	a	1.99	a	a	a	1.45	1.37	1.40	1.56	1.31
Cleveland Area[c]	.63	.94	1.19	1.36	1.41	1.35	1.68	1.84	2.31	1.94	2.30	2.18	2.06	2.31	1.88	1.86	2.06
St. Louis Area[c]	4.35	2.32	2.72	2.33	2.20	2.43	2.08	2.18	1.80	1.87	1.91	1.89	1.93	1.95	1.93	2.01	1.77
Milwaukee Area	.54	.95	1.13	1.31	1.36	a	a	a	1.63	a	a	a	1.72	1.73	1.42	1.34	1.50
Bridgeport Area	1.95	2.03	1.68	1.63	1.67	a	a	a	1.60	a	a	a	1.37	1.39	1.35	1.38	1.48
Buffalo Area[c]	.81	.96	1.25	1.10	1.07	1.29	1.44	1.39	1.38	1.42	1.54	1.53	1.52	1.55	1.51	1.56	1.40
Los Angeles Area[c]	.02	.03	.12	.21	.17	.31	.45	.63	.79	1.20	1.17	1.41	1.65	1.91	2.06	2.06	2.38
Cincinnati Area[c]	2.26	2.54	3.06	1.89	1.93	1.84	1.66	1.52	1.34	1.49	1.25	1.29	1.32	1.38	1.27	1.20	1.31
Baltimore Area[c]	1.32	1.72	1.71	1.47	1.42	1.25	1.12	1.15	1.09	1.12	1.05	1.07	1.11	1.08	1.24	1.28	1.32

TABLE 32 (*Continued*)

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**												
	1869	1879	1889	1899	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#φ	1933#@	1935#
Industrial Areas:[b]—*Continued*																	
San Francisco Area[c]	1.06	1.64	1.52	1.14	1.02	1.19	1.14	1.31	1.41	1.45	1.38	1.31	1.40	1.45	1.55	1.59	1.50
Worcester Area	1.75	1.79	1.21	1.18	1.23	a	a	a	.95	a	a	a	.81	.76	.75	.84	.79
Youngstown Area	.43	.40	.38	.61	.67	a	a	a	1.09	a	a	a	.90	1.00	.84	.67	.84
Akron Area	.24	.20	.15	.22	.24	a	a	a	1.04	a	a	a	1.01	.88	.95	.93	.88
Hartford Area	1.00	.82	.57	.68	.65	a	a	a	.69	a	a	a	.70	.72	.59	.61	.69
Minneapolis Area	.22	.58	1.24	.95	.85	a	a	a	.84	a	a	a	.84	.86	.93	.95	.89
Rochester Area	.53	.58	.81	.89	.69	a	a	a	.78	a	a	a	.87	.79	.87	.78	.71
Albany Area	1.43	1.68	1.12	.95	.94	a	a	a	.63	a	a	a	.57	.59	.57	.54	.59
Allentown Area	.55	.48	.34	.52	.53	a	a	a	.63	a	a	a	.59	.60	.51	.49	.50
Springfield Area	.70	.85	.72	.63	.63	a	a	a	.69	a	a	a	.60	.56	.59	.53	.51
Toledo Area	.11	.23	.23	.28	.26	a	a	a	.50	a	a	a	.57	.67	.48	.48	.65
Indianapolis Area	.39	.43	.38	.47	.43	a	a	a	.54	a	a	a	.54	.60	.59	.60	.57
Kansas City Area	.22	.23	.66	.65	.52	a	a	a	.51	a	a	a	.59	.72	.67	.71	.64
Seattle Area	.01	.02	.31	.33	.25	a	a	a	.78	a	a	a	.48	.51	.45	.47	.45
Reading Area	.32	.36	.28	.40	.42	a	a	a	.32	a	a	a	.37	.39	.35	.36	.35
Wheeling Area	.44	.49	.41	.52	.55	a	a	a	.48	a	a	a	.34	.44	.44	.46	.52
Dayton Area	.28	.30	.31	.37	.39	a	a	a	.40	a	a	a	.54	.66	.69	.65	.62
Scranton Area	.46	.22	.34	.39	.37	a	a	a	.33	a	a	a	.31	.29	.34	.37	.30
Birmingham District[d]	*	.02	.18	.21	.24	a	a	a	.25	a	a	a	.38	.35	.31	.25	.31

Source: Based on manufacturing reports of the United States Bureau of the Census.
For footnotes other than the following, see Table 21.
* Less than 0.005 per cent.

TABLE 33

Percentage Change in Value Added by Manufacture for the United States, Pennsylvania, and Industrial Areas, during Specified Periods, 1869–1935*

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**													
	1869 to 1879	1879 to 1889	1889 to 1899	1869 to 1899	1899† to 1904‡	1904‡ to 1909‡	1909‡ to 1914‡	1914‡ to 1919§	1919§ to 1921‡	1921‡ to 1923‡	1923‡ to 1925‡	1925‡ to 1927	1927 to 1929	1929 to 1931#ϕ	1931#ϕ to 1933#@	1933#@ to 1935#	1899 to 1919§	1919§ to 1929	1869 to 1929##
United States	13.1%	113.4%	34.9%	225.6%	30.3%	35.5%	15.8%	154.0%	−27.0%	41.1%	3.6%	3.0%	15.6%	−37.3%	−26.8%	34.3%	419.3%	27.1%	2,049.0%
Pennsylvania	−3.7	99.5	42.0	172.6	17.6	28.5	9.5	171.6	−32.4	45.9	−1.6	−0.8	14.8	−42.0	−27.0	34.8	349.0	10.5	1,252.1
Total, 33 Industrial Areas	20.2	119.5	27.9	237.5	a	a	a	a	a	a	a	a	16.5	−37.4	−28.2	36.3	434.7	27.2	2,194.5
Total, 13 Large Ind. Areas	19.2	126.1	24.4	235.3	29.2	34.4	19.1	153.3	−24.2	38.5	2.5	3.8	15.8	−36.2	−28.7	36.6	423.8	29.6	2,175.8
Industrial Areas:[b]																			
New York City Area[c]	35.2	118.5	27.7	277.4	33.9	35.2	14.8	137.3	−17.4	30.3	−0.6	7.0	11.0	−29.5	−31.5	27.0	393.1	27.7	2,264.8
Chicago Area[c]	120.5	241.3	44.6	988.0	28.2	35.5	24.9	131.5	−18.1	37.3	9.3	4.6	18.6	−41.6	−31.8	43.2	402.3	52.6	8,238.8
Philadelphia Area[c]	−5.3	100.6	8.6	108.4	15.0	28.2	10.3	187.4	−25.5	32.2	3.4	0.7	13.2	−34.3	−26.7	24.9	367.1	9.8	958.3
Detroit Area[c]	23.9	176.7	41.8	386.0	51.6	94.2	108.9	227.5	−45.0	82.7	14.5	−5.9	18.9	−38.2	−23.6	78.8	1,913.6	28.6	12,481.3
Boston Area[c]	6.7	78.5	7.0	103.9	23.9	28.9	4.5	135.0	−18.1	23.6	−5.5	3.2	3.9	−30.5	−24.5	15.3	292.4	2.6	720.9
Pittsburgh Area[c]	18.8	125.0	92.7	415.1	17.8	25.6	8.4	175.5	−45.2	82.9	−11.0	−3.1	23.4	−52.8	−33.2	69.4	342.0	6.6	2,327.2
Providence Area	23.8	62.1	37.9	176.7	a	a	a	a	a	a	a	a	9.2	−35.8	−18.8	13.3	339.5	−12.3	966.9
Cleveland Area[c]	70.0	168.8	55.1	608.6	25.3	68.2	26.8	218.1	−38.6	67.8	−1.7	−2.7	29.2	−48.9	−27.6	49.0	749.9	27.2	7,561.5
St. Louis Area[c]	−39.7	149.9	15.9	74.6	44.3	15.9	21.1	110.2	−24.1	44.2	2.3	5.4	16.9	−37.9	−23.8	18.1	325.7	37.9	925.3
Milwaukee Area	101.1	153.5	56.5	698.2	a	a	a	a	a	a	a	a	15.7	−48.3	−31.3	50.8	522.8	34.5	6,585.3
Bridgeport Area	17.5	77.2	30.8	172.3	a	a	a	a	a	a	a	a	17.5	−39.4	−25.1	43.9	396.5	10.8	1,397.5
Buffalo Area[c]	34.3	178.4	19.4	346.2	56.8	51.3	12.3	152.1	−24.8	52.9	2.7	2.2	17.9	−38.9	−24.2	20.3	571.8	42.4	4,167.9
Los Angeles Area[c]	52.8	691.8	130.7	2,691.2	145.0	96.4	61.3	221.9	10.3	37.6	24.8	20.0	34.1	−32.5	−26.7	55.6	2,398.8	204.7	212,111.8
Cincinnati Area[c]	27.3	157.3	−16.8	172.4	24.0	22.6	5.8	124.5	−19.3	19.2	6.6	5.6	20.2	−42.2	−30.9	46.5	261.3	30.2	1,181.8
Baltimore Area[c]	46.9	112.8	15.9	262.2	14.6	21.0	19.3	141.4	−25.1	31.9	5.5	7.5	11.6	−28.0	−23.9	37.9	299.3	25.1	1,708.6

TABLE 33 (*Continued*)

Area	Including Hand, Building, and Neighborhood Industries**				Excluding Hand, Building, and Neighborhood Industries**														
	1869 to 1879	1879 to 1889	1889 to 1899	1869 to 1899	1899† to 1904‡	1904‡ to 1909‡	1909‡ to 1914‡	1914‡ to 1919§	1919§ to 1921‡	1921‡ to 1923‡	1923‡ to 1925‡	1925‡ to 1927	1927 to 1929	1929 to 1931#ϕ	1931#ϕ to 1933#@	1933#@ to 1935#	1899 to 1919§	1919§ to 1929	1869 to 1929##
Ind. Areas:[b]—*Continued*																			
San Francisco Area[e]	75.4	97.3	1.6	251.8	52.2	30.2	32.8	172.4	−24.6	33.7	−1.3	10.4	19.6	−33.3	−24.9	27.1	616.9	31.3	3,211.1
Worcester Area	15.8	43.9	32.5	120.9	a	a	a	a	a	a	a	a	9.6	−38.5	−18.3	27.2	300.9	2.1	804.1
Youngstown Area	7.1	100.3	116.3	364.0	a	a	a	a	a	a	a	a	20.4	−59.7	−24.5	69.3	747.1	16.4	4,476.1
Akron Area	−5.1	62.9	96.7	204.2	a	a	a	a	a	a	a	a	1.0	−32.4	−28.6	28.0	2,151.5	7.7	7,279.8
Hartford Area	−7.9	48.9	60.0	119.4	a	a	a	a	a	a	a	a	19.0	−48.4	−24.7	52.3	451.0	33.1	1,508.2
Minneapolis Area	193.2	356.8	8.7	1,280.3	a	a	a	a	a	a	a	a	19.0	−32.6	−25.2	26.3	412.3	30.1	9,169.3
Rochester Area	22.9	199.4	15.2	328.9	a	a	a	a	a	a	a	a	4.8	−30.9	−34.5	21.3	488.3	20.0	3,117.1
Albany Area	32.8	42.7	14.2	116.4	a	a	a	a	a	a	a	a	20.1	−39.5	−30.6	47.2	245.3	19.0	791.0
Allentown Area	−2.5	52.0	106.5	205.9	a	a	a	a	a	a	a	a	18.1	−46.4	−30.1	37.4	520.3	20.3	2,182.7
Springfield Area	36.0	80.6	18.6	191.3	a	a	a	a	a	a	a	a	9.5	−34.1	−34.4	29.1	465.4	4.3	1,617.5
Toledo Area	124.1	120.8	58.1	682.4	a	a	a	a	a	a	a	a	36.5	−54.8	−27.8	83.0	881.8	69.4	12,009.7
Indianapolis Area	24.8	87.1	67.4	291.0	a	a	a	a	a	a	a	a	27.1	−38.0	−25.5	28.6	546.2	40.0	3,436.0
Kansas City Area	21.7	504.3	34.4	888.1	a	a	a	a	a	a	a	a	40.7	−41.5	−23.2	21.8	413.8	78.3	8,951.2
Seattle Area	72.0	4,030.0	46.1	10,276.4	a	a	a	a	a	a	a	a	22.9	−45.0	−22.5	29.1	1,510.4	−16.9	138,328.9
Reading Area	27.2	65.5	94.5	309.4	a	a	a	a	a	a	a	a	23.4	−43.6	−25.7	31.7	298.7	53.5	2,405.1
Wheeling Area	25.6	76.2	72.9	282.4	a	a	a	a	a	a	a	a	50.5	−36.9	−24.0	52.0	354.6	16.3	1,921.5
Dayton Area	24.2	115.7	62.6	335.9	a	a	a	a	a	a	a	a	40.6	−34.6	−31.3	28.0	438.1	110.1	4,828.4
Scranton Area	−46.8	238.3	56.0	180.7	a	a	a	a	a	a	a	a	8.1	−27.7	−19.7	9.6	368.6	10.6	1,354.6
Birmingham District[d]	1,265.5	1,339.9	58.4	41,351.7	a	a	a	a	a	a	a	a	4.9	−43.6	−42.0	65.8	430.0	77.8	397,082.1

Source: Based on manufacturing reports of the United States Bureau of the Census.

For footnotes other than the following, see Table 21.

These percentages were computed from adjusted figures for 1869. In order to eliminate hand trades, the 1869 figure for each area was lowered according to the extent of hand trades in 1899.

of building, hand trades, and neighborhood industries, was 3.7¢ per cent. This figure represents the maximum national importance of the area in terms of values added in the manufacturing process. Since 1899 the importance of the area has tended to decrease, especially if the depression years of 1914 and 1921 be excluded. The relatively severe effect of cyclical fluctuations on this producers' goods area is indicated by the sharp drop in its share of the national total from 2.69 per cent in 1929 to 1.85 per cent in 1933 and the rise to 2.33 per cent in 1935.

Up to 1899 the Pittsburgh area grew relatively, not only with respect to the United States but also with respect to the two groups of areas and Pennsylvania. Since then the area has tended to decrease relatively to each of the two groups of areas. From 1899 to 1923 the rate of expansion was the same in the Pittsburgh area as in Pennsylvania, but after that the area failed to grow as rapidly as did the state.

The relative importance of the Pittsburgh Industrial Area in value added by manufacture in the United States, Pennsylvania, and the two groups of areas for indicated census years was as follows:

Year	Per Cent of United States Total	Per Cent of Pennsylvania Total	Per Cent of 33 Area Total	Per Cent of 13 Area Total
1869	2.32%	13.91%	3.86%	5.05%
1879	2.43	17.16	3.81	5.03
1889	2.57	19.36	3.91	5.01
1899	3.67	26.28	5.89	7.76
1899 (revised)	3.76	26.29	6.12	8.09
1904	3.40	26.36	—	7.37
1909	3.15	25.76	—	6.89
1914	2.95	25.51	—	6.28
1919	3.21	25.88	5.06	6.84
1921	2.40	20.98	—	4.93
1923	3.11	26.30	—	6.50
1925	2.68	23.80	—	5.65
1927	2.52	23.25	4.00	5.27
1929	2.69	24.97	4.24	5.61
1931	2.02	20.30	3.19	4.15
1933	1.85	18.57	2.97	3.89
1935	2.33	23.33	3.69	4.83

Average Annual Rates of Growth

A rough estimate of the average annual rate of change from 1869 to 1929, with adjustments for the exclusion of building and

other hand trades, indicates that values created in the manufacturing process in the United States grew at an average annual rate of approximately 5¼ per cent. (Adjustment for change of prices would probably lower this figure to about 4½ per cent per year.) The average annual rate of gain for this 60-year period for the 33 industrial areas and also for the 13 major industrial areas was slightly less than that for the country as a whole, or about 5⅓ per cent. Pittsburgh grew at about the same rate as did the average for all industrial areas. The rate for Pennsylvania was approximately 4½ per cent; for the Philadelphia Industrial Area, approximately 4 per cent.

Intercensal Percentage Changes

The percentage changes in value added by manufacture in Pennsylvania industrial areas for each intercensal period are contained in Table 33. Here are presented the percentage changes for important segments of the period from 1869 to 1935:

Area	1869–1899	1899–1919	1919–1929	1929–1933	1933–1935
Philadelphia	106.7%	367.1%	9.8%	−51.9%	24.9%
Pittsburgh	415.1	342.0	6.6	−68.5	69.4
Allentown	205.9	520.3	20.3	−62.5	37.4
Reading	309.4	298.7	53.5	−58.1	31.7
Scranton	180.7	368.6	10.6	−42.0	9.6

In the Pittsburgh area the recovery from 1933 to 1935 was rapid; of the other 32 areas only Detroit and Toledo reported higher percentage gains.

Comparative Growth in Value Added by Manufacture in Iron and Steel Areas

Importance of Local Iron and Steel Production

Of the iron and steel areas in the United States, the Pittsburgh Industrial Area was in 1929 the most important in terms of value added in the iron and steel industry (Table 34). In that year the value added by manufacture in blast furnaces and steelworks and rolling mills in the Pittsburgh area accounted for 19.6 per cent—approximately one-fifth—of the total amount of value added in making iron and steel in the United States. The Chicago

TABLE 34

VALUE ADDED BY MANUFACTURE IN THE IRON AND STEEL INDUSTRY: SELECTED DATA FOR SPECIFIED INDUSTRIAL AREAS AND DISTRICTS, 1929

Area	Value Added by Manufacture in the Iron and Steel Industry* (In Millions of Dollars) 1929	Percentage of the United States Total Accounted for by Each Area 1929	Percentage Ratio of Iron and Steel Value Added to Total Manufacturing Value Added, for Each Area 1929
United States	$1,622.8	100.0%	5.1%
Pittsburgh Industrial Area[a]	317.8	19.6	37.1
Chicago Industrial Area[a]	249.1	15.4	9.8
Youngstown Industrial Area	172.4	10.6	54.0
Cleveland Industrial Area	96.1	5.9	13.1
Wheeling Industrial Area	63.9	3.9	45.6
Canton District[a b]	63.0	3.9	44.2
Buffalo Industrial Area[c]	59.3	3.7	12.0
Allentown Industrial Area[a]	45.0	2.8	23.6
Philadelphia Industrial Area	43.0	2.7	3.0
Birmingham District[a e]	39.0	2.4	35.1
St. Louis Industrial Area[a]	38.8	2.4	6.2
Baltimore Industrial Area[a]	38.0	2.3	11.1
Johnstown District[a d]	33.0	2.0	71.7
Detroit Industrial Area	30.0	1.8	2.4
Harrisburg District[a e]	21.0	1.3	33.1
Milwaukee Industrial Area	17.5	1.1	3.2
Remainder of the United States	295.9	18.2	—

Source: Based on manufacturing reports of the United States Bureau of the Census.
* Blast furnaces and steelworks and rolling mills.
[a] Partly estimated.
[b] Stark County, Ohio.
[c] Jefferson, Alabama. Much of the pig iron produced in the Birmingham district is used in the manufacture of cast-iron pipe instead of steel. Cast-iron pipe in 1929 accounted for about $17 million of value added by manufacture.
[d] Cambria County, Pennsylvania.
[e] Dauphin County, Pennsylvania.

area ranked second in importance, the Youngstown area third, and the Cleveland area fourth. These four areas accounted for slightly more than half of the national total.

Among the major iron and steel areas the local importance of the basic industry was by far the greatest in the Youngstown area. Over half the value added in all manufacturing industries in that area in 1929 was attributable to the iron and steel industry. In the Wheeling area that industry accounted for a somewhat smaller percentage of total manufacturing. In the Pittsburgh area the iron and steel industry accounted for somewhat over a third of the area total. Although among areas Chicago ranked second in the industry, within the Chicago Industrial Area iron and steel contributed less than 10 per cent of the area's value added by manufacture. In one of the minor steel-producing districts,

Johnstown, the industry contributed nearly three-fourths of the district's net manufacturing values in 1929 (Table 34).

Comparative Gains in Total Value Added

In 1869 the Pittsburgh area had a larger total value added by manufacture than any other present major steel area. (Refer in Table 31 to the steel areas cited in Table 34.) Since that year, however, the Chicago area has been a more important manufacturing area than the Pittsburgh area, which has continued to rank second in the group. In terms of number of manufacturing wage earners, approximately the same relationship existed among the iron and steel areas, except that according to that measure Baltimore exceeded Pittsburgh in 1879. In 1929 the value added in the Chicago area exceeded $2.5 billion, whereas the Pittsburgh figure was considerably less than $1 billion. From 1919 to 1929 there was a large gain in the Chicago area but only a slight increase in the Pittsburgh area (Chart 41). Throughout the 60-year period the Chicago area grew more rapidly than the Pittsburgh area, with the exception of the decade 1889–1899 and the 1914–1919 period; the sharp upswing during the war was the result of an unusually great cyclical swing from depression to prosperity, which affected Pittsburgh more than Chicago.

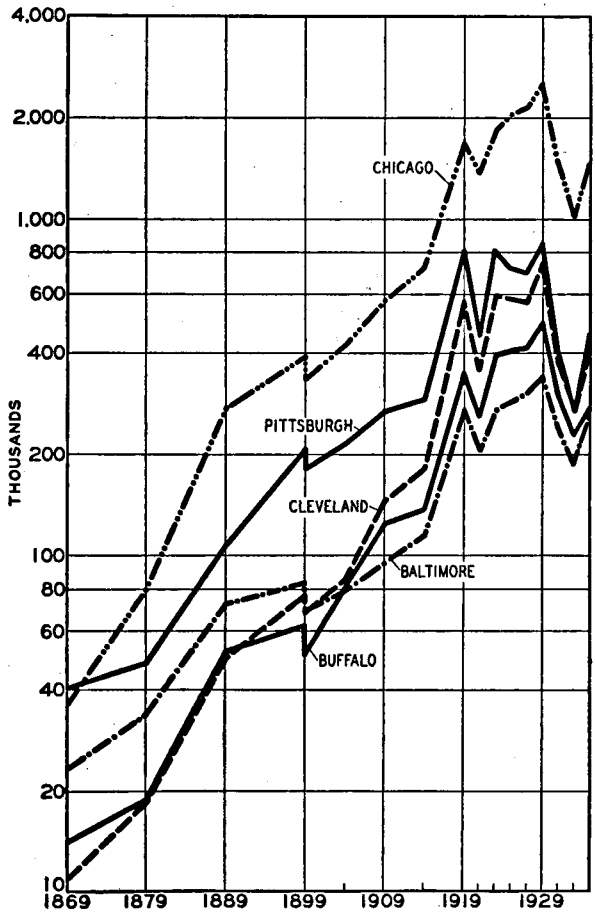
Of the five large iron and steel areas Chicago grew the most rapidly from 1869 to 1899, Cleveland from 1899 to 1919, and Chicago again from 1919 to 1929. On the other hand, the Baltimore area grew the least rapidly from 1869 through 1919, and from 1919 to 1929 the slowest growth occurred in the Pittsburgh area. Throughout the 60-year period the relative gains in the Chicago and Cleveland areas were practically identical; however, after the relatively great adjustment in the Chicago area for the exclusion of building and other hand trades in 1899—because of the great amount of building activity there at that time—the percentage increase is greater in the Chicago area.

Cyclical changes appear to be greatest in the Pittsburgh area, doubtless owing to the dominance of industries making producers' goods—heavy machinery, glass, coke, fabricated steel, as well as tonnage steel products. The 1919–1921 drop and the 1921–1923 rise were the greatest for any of the areas for which data are available. If complete figures were at hand for the Youngstown

area, they might indicate wider swings in that area than in the Pittsburgh area. Yet the movements from 1929 to 1933 and from 1933 to 1935 were almost identical in the two areas. The depres-

CHART 41

VALUE ADDED BY MANUFACTURE IN FIVE IRON AND STEEL INDUSTRIAL AREAS, 1869–1935



sion drop was the least in 1921 in Chicago and in 1933 in Baltimore. (Note, in Table 34, the relatively small local importance of the iron and steel industry in each of these areas.)

Relative National Importance of Each Area

Of the five large steel areas, Chicago has gained by far the most in the national total of value added since 1869 (Chart 42). In that year the Chicago area included 2.08 per cent of the national total (Table 32). The area share increased rapidly up to 1899, when it reached 6.94 per cent; the subsequent census adjustment for that year lowered the percentage slightly. After 1909, with the continued construction of Gary iron and steel plants, the relative importance of the area again began to rise. The relative importance of the Chicago district fell in 1919, because the area failed to share in war activity to the same extent as did eastern industrial areas. In 1929 the Chicago area reached its greatest relative importance, accounting for 7.99 per cent of the national total. The percentage fell off markedly in the following depression but rose somewhat in 1935.

The Pittsburgh area gained rather slowly in national importance from 1869 to 1889, but during the following decade the relative importance of the area rose sharply—from 2.57 per cent in 1889 to 3.67 per cent in 1899. The rapid development of the open-hearth process in western Pennsylvania was an important factor in this relative gain. Since 1899 Pittsburgh's share of the nation's value added has tended to decrease. The share increased somewhat in 1919 as a result of war prosperity but afterward tended to decrease.

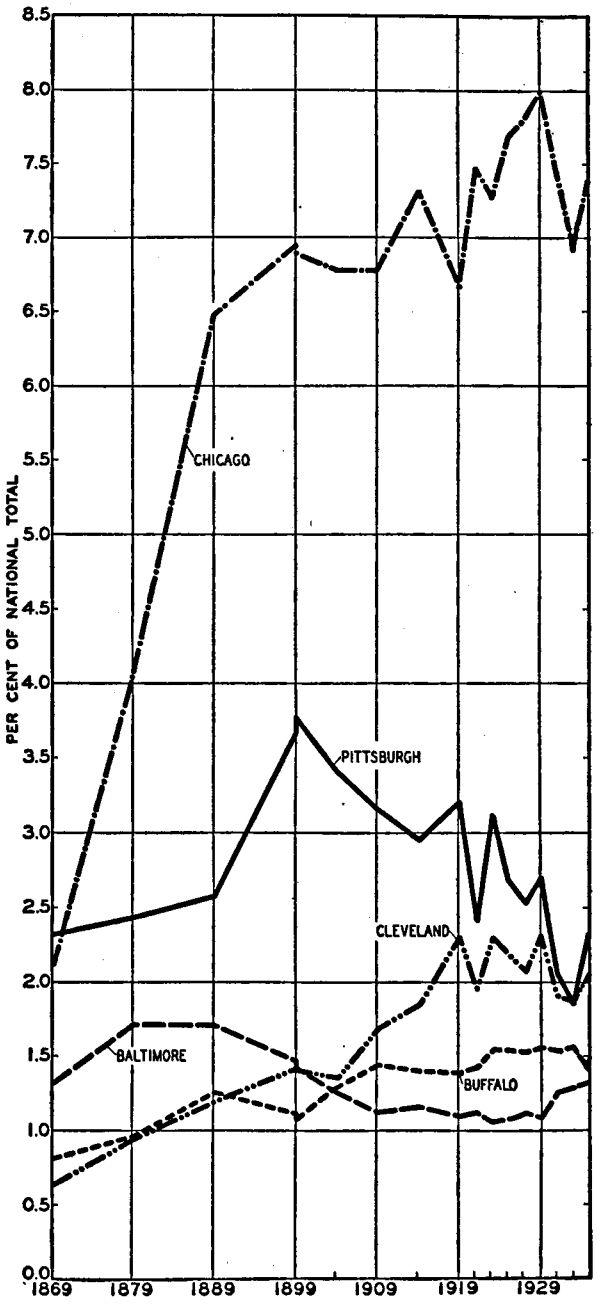
The Cleveland area gained in national importance during most of the 60-year period. Very little increase, however, has been registered since 1919. The Buffalo area also gained in national importance throughout the period, but to a much lesser extent, whereas the Baltimore area lost most of the time.

Average Annual Rates of Growth

As already indicated, among iron and steel areas the average annual rate of gain in value added by manufacture was the greatest in the Chicago area. After adjustment for the exclusion of hand trades and other nonfactory activity, the average rate of gain in the Chicago area was approximately 8 per cent per year from 1869 to 1929. The comparable rate for the Cleveland area was 7½ per cent; for the Buffalo area, about 6½ per cent; for the Pittsburgh area, 5½ per cent; and for the Baltimore area, slightly less than 5 per cent.

CHART 42

PERCENTAGE OF THE UNITED STATES TOTAL VALUE ADDED BY MANUFACTURE IN FIVE IRON AND STEEL INDUSTRIAL AREAS, 1869–1935



Intercensal Percentage Changes

The relative changes in net manufacturing values in iron and steel areas for each intercensal period are included in Table 33. Here are presented percentage changes for important segments of the 60-year period:

Area	1869–1899	1899–1919	1919–1929	1929–1933	1933–1935
Chicago	988.0%	402.3%	52.6%	−60.2%	43.2%
Pittsburgh	415.1	342.0	6.6	−68.5	69.4
Cleveland	608.6	749.9	27.2	−63.0	49.0
Buffalo	349.3	571.8	42.4	−53.7	20.3
Baltimore	262.2	299.3	25.1	−45.3	37.9
Youngstown	364.0	747.1	16.4	−69.5	69.3
Allentown	205.9	520.3	20.3	−62.5	37.4
Wheeling	282.4	354.6	16.3	−52.0	52.0
Birmingham	41,851.7	430.0	77.8	−67.3	65.8

PATTERNS OF PERCENTAGE GAINS IN SUBPERIODS

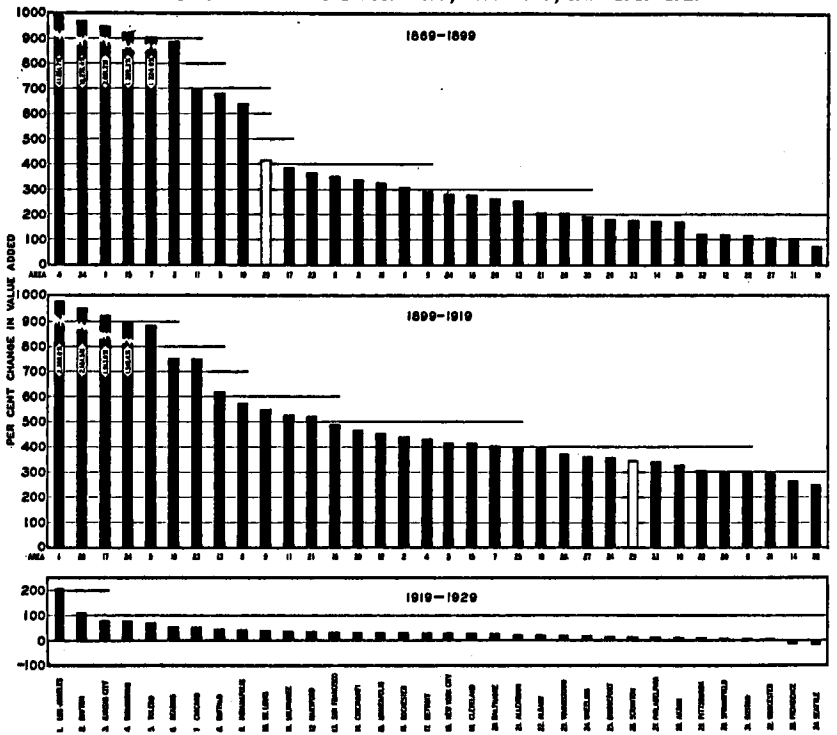
Many of the areas which rank high in percentage gains for the 60-year period also rank high in the period from 1869 to 1899 and again in the period from 1899 to 1919 (Chart 43). The Los Angeles, Seattle, and Detroit areas were at or near the top of the list in each of these three periods. The Akron area, which ranks fairly high in rate of gain for the entire period, did not grow very rapidly until after 1899, but from 1899 to 1919 it grew almost as rapidly as the Los Angeles area, which ranked at the top.

The patterns of percentage change from 1869 to 1899 indicate a great contrast between areas which grew rapidly and those which grew slowly. Value added in the Birmingham district multiplied by more than 400 during that 30-year period, whereas the value added in the St. Louis area failed to double. During the next 20 years, the contrast between the extremes in percentage gains was much less; value added in the Los Angeles area multiplied by 25, whereas value added in the Albany area multiplied by somewhat more than three. In the decade from 1919 to 1929 the percentage changes in value added ranged from a gain of 200 per cent in the Los Angeles area to a loss of 17 per cent in the Seattle area. The Providence area, in which value added decreased 12 per cent, was the only other area to report a loss during this postwar decade.

In terms of percentage gain the Pittsburgh area dropped in rank in the successive subperiods here considered. In the period

CHART 43

PERCENTAGE CHANGES IN VALUE ADDED BY MANUFACTURE IN INDUSTRIAL AREAS FOR THE PERIODS 1869–1899, 1899–1919, AND 1919–1929



from 1869 to 1899 it ranked tenth among the 33 areas; in the period from 1899 to 1919, twenty-sixth; and in the following decade, twenty-ninth.

Areas with High Rates of Growth

Four of the 12 large areas grew at very high rates in value added by manufacture during the 60-year period after 1869. These areas—Los Angeles, Detroit, Chicago, and Cleveland—are presented in Chart 44, which also includes the Pittsburgh curve for purposes of comparison. The group of areas with high rates of growth includes also eight smaller areas, namely, Seattle, Toledo, Minneapolis, Akron, Kansas City, Milwaukee, Dayton, and Youngstown. None of these 12 areas with high rates of gain are located in New England or Middle Atlantic states. All of them are midwestern areas, although the Youngstown area, which ranks twelfth in percentage gain over the 60-year interval (or the lowest in this group), includes two counties in Pennsylvania.

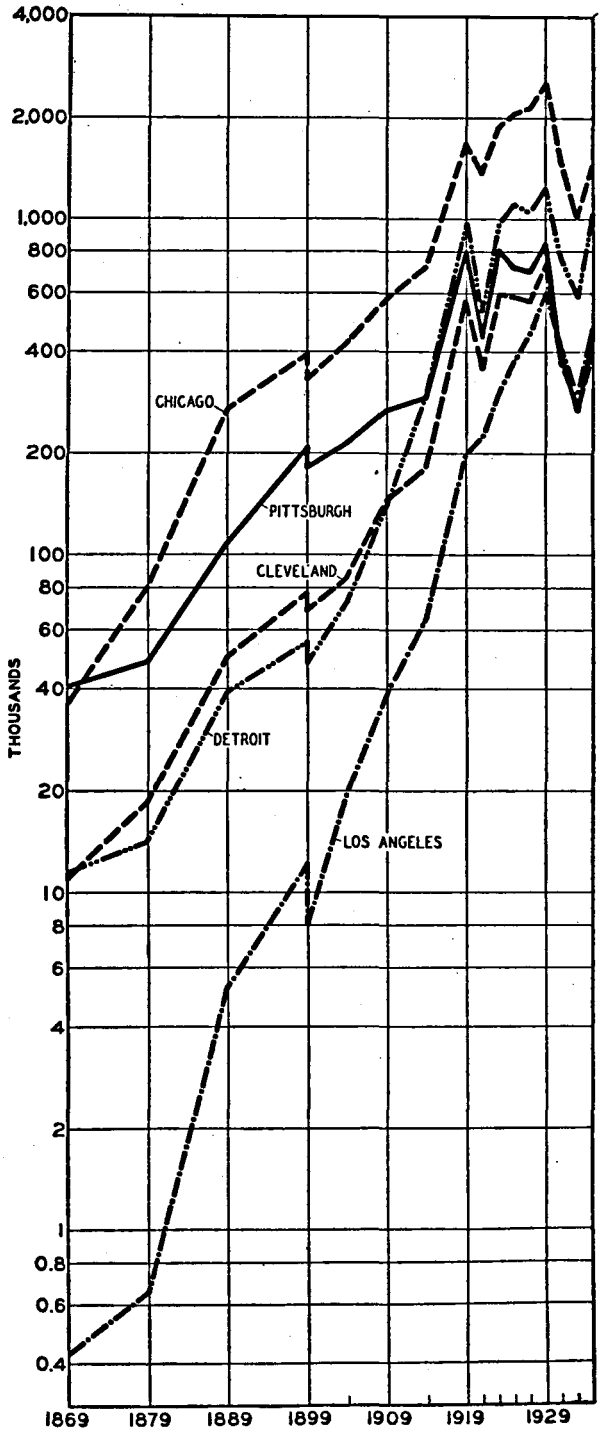
The Los Angeles area grew more rapidly during the 60-year period than any of the other industrial areas, although the rate of gain in the Seattle area also was phenomenal. Indeed, the greatest decade increase occurred in the Seattle area between 1879 and 1889, when value added multiplied by 41 (Table 33). The Los Angeles area ranked high also in gains in manufacturing employment and population, but it should be noted again that this area was of little importance during the first half of the period. In 1899 the value added in the Los Angeles area in manufacturing proper (excluding building and hand trades) amounted to only $8 million. The Los Angeles area, however, maintained unusually high rates of growth after it had become of real importance, and not until 1931 did any census report a decrease in net manufacturing values in that area. Throughout the postwar decade the area was relatively more important in value added than in manufacturing employment. The greatest gains in value added in the Detroit area occurred after 1904, with the development of the automobile industry in that district. From 1909 to 1914 the gain was about 109 per cent; from 1914 to 1919, almost 228 per cent. In each of these intercensal periods the gain in the Detroit area was the largest among the areas for which figures can be obtained.

Between 1869 and 1929, value added by manufacture increased an average of 13.6 per cent per year in the Los Angeles area.

CHART 44

VALUE ADDED BY MANUFACTURE IN INDUSTRIAL AREAS WITH HIGH RATES OF GROWTH, 1869–1935

(The Pittsburgh area is included for comparison)



(This and the following percentages are computed from figures adjusted for the elimination of building and hand trades from the Census of Manufactures in 1899.) In the Seattle area the annual percentage gain over the 60-year period was 12.8 per cent. The other 10 areas in this group grew at annual rates varying from 6.6 per cent in the Youngstown area to 8.4 per cent in the Detroit area.

By and large, the areas which grew at high rates in value added by manufacture were also the areas which grew rapidly in manufacturing employment and in population. The Los Angeles, Seattle, Toledo, and Detroit areas rank very high according to each of these three measures.

For the total of the 33 industrial areas the average annual gain in value added was nearly twice the annual gain in manufacturing employment—5.36 per cent in comparison with 2.82 per cent. In each of the 12 areas having the higher rates of growth in value added, however, the annual percentage gain in value added failed by a wide margin to double the percentage gain in manufacturing employment. These areas were all located west of Pennsylvania. In 1869 the value added per worker was already comparatively high in western areas in total output as well as within the same industry (see page 183). The gains in value added per worker after 1869 were greater in eastern areas, both because of the existence there of many old inadequately mechanized plants in 1869 and because of the comparatively late introduction of a high degree of mechanization into many old and largely eastern industries. In many of the older areas the annual gain in value added was two or three times the gain in manufacturing employment.

Areas with Low Rates of Growth

Areas with low rates of growth include five mature manufacturing districts, of which three are old eastern manufacturing areas and two are relatively old midwestern areas. These five areas—Philadelphia, Boston, Baltimore, St. Louis, and Cincinnati —also ranked low in terms of growth in manufacturing employment and in population since 1869. They reached their maximum national importance comparatively early, in all cases before 1900 (Table 32).

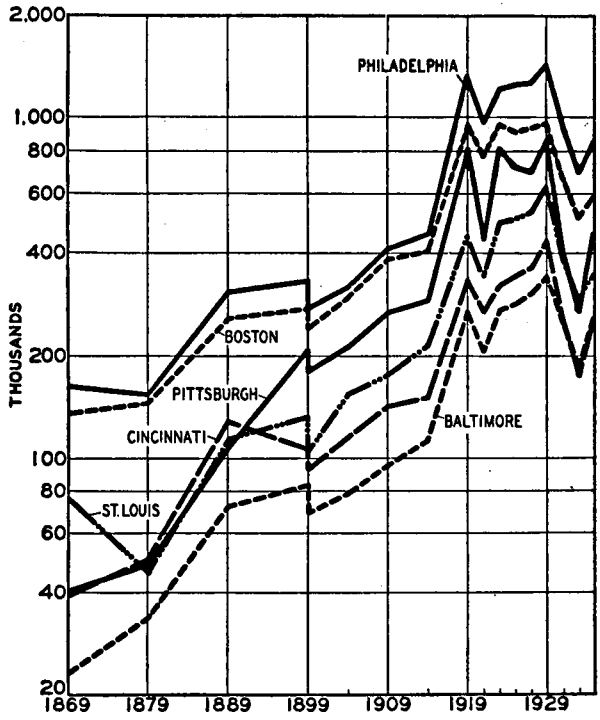
The growth in value added for these five areas was very rapid during the 1880's (Chart 45). During the previous decade, how-

ever, two of the areas had lost, the decline in value added being very severe in the St. Louis area; during the 1890's there was a considerable decrease in value added in the Cincinnati area. In each area there was a moderate rate of growth from 1899 to 1914

CHART 45

VALUE ADDED BY MANUFACTURE IN INDUSTRIAL AREAS WITH LOW RATES OF GROWTH, 1869–1935

(The Pittsburgh area is included for comparison)



and rapid gains during the war period. Since the war, changes in value added have been very irregular. From 1919 to 1929 there were only slight gains in the Boston and Philadelphia areas, whereas in the other three areas there were larger increases (Chart 45). Of the five, only St. Louis and Cincinnati were nationally more important in 1929 than in 1919. Baltimore, however, practically maintained its relative position.

For comparative purposes the Pittsburgh area is included in Chart 45. In many respects changes in that area are similar to those in the five areas already discussed. Since 1919 the growth in the local area has been no more rapid than that in either the Boston or the Philadelphia area. The Pittsburgh area, however, is properly included in the group having medium rates of growth, considered presently.

Seven smaller areas should be classed as areas with low rates of growth. They are not included in Chart 45 because of the incompleteness of data. These seven areas are Albany, Worcester, Providence, Scranton, Bridgeport, Hartford, and Springfield. The last four areas ranked at the top of this group in terms of percentage increases over the 60-year period. These seven smaller areas are all old northeastern industrial districts. Five of them are located in southern New England, one in New York, and one in Pennsylvania. All these areas reached their maximum national importance in value added in 1869 or 1879—that is, in terms of census years.

Relative growth of the 12 areas in this group is much the same in population as in value added by manufacture. The four smaller areas which rank at the top of the list in terms of value added, however, belong in the group of areas with medium rates of growth in population. In other words, over the 60-year period since 1869 the Scranton, Bridgeport, Hartford, and Springfield areas were growing more rapidly in population than in manufacturing activity as measured by value added. Forms of economic activity other than manufacturing were of considerable local significance in each of these four areas and contributed greatly to the increase in population.

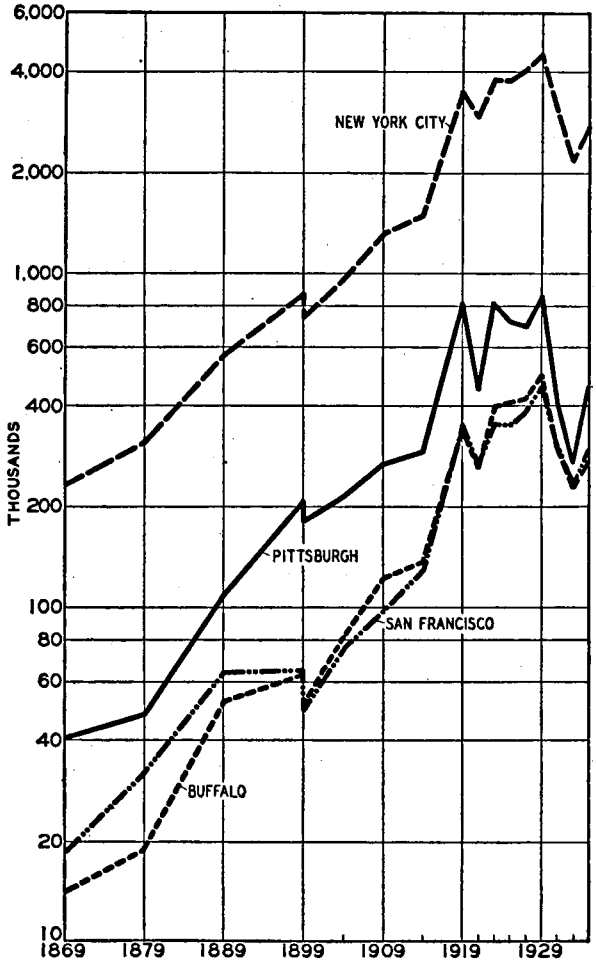
In each of the 12 areas in this group, the textile and clothing industries were of importance. In several of the areas the downward local trends of these industries help explain the comparatively low position of these areas in terms of growth in manufacturing. Moreover, most of these areas were centers for the production of light machinery and were injured relatively, if not absolutely, by the westward spread of machinery industries.

Areas with Medium Rates of Growth

Four of the 13 large industrial areas have been classified as areas in which value added by manufacture grew from 1869 to

CHART 46

VALUE ADDED BY MANUFACTURE IN INDUSTRIAL AREAS WITH MEDIUM RATES OF GROWTH, 1869–1935



1929 at moderate rates. These are the New York City, Pittsburgh, Buffalo, and San Francisco areas (Chart 46). The group having medium rates of growth also includes five smaller areas. Average annual rates of gain over the 60-year period for the nine areas fall within a range from 5 per cent to 6½ per cent; in terms

of percentage gain over the entire period the group includes all areas with increases between 1,700 per cent and 3,500 per cent. For the most part these nine areas are relatively old. Six of the nine areas are located in New York and Pennsylvania.

The Buffalo area attained its maximum national importance in 1933, the New York City area in 1889, the Pittsburgh area in 1899, and the San Francisco area in 1879—although the latter area was of only slightly less relative importance in 1933 than in 1879 (Table 32). Of the four large areas in this group, the Pittsburgh area has been growing the least rapidly since 1899.

From 1869 to 1899 the Pittsburgh area grew relatively faster than either the combined group of 13 areas or the combined group of 33 areas—increases of 415 per cent in comparison with 235 per cent and 238 per cent, respectively. During the next 30 years, however, the Pittsburgh area grew much less rapidly than either of the two groups of areas—increases of 371 per cent in comparison with 579 per cent and 580 per cent, respectively. Yet for the entire 60-year period the rate of growth in value added by manufacture in the Pittsburgh area was approximately the same as that for the average of all areas combined. Comparatively rapid growth in the first 30 years and comparatively slow growth in the second 30 years also characterized changes in population and manufacturing employment in the Pittsburgh area. The area reached its maximum national importance in value added in 1899; its maximum national importance in manufacturing employment was attained five years later.

For the entire 60-year period the Pittsburgh area is properly classified as an area with a medium rate of growth. But for the decade between 1919 and 1929 it would be classified as an area with a low rate of growth. It is quite possible, however, that post-war gains are understated somewhat because of the high valuation placed on materials used in manufacturing in 1929 by the great steel companies in this district. These companies do not buy ore and coal in the open market but charge their furnace departments with these materials at prices sufficient to offset the original purchase cost of ore and coal reserves, many of which were obtained at high prices during the early 1920's (see page 140).

The five smaller areas having medium rates of growth are those centering in Indianapolis, Rochester, Reading, Allentown, and Wheeling. Each grew much more rapidly during the 30 years

after 1899 than during the previous 30 years (Table 33). Among this subgroup the greatest postwar increase in net values occurred in the Reading area, where activity was augmented by new industrial plants, especially in the knit goods industry. All these smaller areas except the Wheeling area attained or approximated maximum national importance in postwar years; the Wheeling area since the war has not approached the national importance it had in 1899.

For the most part the nine areas in the group also ranked as areas with medium rates of growth in population and manufacturing employment. In terms of population, however, Allentown, Wheeling, and Reading fall in the group of areas with low rates of growth. These areas are dominated by manufacturing activity, and the support of the local population has received relatively little assistance from other forms of economic activity. (Mining is important in the Wheeling area, but the trend of mining in that area has been relatively weak in the last few decades; furthermore, the coal mining in the area is closely tied to manufacturing activity.)

Relation between Growth in Value Added by Manufacture and the Size and Location of Manufacturing Areas

Growth in value added by manufacture has been related to the size and the location of the area in much the same manner as was growth in manufacturing employment. In the main, the areas with the highest rates of growth in the entire 60-year period and in most intercensal subperiods have been comparatively small areas. On the whole, the areas which were the larger at the beginning of the period have grown less rapidly than the smaller areas.

Moreover, the rates of growth appear to be related to the location of the area. By and large, the rate of growth has tended to increase from east to west. The New England areas have grown at very low rates, the Middle Atlantic areas at somewhat greater rates, whereas the higher rates of growth have characterized areas in the Midwest, the South, and the Far West.

Changes in Rank among Industrial Areas

The New York City, Philadelphia, and Boston areas were the three largest industrial areas in the United States in 1869 (Table 35). They ranked in the same order in value added by manu-

TABLE 35

THE 33 INDUSTRIAL AREAS RANKED ACCORDING TO THE VALUE ADDED BY MANUFACTURE, 1869–1935

Industrial Area*	Rank by Value Added in Manufacture																
	1869	1879	1889	1899	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#	1933#	1935#
New York City Area	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chicago Area	8	4	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Philadelphia Area	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	4
Detroit Area	17	19	18	16	16	15	10	5	4	5	5	4	4	4	4	4	3
Boston Area	3	3	4	4	4	4	4	4	5	4	4	5	5	5	5	5	5
Pittsburgh Area	6	7	7	5	5	5	5	6	6	6	6	6	6	6	7	9	7
Cleveland Area	18	16	15	11	11	11	8	8	7	8	7	7	7	7	9	8	8
St. Louis Area	4	8	6	6	7	6	7	7	9	9	8	8	8	8	8	7	9
Los Angeles Area	32	32	33	33	33	a	a	a	20	14	15	12	10	9	6	6	6
Milwaukee Area	20	15	16	12	12	10	12	10	10	10	11	9	9	10	12	14	11
Buffalo Area	15	14	12	15	14	12	13	13	13	13	10	10	11	11	11	11	13
San Francisco Area	13	13	11	14	15	14	14	14	12	12	12	13	13	12	10	10	10
Bridgeport Area	9	9	10	9	9	9	11	12	11	15	13	15	14	13	14	13	12
Cincinnati Area	7	6	5	8	8	8	9	11	14	11	14	14	15	14	15	16	16
Providence Area	5	5	8	7	6	7	6	9	8	7	9	11	12	15	13	12	15
Baltimore Area	12	11	9	10	10	13	15	15	16	16	17	16	16	16	16	15	14
Youngstown Area	24	25	25	23	20	a	a	a	15	a	16	18	18	17	23	22	19
Akron Area	28	31	32	32	32	a	a	a	17	a	a	17	17	18	17	18	18
Minneapolis Area	29	20	13	17	18	18	17	16	19	17	a	a	20	19	18	17	17
Rochester Area	21	21	19	19	19	a	a	a	21	a	a	a	19	20	19	20	21

TABLE 35 (*Continued*)

Industrial Area*	Rank by Value Added in Manufacture																
	1869	1879	1889	1899	1899†	1904‡	1909‡	1914‡	1919§	1921‡	1923‡	1925‡	1927	1929	1931#	1933#	1935#
Worcester Area	10	10	14	13	13	16	16	17	18	18	18	a	21	21	20	19	20
Kansas City Area	30	28	21	21	25	a	a	a	28	a	a	a	24	22	22	21	24
Hartford Area	14	18	22	20	21	a	a	a	24	a	a	a	22	23	25	24	22
Toledo Area	31	29	31	31	30	a	a	a	29	a	a	a	27	24	29	29	23
Dayton Area	27	27	28	29	28	a	a	a	31	a	a	a	28	25	21	23	25
Allentown Area	19	23	27	25	24	a	a	a	25	a	a	a	25	26	28	28	30
Indianapolis Area	25	24	24	26	26	a	a	a	27	a	a	a	29	27	26	25	27
Albany Area	11	12	17	18	17	17	18	18	26	a	a	a	26	28	27	26	26
Springfield Area	16	17	20	22	22	a	a	a	23	a	a	a	23	29	24	27	29
Seattle Area	33	33	29	30	31	a	a	a	22	a	a	a	30	30	30	30	31
Wheeling Area	23	22	23	24	23	a	a	a	30	a	a	a	32	31	31	31	28
Reading Area	26	26	30	27	27	a	a	a	33	a	a	a	31	32	32	33	32
Scranton Area	22	30	26	28	29	a	a	a	32	a	a	a	33	33	33	32	33

Source: Based on manufacturing reports of the United States Bureau of the Census.
For footnotes other than the following, see Table 21.
* The industrial areas are listed in order of rank in 1929. For full name and definition of areas, see Table 4.
a The rank for these years cannot be determined, but it is below 18.

facture as in number of manufacturing wage earners. The other 30 areas tended to rank in approximately the same position according to both measures. There were, however, significant differences, notably between areas east of the Allegheny Mountains and those farther west. The 11 eastern areas other than the three outstanding areas just mentioned tended to rank on the average more than one full position lower in terms of value added than in terms of manufacturing employment. Conversely, the western areas on the average ranked higher in value added by manufacture. In the East the greatest difference in rank occurred in the Worcester area, which in 1869 ranked fifth in the number of wage earners and tenth in value added by manufacture. Among western areas the greatest difference occurred in the San Francisco area, which ranked seventeenth in the number of wage earners and thirteenth in value added. The relatively higher rank in the West in values produced in the manufacturing process means that the value added per wage earner was higher there than in the East. One explanation lies in differences in the types of industry in the two sections in 1869. The western areas included the iron districts of Pittsburgh, Youngstown, Cleveland, and Chicago, where the capital investment per wage earner was very high. The eastern districts included industries which required relatively much more hand labor, such as the textile industry. But to some extent the differences in rank in value added in comparison with rank in employment reflected the relative scarcity of man power which characterized the districts west of the Allegheny Mountains in the early part of the period. This relative scarcity is perhaps more clearly indicated by the greater value added per wage earner within the same industry in the West than in the East. Thus, in the making of bakery products, in publishing and printing, and in railroad repair shops the value added per worker was on the average greater in western states in 1869 than in eastern states. Yet, it should be noted that in part these differences probably resulted from the fact that the West possessed newer equipment requiring relatively less man power.

The New York City area ranked first in value added by manufacture throughout the period from 1869 to 1935. In 1869 it accounted for half again as much value added as did the Philadelphia area, which ranked second. The New York City area grew rapidly during the next decade and in 1879 was more than

twice as important as the Philadelphia area, which still ranked second. In every census year since 1879, the New York City area has created roughly twice as much value in the manufacturing process as the next ranking area (Table 31).

The New York City area is the only one which did not change in rank throughout the entire period. The Philadelphia area changed position only twice in terms of value added; it fell below the Chicago area to third position in 1899 and below the Detroit area to fourth position in 1935. In 1909 it fell to third position in manufacturing employment. Longer retention of second position in terms of employment is evidence of the lesser value added per wage earner in the Philadelphia area than in the Chicago area. The Boston and Rochester areas also maintained approximately the same positions throughout the entire period. In 1889 the Boston area fell from third to fourth position and after the war to fifth position, below the Detroit area; but in the census years 1921 and 1923 the Boston area again ranked above the Detroit area.

In 1869 the three areas most outstanding in value added were located in the extreme northeastern part of the country. The fifth area, Providence, also was located in that section. St. Louis was the outstanding western area. It ranked fourth in 1869 in comparison with a rank of sixth for Pittsburgh, seventh for Cincinnati, and eighth for Chicago. Of these eight leading areas in 1869, all except the New York City and Chicago areas lost in rank by 1935. In 1929, however, the Pittsburgh area ranked in the same position it had held in 1869.

To repeat, the Pittsburgh area ranked sixth in 1869, not far below the Providence area and very little above the Cincinnati area. Pittsburgh dropped to seventh position in 1879, and Chicago jumped from eighth place in 1869 to fourth place in 1879. From 1889 to 1899 the Pittsburgh area rose to fifth position above both St. Louis and Cincinnati; this place was held until 1914, when Pittsburgh fell below the Detroit area into sixth position. The local area ranked sixth until 1931, when it fell to seventh position. In 1933 it lost two more places and ranked ninth. The drop in rank from sixth in 1929 to ninth in 1933 is in large part a result of the fact that the depression was much more severe in heavy industry areas than in areas specializing in light manufacturing. The Pittsburgh, Cleveland, St. Louis, and Los Angeles areas, which ranked in that order in 1929, ranked in exactly the

reverse order in 1933. It is interesting to note that the 1929 order of these four areas is also the order of the extent to which each of these areas specializes in heavy industry. Partial business recovery in 1935 resulted in a redistribution of the ranks of these four areas. Los Angeles remained in sixth position, but Pittsburgh, Cleveland, and St. Louis again ranked in the 1929 order. The year 1937, a year of complete recovery, may well witness the reappearance of the Pittsburgh area in sixth position, but if the past trends in the other three areas in this group continue it is questionable whether Pittsburgh could long continue to rank above the Los Angeles, Cleveland, and St. Louis areas. The Pittsburgh area is not likely in the near future, even with complete business recovery, to rise above sixth position; because value added in this area, even in the prosperous year of 1929, was more than an eighth less than that of the area next above it. Nor is it at all likely in the next few years, even in the event of a depression, that the Pittsburgh area will fall lower than ninth position, because of the wide margin which it held in 1933 over the San Francisco area, which ranked tenth.

Enough has been said to indicate that the rank of an industrial area in any year is in part a function of the condition of business in that year. Heavy industry areas tend to rank higher in prosperity years than in depression years, and the reverse is true of light industry areas, especially those making consumers' goods. From this standpoint the ranks in 1929 tend to favor one set of areas, whereas the ranks of 1933 tend to favor another set. In the following statements comparisons are made between ranks in 1869 and in 1935, but in each instance it would be well to refer to Table 35 for a comparison of the 1929 and 1933 ranks. The greatest gain in position was made by the Los Angeles area which rose from thirty-second in value added in 1869 to sixth in 1935, a rise of 26 places. The Detroit area rose 14 positions in rank over this period, the Minneapolis area 12 places, the Cleveland and Akron areas 10 positions each, and the Milwaukee area 9 positions. On the other hand, the Albany area fell 15 places, or from eleventh in 1869 to twenty-sixth in 1935. Of the other areas which dropped heavily in rank, Springfield lost 13 places, Allentown and Scranton 11 places, and Providence and Worcester 10 places. The changes in rank in value added are much the same as those in manufacturing employment. For Los Angeles the rise in rank,

however, is considerably greater in value added than in manufacturing employment.

Suburban Movement of Manufacturing

Since 1889, manufacturing activity has grown more rapidly in the suburban sections surrounding great manufacturing cities than in the manufacturing cities themselves.[8] This difference in rate of growth has resulted mainly from the establishment of new factories in the suburban area and from the more rapid growth of production in old factories in that area. But it has been related also, at least in some areas, to the actual movement of manufacturing establishments from the city to surrounding districts.

Between 1879 and 1889, manufacturing activity was growing more rapidly in most large metropolitan cities than in the surrounding districts. Los Angeles data are not available for 1879, but nine of the other 12 central cities included in Table 36 increased as percentages of their respective area totals. In the cities of Philadelphia and St. Louis, growth was much more rapid than that in surrounding sections. On the other hand, from 1889 to 1899 growth in the suburban districts cut down the share of the central city in every one of the 13 areas.

Since 1899, census statistics on manufacturing have been limited to factories proper, instead of including building and hand trades, as had been the practice theretofore. From 1899 to 1919, manufacturing activity continued to grow more rapidly in suburban sections. Only in the Baltimore area did the city percentage of the total rise. From 1919 to 1929 the suburban development of activity was much less rapid relative to expansion in the central city, and in five of the 13 areas the growth in value added by manufacture was more rapid in the city than in the balance of the area. For the 30-year period from 1899 to 1929, however, the importance of the central city in relation to the rest of the industrial area fell in every one of the 13 large areas.

From 1879 to 1929 the central city that lost the most in local importance was Pittsburgh. At the beginning of the period the city accounted for 81 per cent of the value added in the area.

[8] Changes in the relative importance of the central city usually are not materially affected by changes in the boundaries of the city. In those instances in which the central city annexed sizable manufacturing territory, adjustments in the city total have been made.

TABLE 36

VALUE ADDED BY MANUFACTURE IN THE CENTRAL CITY AS A PERCENTAGE OF VALUE ADDED BY MANUFACTURE IN THE CORRESPONDING INDUSTRIAL AREA, 1879–1935

Central City	Based on Factory, Hand, Building, and Neighborhood Industries			Based on Factory Industries Only												
	1879	1889	1899	1899	1904	1909	1914	1919	1921	1923	1925	1927	1929	1931	1933	1935
New York City	76.6%	80.1%	76.0%	74.8%	73.5%	72.0%	71.1%	67.9%	70.9%	65.8%	68.6%	70.6%	67.3%	71.9%	70.2%	69.5%
Chicago	87.4	93.6	89.0	88.9	85.6	84.4	80.6	76.5	78.1	78.0	75.8	73.9	71.2	73.4	75.1	72.0
Philadelphia	77.0	85.7	82.2	80.5	80.4	77.0	73.4	64.4	69.2	68.3	70.8	69.7	68.3	70.7	67.9	67.8
Detroit	85.0	91.9	87.4	87.1	85.6	87.8	61.0	60.5	60.0	63.3	63.0	75.2	76.7	67.7	57.1	64.6
Boston	33.5	40.5	38.3	33.3	29.9	29.2	33.2	28.4	29.7	29.5	32.6	33.1	32.8	31.6	29.7	29.1
Pittsburgh	80.6	64.4	51.1	49.4	40.5	35.3	33.2	30.8	36.3	33.2	31.3	31.7	29.6	33.9	33.9	28.9
Cleveland	91.4	95.3	88.1	92.5	87.3	81.7	84.7	82.7	85.9	84.3	84.6	85.1	84.0	85.9	85.1	82.7
St. Louis	85.1	93.5	87.4	86.6	84.6	79.0	72.9	73.2	71.6	72.1	71.4	72.8	70.5	72.4	73.2	72.8
Buffalo	81.6	87.5	78.0	76.9	72.9	67.2	65.1	67.4	62.8	69.5	59.8	58.9	56.8	61.5	61.0	57.5
Los Angeles	—	93.8	89.4	88.1	82.3	77.1	71.7	68.1	67.7	66.1	67.7	67.1	62.8	61.2	73.3	52.4
Cincinnati	85.6	80.3	74.9	75.3	71.6	65.2	64.4	60.4	68.7	61.4	62.6	59.2	57.8	57.6	58.5	58.2
Baltimore	89.8	94.2	88.6	87.2	88.5	84.0	83.3	91.2	89.4	88.6	87.6	86.7	85.4	85.3	86.0	84.9
San Francisco	92.2	89.3	82.6	84.3	82.6	58.3	50.4	44.2	48.9	48.9	50.5	49.6	47.9	51.3	46.5	43.4

Source: Percentages are based on reports of the United States Bureau of the Census. Data for cities are published figures, except those for 1923 which are estimated; wherever necessary, adjustments were made for changes in city boundaries. Data for areas are given in Table 31.

At the end of the period the city contributed less than 30 per cent of the total. Another great drop in the prominence of the central city occurred in the San Francisco area, where the share of the major city fell from 92 per cent to 48 per cent. Somewhat the same change characterized manufacturing activity in the Los Angeles area. The least change in the relative size of manufacturing in the city and in the suburban part of the area took place in the Boston area. In 1879 the city accounted for 33.5 per cent of the area total of value added; in 1899, 33.3 per cent (building and hand trades excluded); and in 1929, 32.8 per cent. In the Baltimore area also there was only a small relative loss to the suburban part of the area.

The importance of the central city is subject to cyclical changes. In most of the 13 areas the relative importance of the city falls in a prosperity year and rises in a depression year. Thus, the central city percentage of the area total of value added dropped from 1927 to 1929 in all but one of the 13 areas, rose in 10 of the areas from 1929 to 1933, and fell again in all but one of the areas from 1933 to 1935. The primary explanation of these changes probably lies in the fact that the central cities contain a far larger percentage of the consumers' goods industries in those areas than do the balance of the areas. In Detroit, however, the relative importance of the city rose in 1929 and fell from 1929 to 1933. These changes were related to shifts in activity in the automobile industry among plants of the same corporation. Such shifts are not necessarily related to the business cycle; in some years at least they have resulted from the closing down of one plant in order to prepare for new models and the consequent moving of all activity to a nearby plant. From 1914 to 1919 the great drop in the relative importance of the central city in the Philadelphia and San Francisco areas resulted largely from the war boom in shipbuilding plants located beyond the boundaries of these two cities; the rise in the relative importance of the city from 1919 to 1921 was accompanied by the collapse of that boom.

Summary with Respect to the Pittsburgh Industrial Area

The conclusions with respect to growth in manufacturing activity in the Pittsburgh district which can be drawn from changes in value added by manufacture are much the same as those which relate to changes in manufacturing employment. Within the area

itself the trend in value added has been and still remains more favorable than the trend in manufacturing employment. The difference results primarily from the increasing output per employe as well as from the improvement in quality of product. Among the 33 manufacturing areas, however, the comparative position of the Pittsburgh area is more favorable when based on manufacturing employment than when based on value added. For, in terms of the latter, the Pittsburgh area is one of the very few areas with a downward trend during the period 1921–1931. The major conclusions of this chapter follow:

1. Value added by manufacture in the Pittsburgh area grew most rapidly from 1914 to 1919. This increase, however, is in large part a result of price inflation, even though there were important gains in output. Otherwise, the greatest gain in value added occurred during the 1880's, although the rate of growth was nearly as high in the next 10-year period. During these two decades, major changes were made in the manufacturing process in the iron and steel industry. In the 1880's the Pittsburgh area led in the introduction and operation of the Bessemer process of making steel. Moreover, in the following decade the area was the first to install large open-hearth furnaces. After the beginning of the century the rate of growth in value added began to fall, and with the exception of the war period the rate has continued to drop.

2. For the entire 60-year period the rate of gain in value added in the Pittsburgh area was somewhat greater than that for the group of 33 areas. During the first half of the period the growth was much greater in the Pittsburgh area. Value added in the area multiplied by five and in the 33 areas by only somewhat more than three. From 1899 to 1919, however, the area grew somewhat less rapidly than the total for all areas and from 1919 to 1929 very much less rapidly. During this latter decade the percentage increase for the area was less than one-fourth that for the 33 areas—6.6 per cent in comparison with 27.2 per cent. As was to be expected because of the dominance of capital goods industries, the relative decrease from 1929 to 1933 and the relative increase from 1933 to 1935 were much greater in the area than in all areas combined.

3. Among the iron and steel areas, value added increased more rapidly during the 30 years ending in 1899 in the Chicago and

Cleveland areas than in the Pittsburgh area. During the 1890's, however, the rate of growth was more rapid in the Pittsburgh area; during this decade the local area preceded the other areas in the introduction and development of the open-hearth process of making steel. From 1899 to 1919, value added increased more rapidly in most of the other iron and steel areas than in the Pittsburgh area, and from 1919 to 1929 the rate of increase in the local area was by far the lowest. In the postwar decade the Youngstown and Wheeling areas ranked just above the Pittsburgh area, though the gains were two to three times as great in these areas as in the local area. Among the iron and steel areas the percentage drop from 1929 to 1933 was the greatest in the Youngstown area, a decrease of 69.5 per cent, although the drop in the Pittsburgh area was almost as great, a decrease of 68.5 per cent. The relative drop exceeded 50 per cent in all the iron and steel areas except Baltimore. From 1933 to 1935 the gain exceeded 69 per cent in both the Pittsburgh and Youngstown areas.

4. In terms of value added by manufacture the Pittsburgh area attained its greatest national importance in 1899 when the area accounted for 3.76 per cent of the national total. During the succeeding 36 years the growth in manufacturing in the area was less rapid than that of the nation, and the area's portion of the national total of value added fell to 2.69 per cent in 1929 and to 1.84 per cent in 1933. The ratio rose to 2.33 per cent in 1935, and a return to approximately the 1929 percentage can be anticipated in 1937.

PART II

INTERPRETATION

CHAPTER 5

REASONS FOR REGIONAL DIFFERENCES IN THE RATE OF INDUSTRIAL GROWTH

INTRODUCTION

Multiplicity of Explanatory Factors

Regional differences in the rate of industrial growth are the resultants of a great variety of economic, social, and geographic factors. In this chapter it is purposed to single out the influences that have had a significant bearing on the rate of industrial growth in important industrial districts during the 60 years ending in 1929, to point out instances of the operation of particular influences, and to evaluate the relative importance of the several tendencies.

Perhaps the most widely held explanation for differences in rate of industrial growth is the shift in population, including the accompanying changes in the relative consuming importance of the areas most affected. But population movements are a result of, as well as a cause of, differential rates of growth in industrial activity. The more fundamental reason, no doubt, lies in differences among areas in costs of production for given products and in changes in these differentials. A related consideration is the great variation in natural advantages for industrial production. Another important factor has to do with the stage of economic development. Some sections of the country are comparatively young, both in terms of settlement and in terms of industrial development, and consequently have at least part of their major period of development ahead of them. On the other hand, other areas are old and fully developed and have already experienced a period of rapid expansion. For a few districts the rate of growth has been determined primarily by the geographical shift of an old industry: one district has lost; another has gained. In still other areas the growth of manufacturing activity is largely the result of the development and the localization of a new industry. Other influences which have contributed to regional differences in industrial expansion are differences in the type of product, shifts

in consumer preferences, and differences in local leadership and initiative.

Interdependence of Factors

The various factors which help explain differences in the rate of industrial growth among states and industrial areas are not mutually independent but for the most part are interrelated. Thus, the stage of development of an area depends in part on the age of the area, which in turn is related to population shifts within the country. Moreover, the movement of an old industry from one section of the country to another is affected by changes in manufacturing costs and distribution costs and may also be related to shifts in the population. The development of new industries is a result of inventive genius, the lowering of costs of production, and shifts in consumer preferences. Localization of these industries within certain industrial areas is a function of differences in natural advantages and is related to the comparative effectiveness of local leadership.

Channels through Which Differences in the Rate of Growth Arise

The explanatory factors enumerated above may operate on regional differences in the rate of industrial growth through any one or any combination of the three following channels: variations among individual industries in the rate of growth; variations among areas in the rate of growth for the same industry; and variations among areas in the relative importance of the same industry.

Variation among Individual Industries in the National Rate of Growth

One of the most clearly established characteristics of industrial growth in the United States has been the great variation among individual industries in the rate of gain. Some industries have expanded at a phenomenally rapid rate while others were contracting. For example, from 1885 to 1929 the average annual rate of growth was 24.3 per cent in the production of aluminum and —1.5 per cent in the production of non-Portland cements.[1] Be-

[1] A. F. Burns, *Production Trends in the United States since 1870*, pp. 59–60.

:ause of the uneven distribution of each industry over the country, :he variations in rates have exercised far more influence on some ıreas than on others. Although differences in rates have always :haracterized industrial growth in this country, changes in census :lassifications as well as the comparative scarcity of statistical ıaterial make it advisable to limit much of the discussion of the :ffect of these different rates on various sections of the country :o the period since 1919.

Expanding Industries.—The number of wage earners employed in making electrical machinery, apparatus, and supplies increased more from 1919 to 1929 than did employment in any other manufacturing industry.[2] Approximately 116,000 more workers were engaged in this industry at the end of the decade than at the beginning. From 1909 to 1919 the increase in numbers employed was even greater—about 125,000. These gains represented significant additions to manufacturing employment in the northeastern quarter of the country. Outside that section the industry is of minor importance. Significant representation in this very rapidly growing industry was an important factor in the continuance of industrial expansion in the Pittsburgh area. Wage earners in this industry in the district increased from approximately 6,000 in 1899 to 20,000 in 1929; the number of office and salaried employes rose from about 450 to nearly 5,000.

An important basis for the great growth in industrial production in the Southwest since 1909 has been the increasing demand for petroleum products. In the entire country nearly 22,000 wage workers were added to the petroleum refining industry between 1919 and 1929, and approximately 45,000 were added during the preceding decade.

The chief reason for the rapid growth in manufacturing in Michigan and in the entire East North Central division[3] was the unusually high rate of growth in the automobile industry, the major part of all branches of which are concentrated in this section of the country. The number of wage earners employed in the automobile industry was 76,000 in 1909; it rose to 343,000 in 1919 and 447,000 in 1929. The increase of 268,000 from 1909

[2] United States Bureau of the Census, *Manufactures: 1929*, Vol. II, Table 5; also United States Bureau of the Census, *Location of Manufactures, 1899–1929*, p. 18.

[3] For the states included in the several geographic divisions of the country, see p. 16.

to 1919 is one of the greatest decade gains in employment for a manufacturing industry. The largest decade gain ever recorded was that for shipbuilding between 1909 and 1919; wage employment increased 347,000. For a time the war shipbuilding boom greatly stimulated industrial activity in most of the country's major ports.

In the Los Angeles Industrial Area the high rate of growth since the war is related to the rapid expansion in petroleum refining, motion picture production, and food canning. The same industries largely account for recent industrial gains in California as a whole.

Contracting Industries.—From 1919 to 1929 the number of wage earners decreased severely in only a few industries: notably, ship and boatbuilding, steam railroad repair shop activity, and the making of lumber and timber products. Moreover, national losses of more than 20,000 wage earners during this decade occurred in industries making meat packing products, musical instruments and phonographs, cigars and cigarettes, foundry and machine shop products, finished leather, and woolen and worsted goods.[4] A few great industries reported lesser losses; among these were cotton goods and boots and shoes other than rubber. The rate of growth in manufacturing employment in districts in which these industries were of considerable importance was accordingly restricted. The industry that lost most in manufacturing employment after the World War was ship and boatbuilding. Wage employment in this industry fell from 387,000 in 1919 to 55,000 in 1929, and salaried employment dropped from 25,000 to 6,000. Industrial districts centering in Philadelphia, New York City, Seattle, San Francisco, Baltimore, and Norfolk suffered severely. Decreases were the greatest in the Middle Atlantic states. These drastic reductions in manufacturing employment were a result of

[4] In terms of quantity of output, five of the above industries and possibly a sixth were expanding from 1919 to 1929. In lumber and timber products, output increased 8 per cent; in meat packing, 14 per cent; in cigars and cigarettes, 57 per cent (a decrease of 8 per cent in cigars and an increase of 130 per cent in cigarettes); and in woolen and worsted goods, 8 per cent. Although no quantity totals have been computed, output also increased for foundry and machine shop products and possibly for steam railroad repair shop activity. In ship and boatbuilding, output dropped 92 per cent; in leather production, 16 per cent; and in musical instruments and phonographs a large though undetermined per cent. Aryness Joy, "Index of Production of Manufactures Derived from Census Data, 1929, 1931," *Journal of the American Statistical Association,* September, 1934, pp. 305–7.

the discontinuance of war shipping, the general drop in ocean traffic after the war, and the greater use of foreign vessels.

There was also a great restriction in employment from 1919 to 1929 in railroad repair shops. The average number of wage earners in this industry declined by 118,000 during that decade. These losses were spread more or less evenly over the United States and had no unusually depressing effect on any one major industrial area. The losses, of course, were more severe in those areas in which railroad transportation was of more than average importance, notably in the Chicago, Pittsburgh, and New York City areas. The employment losses in this industry resulted more from the introduction of more efficient methods than from competition from the automobile industry. The considerable losses in industrial activity since 1899 in the lumbering districts of Michigan, Wisconsin, Minnesota, and some southern states did not indicate a declining trend in the entire industry or a falling per capita consumption of timber products but merely followed the exhaustion of timber reserves in those districts.

Variation among Areas in the Rate of Growth in the Same Industry

Although the rapid development of the electrical machinery industry has contributed much to industrial growth in the northeast section of the country, there have been important regional differences in the rate of expansion of the industry. In general the Midwest has experienced a more rapid growth of the industry than the Middle Atlantic and New England states. Since 1909 the relative positions of New York and Massachusetts in the industry have been weakened, those of New Jersey and Pennsylvania have remained about the same, and those of Illinois and Ohio have been strengthened. The major exception to the westward shift of the industry has been the marked expansion in the Philadelphia area, owing in considerable part to the increase in output of radio apparatus. From 1909 to 1929 the industry grew more rapidly in the Chicago and Philadelphia areas than in any other district important in the manufacture of electrical machinery. On the other hand, growth has been comparatively slow in the areas in which the industry first grew up, that is, in Pittsburgh and Schenectady. Growth has been moderately rapid in the New York City, Cleveland, and Boston areas.

The high rate of expansion in industrial activity in the Southwest in the past 20 or 30 years has been related not only to the growth of the petroleum refining industry nationally but also to regional differences in the rate of growth. After the war the industry grew much more rapidly in West South Central states than in East North Central states, and in Middle Atlantic states employment in the industry actually decreased. Of an increase of 22,000 wage earners in petroleum refining from 1919 to 1929, nearly 17,000 were accounted for by Texas, Louisiana, Oklahoma, and Arkansas. Consequently, during this decade the percentage of national employment in West South Central states rose from 27 per cent to 40 per cent, whereas in Middle Atlantic states it fell from 36 per cent to 23 per cent. This relatively great change during a single decade was related to the rise of crude oil output in Texas, to increased shipments of refined products by tankers, and to the development of pipe line transportation for gasoline. Previously only crude oil had been pumped through pipe lines from producing fields to centers of population in the northeastern quarter of the country; now important amounts of gasoline are shipped by this method. Consequently, refining activity developed more rapidly at the source of raw materials.[5]

The drop in employment in establishments making lumber and timber products during the 1920's was more than 60,000, the heaviest losses being concentrated in the South. In Pacific states, on the other hand, the industry grew so rapidly that it attracted 22,000 additional workers during the decade. This shift in activity in the lumber industry was an important factor contributing to the maintenance of industrial growth in the Pacific Northwest. The rate of expansion in that section was considerably lowered, however, by the postwar collapse of the shipbuilding industry.

Regional differences in the rate of growth of the iron and steel industry have had their effect on the development of several industrial areas. From 1919 to 1929 Middle Atlantic states lost nearly 32,000 workers in steelworks and rolling mills alone. As a consequence, the proportion of employment in this industry in that

[5] Between 1929 and 1933, however, refining activity held up somewhat better in the Northeast than in the Southwest; the result was a drop in the relative national employment in the four West South Central states from 40 per cent to 36 per cent and a rise in the three Middle Atlantic states from 23 per cent to 26 per cent. In 1935 the proportions were 35 per cent in West South Central states and 27 per cent in Middle Atlantic states.

geographic division fell from 54 per cent to 43 per cent of the national total. On the other hand, in East North Central states the additions to wage employment in this industry amounted to nearly 31.2 per cent, the relative importance of these states rising from 32 per cent to 40 per cent of the national total. The Pittsburgh, Buffalo, Allentown, Philadelphia, and Harrisburg steel districts are situated in the Middle Atlantic division; the Chicago, Cleveland, Youngstown, Detroit, and Cincinnati districts, in the East North Central division.

Significant regional differences also characterized the growth of the boot and shoe industry during the same decade. The percentage of employment in the industry in New England fell from 49 per cent to 39 per cent of the national total, whereas in East North Central and West North Central states combined the percentage rose from 24 to 32. The main loser was the Boston Industrial Area. The outstanding gains accrued to the St. Louis and Chicago districts. In the cotton goods industry an even greater relative change occurred; the proportion of employment in New England fell from 47 per cent to 30 per cent of the national total, whereas the proportion accounted for by South Atlantic states rose from 38 per cent to 54 per cent.

Variation among Areas in the Relative Importance of the Same Industry

Industrial Specialization by Areas.—The industrial areas of the country are not simply *general* industrial areas—though in some areas there is a very wide variety of activity. To a considerable extent they are iron and steel areas, textile areas, automobile areas, machinery areas, coal areas, or oil areas. A considerable degree of geographical division of labor has been developed in the industrial life of the nation, and the extent of this localization has increased during the past two or three decades. Nearly every area has its own specialties and is generally known for its efficiency in those industries. Yet each area contains a great variety of other, and usually smaller, industries. In some areas these industries are related directly to the major industry or industries in which the area may be said to specialize; in others, the minor industries have no connection whatever with the dominant industry. For example, the importance of the food canning industry in the Pittsburgh area in no way depends on the local specialization in iron

and steel production; it is an entirely independent line of productive effort. In a few industrial areas the rate of growth in the major industry may be largely offset by losses in minor industries or in some important industry in which the area previously specialized. For example, although the manufacture of electrical equipment has increased rapidly in the Albany-Schenectady area, total manufacturing employment in the area has not gained markedly because of decreases in textile and clothing manufactures. In other areas the slow growth in the primary industry has covered up the rapid growth of an important but secondary industry. The rate of expansion in the manufacture of electrical equipment in the Pittsburgh area has been outstanding and would have appeared so had the development taken place in a district with little other manufacturing activity. But the greater local importance of the iron and steel industry, which since 1910 has been growing at a much slower pace than theretofore, served to hide the rapid gains in the making of electrical equipment.

Areas may specialize in several industries, in the sense that a large proportion of the total national activity of each is concentrated within the area. Among other industries an area may specialize in the manufacture of a variety of relatively unimportant commodities. In many accessory products industries, such as those connected with the production of clothing, furnishings, and office equipment, the New York City Industrial Area ranks first. But the net effect of these small industries on the growth of that area is insignificant. Only those industries which are important nationally are likely to influence local industrial growth. Moreover, the influence will be greater if the industry is expanding rapidly; for, in that event, the area will tend to concentrate more and more of its effort on that industry.

Differences in Industrial Concentration.—Although it may be theoretically possible, no area has a perfectly even distribution of economic activity among local industries, in terms of either wage earners or value of production. On the contrary, industrial operations in each area usually concentrate on the making of certain products. In many areas two or three industries tend to dominate, and even a single industry may do so. In some areas more than half of total manufacturing employment, for example, is accounted for by a single industry. In others the largest industry accounts for as little as 7 per cent of manufacturing em-

ployment, although it probably influences productive activity in some of the smaller industries.

Examples of These Regional Variations.—Variations in the local relative importance of the iron and steel industry, particularly when considered in connection with regional variations in the rate of growth of the industry, help account for differences in manufacturing trends in the several iron and steel districts. During the past 50 years the iron and steel industry—blast furnaces, steel furnaces, and rolling mills—has been of dominating influence in the Pittsburgh area, whereas in the Chicago area this industry, although of significant size, has always been of much less *relative* importance. Consequently, the rounding off of the growth curve for this basic industry has had a more retarding effect on the trend in total industrial production in the Pittsburgh area than in the Chicago area.

The local relative importance of iron and steelmaking, however, has been falling in the Pittsburgh area and rising in the Chicago area. From 1899 to 1929 the share contributed by this industry to the total value added by manufacture decreased from 45 per cent to 37 per cent in the Pittsburgh area and increased from 5 per cent to 10 per cent in the Chicago area. These changes in the local importance of the industry have followed in part from regional differences in rate of growth of steelmaking. The Pittsburgh area is located in a geographic division of the country which has been losing relatively in the industry since 1900 and which has failed to report material increases since 1919.[6] On the other hand, the Chicago area is located in a geographic division which has been gaining both relatively and absolutely for the past 40 years. Rapid expansion of steel production in other areas has acted as a brake on the growth of the industry in western Pennsylvania. There are indications, however, that the decline in the national importance of the Pittsburgh area in this industry has halted. In 1898, western Pennsylvania accounted for 38.3 per cent of the national out-

[6] In the Middle Atlantic states (New York, New Jersey, and Pennsylvania), the production of steel ingots and castings was 22,300,000 gross tons in 1917, the peak war year, and 22,800,000 in 1929. In Pennsylvania, pig iron production, excluding ferroalloys, decreased from 16,200,000 gross tons in 1916 to 14,000,000 in 1929. The Pittsburgh steel district, of course, is located at the western edge of this geographic division; moreover, it has been growing more rapidly than the balance of the division. American Iron and Steel Institute, *Annual Statistical Report,* for 1916, 1917, and 1929.

put of finished hot-rolled iron and steel production; in 1919, 35.6 per cent; in 1925, 28.2 per cent; and in 1929, 27.8 per cent.

If total industrial activity in the Pittsburgh area continues to grow and if the national trend of the iron and steel industry does not rise materially, the dominance of this industry in the area is likely to continue to drop in response to the more rapid growth of other industries.[7] To the extent that the more rapid local expansion of other industries has decreased the relative importance of the iron and steel industry, the decrease is desirable; for the iron and steel industry is an old industry and is not likely to regain a rapid upward trend. Yet for some time to come, Pittsburgh will remain essentially a steel-producing area and as such will stand to be more directly affected than the Chicago area, the second ranking steel area, by any change in the rate of growth in the entire industry or by changes in regional differences in the rate.

Growth in the manufacture of electrical equipment has had a far greater effect on the rate of industrial expansion in the Chicago area than in the New York City area, because in the former area the industry has been relatively twice as important. In 1929 the number of wage earners employed in the industry was about 55,000 in each area. But, whereas the industry accounted for more than 10 per cent of all wage earners in the Chicago area, it accounted for only 6 per cent in the New York City area.

The motor vehicle industry, including the making of bodies and parts, employed 54 per cent of all manufacturing wage earners in the Detroit area in 1929. Many of the small machine and tool industries are very closely tied to the automobile industry. Other industries are represented only to a small extent. Since the Detroit area specializes in the production of automobiles, what happens to the automobile industry will continue to determine in the immediate future, as it has in the past, the trend of industrial production in that area.

Most other industrial areas are much less dominated by a single industry. In Buffalo, for example, the leading industry, steelworks and rolling mills, accounted for only 11 per cent of all wage earners employed in manufacturing activity in that area in 1929.

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[7] It is possible that for a time the local rate of growth in the steel industry might so far exceed the rate for the country as to allow a rise in the local importance of the industry. This rise is unlikely because of the comparatively high rates of growth of the younger industries in the area.

In this respect, Buffalo is much more nearly typical of large industrial areas than is Detroit. For most areas the rate of growth in total industrial production is not determined primarily by a single industry.

Stage of Development

Successive Stages of Growth

The most generally applicable growth curve is the so-called "ogive" or flattened "S" curve. This curve indicates slow gains during the first part of the growth period, more and more rapid gains until the curve reaches its steepest slope and the rate of growth attains a maximum, then a declining rate of growth until comparative stability is reached. Thus far, this type of curve has characterized the growth of population in the United States and in most of its subdivisions and also the growth of most industries.[8]

Tendency toward a Type Growth Curve

The growth of industrial production in most regions shows a rough tendency to conform to the flattened "S" type of curve. Ordinarily, during the early period of industrial development, the rate of growth has been small but increasing. The growth curve has risen much more rapidly in some areas than in others; but nearly all industrial areas have experienced a period of steeply rising trend in production, which has usually led to the national recognition of the area as an important manufacturing district. For a time, rates of gain have remained high, but eventually in most areas industrial activity has shown a tendency to approach a maximum. The trend in manufacturing employment also follows the usual growth curve, but in many districts the curve actually has fallen since 1919. In some instances the growth curve is a combination of a series of secondary curves or, in other words, of a series of flattened "S's." The population curve for Butler County, Pennsylvania, for example, shows three periods of the "S" type of growth (see page 263).

Examples of Areas in Different Stages of Development

During the period of initial settlement most districts accounted for very little, if any, manufacturing activity, except a minor

[8] For some industries the early period of growth at an increasing rate appears to be very short.

amount of handicraft production. Between 1800 and 1830, Pittsburgh, for example, was primarily a trading center; manufacturing was in a very early stage of development and was growing slowly. The curve of industrial output had scarcely begun to rise. Many embryonic industrial areas may exist in the country at the present time; some southern areas now attracting their first industrial plants, often textile mills, may become important manufacturing districts.

Few districts in the country are now, or have recently been, in a period of industrial growth characterized by increasing rates. In the last two decades the Houston (Texas) district grew more rapidly than theretofore and may be given as such an example. Most of the large industrial areas have probably passed the period during which their rates of growth were at a maximum. Even in the Los Angeles area the peak in the rate came as early as the 1880's, although the rate of growth remained very high until 1920; after that the area may be said to have entered the period of significant declines in the rate of gain.

Many industrial areas appear to be in the stage in which the rate of growth is falling rapidly and consequently the growth curve rounding off sharply. This situation clearly applies to manufacturing employment in the Chicago, Detroit, and Cleveland areas. Several other areas have entered a still later period in which the growth curve for manufacturing employment has reached the top level and begun to fall. The Pittsburgh area is in this group. However, in terms of value added by manufacture (adjusted for price changes) the Pittsburgh area is growing very slowly.

Variation in Time Required to Reach Maturity

Although industrial activity in most areas has a tendency to conform to the "S" curve, there is, nevertheless, a great variation in the time required to pass from industrial infancy to industrial maturity. In the New York City Industrial Area the growth in manufacturing employment has tended to follow an "S" curve, but the curve has been stretched out over a very long period of time. (The beginnings of manufacturing employment there extend back to Colonial times.) Consequently, the upward slope of the employment curve has been comparatively moderate. This industrial area has grown with the country, and any outstanding gain in population or industrial production in the nation has had

its effect on industrial employment in the New York City area. The dominating metropolitan area is not likely to reach industrial maturity ahead of the country.

On the other hand, the Los Angeles Industrial Area required comparatively few years to move from industrial infancy to a stage which appears to foreshadow industrial maturity (Chart 28). Manufacturing employment in this area began to grow slowly during the 1870's, increased very rapidly between 1879 and 1919, and expanded more slowly during the 1920's. The New York City Industrial Area required about 150 years to go through the stages of development that the Los Angeles Industrial Area experienced in 50 years. This great difference, of course, results from the fact that the Los Angeles area was in a sense held back from industrial development until the westward wave of population reached that part of the country. Still, for some time after 1880, when significant expansion began, manufacturing activity in that area consisted in supplying local needs. Two or three decades later the industry of the district began to adopt very rapidly the type of organization and technique characteristic of the more mature industrial establishments in other parts of the country. In a sense, the New York and Los Angeles areas represent extremes; a comparison of their rates of industrial growth since 1870 should be judged in that light. Less outstanding differences characterize the *timing* of the growth curves of other industrial areas.

Variation in Height of Growth Curve

If the industrial curves are plotted on the same ratio scales or on the basis of index numbers, great variations in the height of these curves are noticeable. These comparisons indicate that from the beginning to the peak some areas have experienced greater percentage gains in industry than others or, to put it another way, that some areas are now much larger than others. Obviously, general conformity to a type of growth curve does not require that industrial maturity represent the same size. Maturity may appear at different levels of industrial activity.

Relation of Stage of Development to Age of Area

Long settled areas are likely to be old centers of industrial activity; newly settled areas are of necessity in an early stage of

industrial development. It is possible, however, for an old community to experience renewed growth in population following upon the initial development of manufacturing activity. The late discovery of natural resources may lead to such a result. Newer areas have a tendency to catch up rapidly in industrial development. Late in entering the field of industry, they must develop rapidly if they are to compete with other regions.

If one is comparing for the same period the rate of growth for a fully matured industrial district with the rate of growth for a comparatively young industrial district which has a surplus of unexploited natural resources, it is well to bear in mind that the difference in the rate does not necessarily mean that total resources are greater or that the maximum possible size is greater in the area with the larger rate. For example, by 1929 manufacturing employment in the Los Angeles area had attained a size approximately as great as that attained by manufacturing employment in the Pittsburgh area around 1890. It required the Los Angeles area only about 50 years to attain a prominence which had required the Pittsburgh area approximately 90 years. The Los Angeles area, however, was probably much nearer maximum possible industrial employment in 1929 than the Pittsburgh area was in 1890.

Population Shifts

Types

East to West.—Each decennial census since 1790 has indicated a westward movement of the center of population. In some decades the center of population has shifted a few miles south and in other decades a few miles north, but the most significant movement has been westward. Indeed, it is not far wrong to say that the center of population has moved westward along the 39th parallel of latitude. In 1790 the center of population was situated in eastern Maryland, 23 miles east of Baltimore. In 1930 it was located in southern Indiana near the western boundary of that state.[9] During this 140-year period the center of population moved 589 miles westward and 15 miles southward.[10] Geographical centers of various forms of economic activity have tended to

[9] Not far from Linton, a small town between Vincennes and Terre Haute.

[10] United States Bureau of the Census, *Population, 1930*, Vol. II, p. 20. The smallest movement of the center of population in any one decade occurred between 1910 and 1920, a shift of less than 10 miles.

move westward with the center of population, though for the most part at a later date.[11] The center of manufacturing has lagged a considerable distance behind the center of population, whereas the geographical centers of the production of some agricultural products for a time moved westward faster than the center of population, and many of these centers are now located west of the Indiana-Illinois line.

The East North Central division of the United States was the most populous geographic section of the country from 1870 through 1900. In 1910, however, the Middle Atlantic section again assumed the lead—a position which it had held from 1840 through 1860—and that section has continued to include the largest number of inhabitants. Had it not been for the tremendous movement of population to the Pacific coast and to the Southwest between 1900 and 1930, the center of population for the first time in the history of the country would have moved eastward.[12] From 1900 to 1930, among the highest relative gains in population were those occurring in the Far West. The percentages of increase were: California, 282; Arizona, 254; Washington, 202; Idaho, 175; and Oregon, 131.[13] (Other high percentage increases were 203 per cent in Oklahoma, 178 in Florida, and 144 in Wyoming.) In each of the decades since 1870, the percentage gain in the Pacific states has ranked third or higher among the geographical divisions of the country, and in each of the past three decades the percentage gain has been the greatest. The greatest absolute gain in population ever recorded by any state in any one census decade occurred in California between 1920 and 1930. During that decade the population of California increased by 2,250,390; in New York the increase was 2,202,839. Perhaps the most significant phases of population movement during the last 60 years have been the migration into Oklahoma from 1890 to 1910, the

[11] In the steel industry the geographical center of steel production moved from 30 miles north of Harrisburg, Pennsylvania, in 1874, to near Butler, Pennsylvania, in 1893, and to near Crestline, in north central Ohio, in 1933. American Iron and Steel Institute, *Steel Facts*, January, 1935, p. 3.

[12] The center of population is the center of gravity of the total population. The effect of population in any district on its determination depends on the size of the local population plus the distance from the "center." It is often mistakenly supposed that the center of population is the intersection of a north-south line and an east-west line that divide the total population into four equal parts.

[13] United States Bureau of Foreign and Domestic Commerce, *Statistical Abstract of the United States, 1935*, p. 5.

migration into Washington between 1900 and 1910, and the extraordinary migration into California between 1900 and 1930.[14]

During most of the period from 1890 to 1930, and especially from 1910 to 1930, there was a considerable migration of population out of Pennsylvania; in other words, the net gain of population in the state has been considerably less than the excess of births over deaths. Judged by this standard, there was an estimated net migration from the state between 1920 and 1930 of 328,000 native whites; the net loss, however, was reduced considerably by estimated net gains of 102,000 Negroes and 14,000 foreign-born whites.[15] The gains in population in New York and in California from 1920 to 1930 were far greater than would have resulted from the excess of births over deaths. The gain in California was about 1,738,000 greater than the excess of births over deaths, and the gain in New York state about 1,229,000 greater.[16]

South to North.—Although by far the predominant net movement of population in the United States has been westward, there have been in some decades small shifts in population from south to north. The greatest northern move of the center of population, that which occurred between 1860 and 1870, was only about 13 miles; the corresponding westward movement was three times as great. The center of population moved northward also between 1880 and 1890 and, very slightly, between 1900 and 1910 and between 1910 and 1920.

The northward migration of the Negro population has been much greater than that of the white population. Ever since the

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[14] C. Warren Thornthwaite, *Internal Migration in the United States* (1934), Plate VI.

[15] These estimates also are from Thornthwaite, *op. cit.*, Plate VII.

[16] Thornthwaite, *op. cit.*, Plates I and VII. Another method of indicating the migration of population is to use the census data indicating state of birth in comparison with the state of residence. This comparison indicated that in 1930 there were 2,306,436 more native whites living in California but born elsewhere than native whites living elsewhere in the United States and born in California. According to the same standard, Oklahoma ranked second in that year in terms of immigration; there were 681,308 more native whites living in Oklahoma but born elsewhere than native whites born in Oklahoma and living elsewhere. Washington ranked third with an excess of 539,243, and New Jersey fourth with an excess of 510,484. On the other hand, in 1930, Pennsylvania had experienced the greatest cumulative net loss from migration of the native-white population. There were 990,776 more native whites born in Pennsylvania and living elsewhere than native whites living in Pennsylvania and born elsewhere. Other high net losses came in Kentucky, 603,884; Iowa, 592,499; and Missouri, 527,344. United States Bureau of the Census, *Population, 1930*, Vol. II, p. 148.

Civil War, Negroes have migrated from the South into the industrial Northeast and to a lesser extent to the Far West. It has been estimated that between 1920 and 1930 approximately 700,000 Negroes left the South.[17] This northward movement has been related to greater industrial opportunities in the North, to the attraction of the Negro to large, partially self-governed groups of his race in northern cities, and to the decline in cotton production in the old South.

North to South.—During three of the decades since 1870 the center of population has moved southward. A shift of approximately nine miles occurred between 1870 and 1880, and a very minor shift between 1890 and 1900. From 1920 to 1930 there was a southward shift of about eight miles. This last move, however, does not represent an important influx into the old South, because it resulted almost exclusively from movements to California, Florida, and Texas. No important migration into the old South has taken place since the Civil War, but in connection with the expansion of textile industries in North Carolina between 1920 and 1930, there was a sizable migration of native whites into that state from South Carolina and Georgia.

Country to City.—One of the most important population shifts since 1900 has been the movement into cities. In large measure the great migrations into California and New York represent an urbanization of the population, but more important has been the movement within each state from rural to urban sections. In 1900, about 37 per cent of the population of the United States resided in metropolitan zones having a central city with a population of 100,000 or more; by 1930 this percentage had risen to 48 per cent.[18] In 1880 the population of the United States was 28.6 per cent urban—that is to say, resided in incorporated places with 2,500 inhabitants or more; by 1930 the population was 55.9 per cent urban.[19]

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[17] Thornthwaite, *op. cit.*, Plates III and VII, for estimates on two bases. Exceptions to this exodus of Negroes out of the South during this decade were movements into Florida, Maryland, West Virginia, and Delaware. Estimates are not accurate enough to indicate whether migration led to slight losses or slight gains in Texas, Oklahoma, Kentucky, and North Carolina. The "South" here includes three geographic divisions of states: South Atlantic, East South Central, and West South Central. See p. 16 above.

[18] Report of the President's Research Committee on Social Trends, *Recent Social Trends in the United States*, p. 447.

[19] *Census of Population, 1930*, Vol. II, p. 7, note 2. Under the Census Bureau's new definition of urban population, first used in 1930, the per-

Interior to Periphery.—A significant transfer of population from the interior to the edge of the country has taken place since 1900; there has been a general shift, in other words, to deep water —toward the Atlantic and Pacific oceans, the Gulf of Mexico, and the Great Lakes. A few interior districts have actually decreased in population, and many have grown by less than the excess of births over deaths. This movement is in part another aspect of the urbanization of the population, since most of the great cities are located within the peripheral zone. In 1900, 36.6 per cent of the population of the United States resided in a zone extending approximately 50 miles inland from the seaboard and from the Great Lakes. The percentage in this zone rose to 45.1 per cent in 1930. Indeed, between 1920 and 1930 this deep-water rim of the country accounted for over two-thirds of the total gain in population in the country, whereas between 1890 and 1900 it had accounted for only two-fifths of the total gain.[20]

Five parts of the country recorded unusually great population gains between 1920 and 1930. These were a strip of the Atlantic seaboard extending from just north of New York City to just south of Baltimore; metropolitan districts of the Great Lakes region from Buffalo to Milwaukee, including districts as far away from the lakes as those centering in Canton, Fort Wayne, and Flint; the metropolitan districts of Tennessee, Florida, Alabama, and northern Georgia, together with smaller middle-sized cities in North Carolina and Florida; a southwestern district running from Kansas City to Houston and San Antonio; and a strip including the metropolitan districts along the west coast.[21] It will be noted that all or part of each of the five zones lies within the peripheral area.

The movement of population to deep water probably is related to the great importance of transportation in the production and distribution of manufactured products. Since water furnishes by far the most economical means of transferring bulky, non-

centage of urban population in that year was 56.2. The percentage under the old definition is used here for comparability. Two minor modifications of the definition of the urban population were made under the new ruling: first, only those New England "towns" in which there is a thickly settled area having more than 2,500 inhabitants were included; and second, all political subdivisions, regardless of incorporation, with 10,000 inhabitants or more and with a population density of 1,000 or more per square mile were included.

[20] *Recent Social Trends in the United States*, p. 446.

[21] *Ibid*, p. 15.

perishable goods, the concentration of economic activity along or near deep water facilitates more economical production. Furthermore, plants located in the peripheral zone have ease of access to foreign markets. Other aspects of this movement to the rim of the country are the decreasing employment in agriculture, which has been made possible by the mechanization of farming operations, and the increasing proportion of the population that has retired from active work and moved to southern California or other "climate" districts. Unless decentralization of industry develops or new economic resources are discovered in the interior of the country, the future will witness the continued net movement of population from the interior toward manufacturing and trading points located around the edge of the country.

Effect of Population Shifts on Industrial Growth

Influence of Westward Population Movement.—American industrial life has always been affected by a great mixture of dynamic forces which have given it a rapidly changing appearance. In the beginning, and even up to comparatively recent times, the dominant influence has been the westward movement of population. Industrialization and the settlement of the country have been more or less contemporaneous; industry, consequently, has been peculiarly susceptible to shifts in population. Only simple forms of economic activity, such as farming, lumbering, and mining, accompanied the westward movement of population; manufacturing industries, on the other hand, moved westward much less rapidly. Since 1800 the center of manufactures has shifted westward roughly paralleling, though lagging considerably behind, the western movement of the center of population.[22] The development of manufacturing operations westward from the Atlantic seaboard has represented not so much a migration of industrial plants as the establishment and expansion of new manufacturing units. This development resulted in comparatively high percentage gains in manufacturing activity in midwestern and western states. The rate of growth during the latter part of the nineteenth century and the first part of the twentieth century was far greater in these comparatively new industrial districts than in industrial areas of the old Northeast. Yet comparatively rapid gains in the West have

[22] United States Bureau of the Census, *Manufactures, 1919*, Vol. VIII, p. 8.

created growing markets for the manufactures of New England and the Middle Atlantic states and have contributed to the continuous growth of manufacturing activity in those older geographical divisions. The westward migration of population has facilitated the spread of industrial activity over much of the country and, moreover, has worked in the direction of a geographical division of labor, that is, industrial specialization by districts.[28] Although an industry has spread southward or westward to the extent that the center of production has moved a great distance, the older producing areas are likely to have retained a dominating position in the making of machinery and tools and in engineering work connected with the construction of new plants.

Industrial Growth in the Far West.—Not until comparatively recently have some of the far western industrial districts begun to take a part in the geographical specialization of manufacturing activity and to produce products for the national, or even a regional, market. Up until the time of the World War the Los Angeles area manufactured little that was not consumed in southern California. Even at the present time most of the products manufactured in that area are for consumption in the Far West, the outstanding exceptions being the making of motion pictures and airplanes. The development of local consumers' goods industries, however, can account for considerable manufacturing activity; the growth of these industries may be very rapid if the influx of population is rapid, as it has been in southern California. Furthermore, efficiency in the distribution of products may make it possible for a manufacturing district to supply consumers' goods to a widening area. The limits, however, are comparatively narrow, since an area soon runs into competition with other areas producing these goods. Much of the earlier manufacturing activity in the three west coast states also was centered on products for local consumption. By 1900, however, food canning had become important in that section; and in 1904 California ranked first in the value of canned and preserved fruits and vegetables, the industry in that state being concentrated in the San Francisco district. During the World War the shipbuilding industry grew to national importance in the San Francisco and Seattle areas and,

[28] Victor S. Clark, *History of Manufactures in the United States,* Vol. II, p. 182.

to a lesser extent, in the Los Angeles area. Even before the war the San Francisco area supplied some products for the national market. San Francisco was the first metropolis of the Pacific Coast; it early attracted artisans and machinists who recognized the necessity of specializing in products of relatively great value, products which required the services of comparatively skilled labor or which were made under patent monopolies. For some time the San Francisco area has been shipping machinery and machine tools to markets throughout the United States.

Lag of Manufacturing Development behind Population Growth.—In their western movements, the center of manufacturing has usually lagged considerably behind the center of population, although in recent decades the former has shown a slight tendency to catch up.[24] Under the present form of industrial arts, the center of manufactures is unlikely to move so far west as the center of population; and probably it will not move so far west as the 1930 center of population, although it may continue to move westward after the center of population begins to shift eastward. A limiting factor will be the intensity of the market, as measured by the decreasing population density[25] and the even more rapidly decreasing purchasing power per unit of territory.

Historically, it is quite clear that important manufacturing activity did not develop until several years after settlement. In some regions manufacturing probably never will become of importance. In the western half of the country locational factors for industrial plants are comparatively unfavorable. If the population in this section is to be supported in part by making products for the national market, local manufacturers must exercise considerable ingenuity in developing products which will stand the high transportation charges from the West to important eastern markets. To a significant extent San Francisco has already specialized in the manufacturing of products with a high ratio of value to weight, such as automobile parts, calculating machines, and other high-value machinery. In the Los Angeles and Seattle areas the production of airplanes and airplane parts constitutes

[24] In 1850 the center of manufactures was approximately 300 miles northeast of the center of population, whereas in 1920 it was about 250 miles northeast.

[25] Owing to the deficiency in moisture and the mountainous terrain in a large part of the area.

a similar adaptation. On the other hand, Pacific Coast areas are able to ship to eastern markets by way of the Panama Canal those products not requiring speedy delivery. This advantage and the ease of access to markets in the Far East have greatly assisted the extensive development of food growing, canning, and preserving.

Geographic Differences in Growth of Manufacturing.—In general, the relative gains in manufacturing since 1869 or since 1899, as measured either by number of wage earners or by value added by manufacture, range in magnitude from comparatively small gains in New England and only fair gains in Middle Atlantic states to large gains in the Middle West and larger gains in the South, West, and Far West (see pages 123 and 180). In most decades the greatest gain has been made by a western or far western area. Population movements largely account for this geographical distribution of relative industrial increases. Most of the areas with great industrial gains in the last three decades lie to the west or to the south of the 1930 center of manufactures. The important exception is the Detroit Industrial Area, which is almost directly north of the 1930 center.

Geographic Specialization and Pittsburgh's Industrial Growth.—The first manufacturing industries which grew up after western settlement were those supplying consumers' goods for the local population; for a long time these consumer industries accounted for by far the major portion of manufacturing activity. Consequently, the extent of manufacturing in cities west of the Allegheny Mountains was a function of the size of the local population, and the industries which first attained importance were those making clothing, processing foods, building furniture, and supplying similar household or personal needs. After a time these western communities began to specialize more in the exploitation of local resources—in the making of iron, heavy machinery, glass, pottery —and for the most part gave up supplying local consumer needs for manufactured articles. The efficiency of railroad operation reduced transportation costs and allowed the sale of local specialties in the East and the shipment of eastern manufactures to the West. During the latter part of the nineteenth century these western districts became integrated in the national economy. In several instances, however, the momentum of an early start, the acumen of business management, and the expanding population caused old consumer industries to remain.

In the Pittsburgh area the early development of manufacturing resulted in the establishment of a few forms of industrial activity which have endured to the present day, even though the original appropriateness of the district for these industries has vanished in whole or in part. (Other advantages may have arisen subsequently.) Before the iron and steel era, the Pittsburgh district produced important amounts of consumers' goods. The market for these products was primarily local, although it extended along the Ohio River and its principal tributaries. The existence of this market was due primarily to the fact that the Alleghenies blocked ease of transportation from the East. A few plants in these early industries have remained in the Pittsburgh district but now appear to be located at a comparative disadvantage and to be subject to the competition of more favorably situated plants. Among these are establishments in the textile and food industries. Originally, the two producers, Heinz and Cruikshank, depended entirely on local demand for canned foods, but they have grown until they compete in the national market. Even though they may have expanded beyond the locational advantages of the Pittsburgh district,[26] they have not been relocated in compliance with considerations which now seen to determine the location of such establishments. Among other factors, the investment of considerable funds in fixed capital and proximity to the center of their market probably cause them to remain in the district.

Pittsburgh probably achieved its first great industrial importance about the middle of the nineteenth century, when southwestern Pennsylvania and adjacent sections of Ohio and West Virginia became the leading district for the making of glass and clay products. The city soon became one of the major producing and marketing centers for these industries. During the following decades the district turned more and more to the production of

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[26] By establishing canneries and other branch plants in food-producing districts in various parts of the country, the Heinz Company apparently has been able to operate the main plant at Pittsburgh more efficiently.

Concerns which make trade-marked products that are advertised nationally do not need to be located at the most favorable point. To some extent they are not making a competitive product. As a matter of fact, the relative amount of value added to materials processed in plants canning and preserving foods is higher in Pennsylvania than in any other major producing state. In that state the Heinz firm accounts for more than half of the industry. The Heinz establishment at Pittsburgh probably is the only large plant in the food canning and preserving industry not located in a great food-growing area.

iron and steel. From about 1880 until the World War, Pittsburgh remained by far the greatest steel-producing district in the nation. The next important local development appears to have been the establishment of a group of machine industries, which to a great extent were based on the relatively cheap supply of iron and steel. Important in this connection was the production of heavy machinery, particularly steel mill equipment. The development of the local electrical machinery industry was less directly related to the local iron and steel industry. In any event the localization of these major industries in Pittsburgh led to the co-ordination of the area with other parts of the national industrial life, and Pittsburgh came to occupy a special place in the geographical distribution of economic effort.

Industrial Gains Attract Additional Population

Gains in industrial activity may lead to gains in population. The discovery of a great natural resource, for example, will probably result in the attraction of people to exploit that resource. The new population may in turn attract additional industrial activity, so that the final development will be a result of the pulling power of both population and industry. In some sections of the country, settlement has awaited the introduction of mining; in others, the introduction of manufacturing. Moreover, the urbanization of economic activity has led to great population movements into cities. These have created markets as well as reserves of labor for further industrial development. The rapid increase in the population of most American states is a result both of natural resources attracting population and of population attracting industry. Historically, the westward movement of manufacturing activity in this country is primarily the result and not the cause of the population movement.[27] In determining which is cause and which is effect, the important criterion is probably whether population tends to lag

[27] In Canada an interesting relationship between population growth and economic development followed from the cooperation between the Canadian banks and the Canadian National Railways in opening up new territory in advance of westward settlement. Indeed, these two groups in cooperation with the Dominion Government attracted population to previously untried areas, farther to the west and to the north than settlers had previously been willing to move. These agencies showed that districts popularly considered unfavorable for settlement were fitted for exploitation as agricultural or mineral districts.

behind industrial development or to precede it. Of course, population gains may lag behind mining developments and still precede the expansion of manufacturing.[28]

Geographic Shifts of Old Industries

Intersectional Shifts

The intersectional shift of industrial activity in most instances is not accomplished by an actual migration of manufacturing plants but by the location of new establishments in newer manufacturing areas. In other words, to a large extent less mature areas account for the growth of industries affected by interregional competition, whereas older areas more or less maintain their output or expand it slowly. Most geographical shifts in industrial activity do not represent a general spreading out over the country; they are primarily in one direction rather than dispersive. For example, when the boot and shoe industry began to develop outside the New England area, most of the new establishments located in Cincinnati and later in St. Louis. This southwestward movement has more recently been modified by the spread of the industry to Chicago and Milwaukee. There has been no general tendency for the industry to distribute itself in the several sections of the United States but rather a tendency to push westward, roughly in response to the movement of population.

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[28] Other causes of population shifts have been the opportunity to obtain free resources, the possibility to settle in new territory, differences in climate, rising standards of living, and greater mobility of the population. The opportunity of obtaining free resources in the West during much of the nineteenth century and the possibility of taking a part in the settlement of new territory appear in the main to have been responsible for the rapid westward migration from the Atlantic seaboard. The more recent shift of the population into cities and towns is related to rising living standards, facilitated by increasing income per capita. This increase in wealth has made it possible for people to retire and live in cities where a great variety of economic services have been centralized or to retire to districts with desirable climates. This factor largely accounts for recent population shifts to Florida and to California. Rising standards of living and the greater income per capita have been related, of course, to the industrialization of the nation. The very great postwar movement of population into California is related to the realization of war and postwar profits and to the retirement from industrial and agricultural occupations, which these profits made possible. Also, greater mobility of the population, since the introduction of the automobile, probably has exerted some influence in causing a shift in population from one section to another.

With respect to the dispersion of industry, there have been two broad movements in this country in the past three or four decades: the shift from the East to the West and the shift from the North to the South. The former is by far the more significant. Indeed, there are few industries which have not located new plants in conformity with the westward movement of population.

The iron and steel industry furnishes an excellent example of this westward shift. During the first six decades of the last century the Philadelphia area was the ranking producing area in that industry. But the use of Lake Superior ore and beehive coke led to more profitable operations beyond the Alleghenies, and by 1890 the Pittsburgh-Youngstown district was overwhelmingly dominant. This area—delineated by the Upper Ohio River and its tributaries —still remains the largest iron- and steel-producing region, but since 1890 important producing centers have developed around Chicago, Cleveland, and Detroit. Soon after its organization in 1901, the United States Steel Corporation began to establish and expand furnace capacity in the Chicago area. Other producers followed suit, and the proportion of iron and steel output west of Pittsburgh rose rapidly.

Many other large industries have tended to move westward during the past fifty years. In one conspicuous instance there was an actual migration of the industry. Prior to the Civil War, Virginia was the leading state in the production of agricultural machinery. Afterwards, Cincinnati attracted most of the manufacturing concerns in that industry. They stopped there only about two decades before moving on to northern Illinois, which remains to the present day the one important district for producing this type of machinery.

The most notable example of the southward movement of industry has been the spread of the cotton textile industry from New England to the South Atlantic region. At first, southern mills specialized in rough goods, and to a large extent they have displaced New England mills in this field. Moreover, before the World War, southern mills undertook the production of high-grade cotton fabrics, and by 1933 the production of much of this branch of the industry was accounted for by southern states. Another important textile industry, the making of rayon, has shown a tendency to grow more rapidly in the South than in the North, especially since about 1925.

Decentralization

The "decentralization of industry" refers to a variety of movements, which may be characterized as suburbanization, ruralization, or intercity shifts. Only the second and third movements tend to dampen the rate of expansion in the area as a whole.

Suburbanization of industrial activity has probably characterized American manufacturing for the past two or three decades. In the Chicago Industrial Area, for example, there was a significant movement between 1919 and 1929 of plants out of the city proper into the immediate suburbs.[29] Movements of this kind, however, exert no material effect on the rate of industrial growth of a particular area, since the industrial areas as defined by the Bureau of the Census in 1929 included, in each instance, all or most of the suburban territory.

Ruralization of part of an industry, that is, the movement from important central manufacturing cities to rural areas, tends to limit the rate of growth in the industrial areas. The purpose of such a movement—usually to escape high urban costs, especially rent, taxes, and wages—often cannot be achieved without moving a considerable distance from the central metropolis. In the past, however, this movement occurred primarily within the limits of the industrial areas as now defined. Between 1900 and 1910, for instance, a considerable number of satellite cities developed around central manufacturing cities within the same or adjacent counties. Important examples of such manufacturing towns were those which grew up around St. Louis, Chicago, Cincinnati, and Pittsburgh.[30] Since these satellite cities were comparatively close to the central city, the rate of growth for the entire industrial area was not lowered by the removal of plants to the suburbs; in fact, the development of nearby manufacturing towns often stimulated the area rate of growth because of the organization of new producing units or the attraction of old units from other areas.

Many of these satellite cities are now part of either the central city or the immediate suburbs. At the present time there may be some tendency for manufacturing to move from the central city to more distant rural areas, but in no instance is it of prime signifi-

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[29] William N. Mitchell, *Trends in Industrial Location in the Chicago Region since 1920*, pp. 65–71.

[30] G. R. Taylor, *Satellite Cities*, pp. 1–14; summarized in Leon Marshall, *Industrial Society*, pp. 678–82.

cance. Evidence that this movement did not occur to any appreciable extent between 1870 and 1930 may be seen in the relatively very low rate of population growth in the rural parts of the major industrial states (see page 40). Manufacturing concerns are not likely to abandon those economic considerations which led to the location of existing plants. An urban manufacturing area has important advantages in assembling raw materials and in marketing the final products. For the most part these advantages are equally available either in suburbs or in the central city, but not far beyond immediate suburbs a zone is reached in which advantages in transportation do not exist. The location of establishments in this outside zone may violate the best balance of locational factors. For some industries, the development of motor transport and the extension of electric power lines have allowed the location of plants far from the metropolis.

The movement of factories out from central manufacturing cities to distant small cities is probably not of great importance, but it has been resorted to by a few manufacturing companies as a means of relocating in or near another major industrial area and at the same time of shifting to a suburban district. During the 1920's the Armstrong Cork Company transferred an additional part of its operations from Pittsburgh to Lancaster, a small manufacturing city on the periphery of the Philadelphia Industrial Area. Manufacturing establishments may move from a large industrial area to a small isolated industrial city and thus exert a greater effect toward decentralization. Such a shift lowers the rate of growth in one major industrial area without raising the rate of growth in another. An example of this type of movement was the transfer by the Westinghouse Electric and Manufacturing Company, often soon after experimental work had turned out satisfactory products, of the making of electric refrigerators and electric household appliances from the East Pittsburgh plant to the plant in Mansfield, Ohio. Another example for the same concern was the movement of a small motors plant from Springfield, Massachusetts, to Lima, Ohio.

The transfer of industrial activity from one district to another has exerted a far greater effect on regional differences in rate of growth than has any other type of geographical shift. With the notable exceptions of the textile and tobacco products industries, most intersectional shifts have involved movements from one

major manufacturing area to another; little decentralization has occurred.[81] Interregional shifts have restricted industrial growth principally in the old industrial Northeast; they have stimulated growth in the Middle West, in parts of the South, and more recently in the Far West. Among areas, Boston and Albany have suffered much from these changes. Up to 1919 Chicago probably profited more from shifts in industrial activity than any other area; since then Los Angeles appears to have been the outstanding gainer. In the New York City area many industries have suffered from the westward and southward spread of manufacturing, but the rate of growth for the area has been held up by the development of newer industries. The Pittsburgh area also has suffered from this movement but has not profited in the past few decades from the attraction of plants in new or comparatively young industries.

Causes of Geographic Shifts

The explanation of the geographical shifts of old industries is to be found largely in changing cost factors, which will be discussed in a later section of this chapter. It should be noted here, however, that wage differentials and variations in the cost imposed by legislation have been important in causing these intersectional movements, particularly in leading to the establishment of branch plants. Another factor which helps explain these interregional movements is variation in the extent of unionization of labor. This factor is related to differences in wage rates and may in fact lead up to such differences. Still another consideration is the movement of population and the development of new, rapidly growing markets.

Development and Localization of New Manufacturing Industries

Types of New Industries

Several manufacturing industries have grown up in the last century—especially in the past three or four decades—as a result of the transfer of production processes from the home and the

[81] In every decade since 1890 the population in 13 large industrial areas has grown more rapidly than has the population in all 33 industrial areas covered by census reports (see Table 14).

farm to the factory. Another group of manufacturing industries has arisen from the substitution of factory products for the products of other industries. A third group of factory industries has developed from the substitution of one factory article for another—often of a motor-driven unit for a manually operated unit. Finally, a fourth group of manufacturing industries has come about through the introduction of products for comparatively new uses.

Most of the industries which have taken over household operations are engaged in the manufacture of consumers' goods. Some of these operations, such as the making of cloth, were long ago in part transferred from the home; on the other hand, some operations, such as the canning of foods, are not yet completely industrialized. Additional manufacturing industries which have grown up in this manner are the making of clothing, soap, and bakery products. Since 1914 the transfer of baking from the home to the factory has been very rapid and has led to a very great growth in the bakery industry. Likewise, many products which were previously made on the farm—in blacksmith shops or in other service units—have been transferred to the factory. Among these are forgings, wagon tires, miscellaneous repair parts, and simple agricultural tools and machinery. Other former farm operations have been taken over by factories—notably, tanning, meat packing, and sawing and milling lumber.

Part of the expansion in manufacturing output in the past 50 years has resulted from the substitution of manufactured products for the products of other industries. Some farm products have been partially displaced. Automobiles, for example, have been substituted for horses. The growing of hay and grain has been restricted by the introduction of the automobile, and the refining of gasoline and other petroleum products has been rapidly expanded. Cotton and wool production has been limited by the manufacture of rayon. (Rayon making requires large amounts of wood pulp and in a sense leads to a substitution of forestry operations for farm operations.) Manufacturing industries also have developed at the expense of coal mining, the most notable example being the competition of petroleum products with bituminous coal. To some extent the production of steel and the making of composition building material have been increased at the expense of lumber products. This substitution is partially

responsible for the comparatively slow growth of the lumber industry since 1900.

Still another group of new industries has arisen from the displacement of older industries; in the main this change has taken the form of the substitution of complex motor-driven equipment for comparatively simple or hand-operated equipment. The making of carriages has been largely displaced by the making of automobiles. To a considerable extent mechanical refrigerators have taken the place of simple refrigerators; and metal ice boxes are being substituted for wooden ones. Electrically operated washing machines have been substituted for hand- or water-driven machines. The electric vacuum cleaner has taken the place of the old-type carpet sweeper. A change of somewhat the same nature is the introduction of electrically driven and hand-driven equipment for use in the kitchen. Some of the new household appliances, however, perform operations previously executed almost entirely by hand. Some of these new products carry small automatic units, electric mixing machines being an illustration. Much of the new equipment for the home, especially washing machines, tables, cabinets, and even furniture, involve the substitution of metal or composite fiber material for wood.

Another group of new industries has arisen from the development of products that serve new purposes. Among these industries are those resulting from the increasing complexity of the factory process, especially the making of tools of one type or another including machine tools. The machinery for making consumers' products and finished producers' goods has become so complicated that an entire industry has developed in the production of tools used in making this machinery. Of these equipment trades, those in connection with the automobile industry have expanded most rapidly during the past few decades. Also in this general group are industries whose products have led to the mechanization of the business office. Sizable plants have grown up for the production of typewriting, calculating, duplicating, billing, and other office machinery. Other products with more or less new uses include electric fans, cameras, airplanes, and radios; growth in the corresponding industries has been very rapid. For the most part these are nonessentials or luxury goods. A luxury good, especially an entirely new product, may come into favor very quickly and thus lead to the creation of a new industry in a com-

paratively short period; on the other hand, the demand for the commodity may diminish very rapidly.

Differences in the Degree of Localization of New Industries

Many of the new industries mentioned above have become highly localized in one or in a very few industrial centers. Others, especially some of the consumers' industries, have spread widely over the country. Baking operations, for example, have been growing up more or less in relation to the distribution of population. On the other hand, instances of a high degree of localization are to be found in the making of cameras and photographic materials in Rochester, the production of automobiles in and around Detroit, and the making of motion pictures in the Los Angeles area. Of new industries arising in the past three or four decades, localization has been far more characteristic than dispersion. Accordingly, the extension of manufacturing operations in a few districts has been stimulated. On the other hand, industrial gains have been restricted in those areas containing important representation in the older industries whose products were being supplanted.

The motorization of a product previously manufactured over a wide territory, such as wagons and carriages, has made it possible—and probably more profitable—to produce the substitute article in a comparatively few plants, all of which may be located in a single industrial district. The making of mechanical refrigerators is largely concentrated in central Ohio, in Erie, Pennsylvania, and in the Detroit Industrial Area, whereas the wooden ice box industry, despite a partial localization in central Michigan, was and still is much more widely scattered over the country.

From the beginning of the industry, the production of airplanes has taken place largely in a few industrial districts. The Detroit area was for a time important, but at the present time the Los Angeles and Seattle industrial areas hold the lion's share of activity in this industry. The making of rubber tires is very highly concentrated in the Akron Industrial Area and, for the western market, in the Los Angeles Industrial Area; iron rims for carriages and wagons had been produced over a much wider territory.

The causes of these high degrees of localization are to be found in the peculiar natural advantages of certain areas and in accidental factors. The high degree of localization of the airplane and motion picture industries in southern California is largely

explained by the unusual climate of that district. In the early stage of the motion picture industry all filming had to be done by daylight. The comparative absence of rainfall and cloudy weather during most of the year plus the great variety of natural scenery largely explained the early shift of the industry to southern California from New York and New Jersey, where the early experimental work was undertaken. At the present time the climatic factor is less important because of the use of artificial light. Consequently, the industry is now comparatively free to return to the Atlantic seaboard, although no tendency in that direction is observable. To the airplane industry also a desirable climate is very important. Comparatively favorable weather conditions for experimental flying helps explain the importance of airplane production in southern California as well as in the Seattle district. Older industries also have been influenced by climate. The textile industry, for instance, originally concentrated in areas of high humidity; now the use of mechanical humidifiers allows location in other districts.

The residence of an inventor or promoter may determine the location of a new industry. Rochester, for example, became the outstanding center for the production of photographic materials, simply because it was the home of George Eastman. It should be noted, however, that marketing factors were favorable. The location of the automobile industry in Detroit and that of the rubber tire industry in Akron were likewise related to the residence of inventors or early promoters.

Some new industries have grown up with reference to the location of older industries. For example, the concentration of the automobile industry and the automobile parts industry around Detroit partially accounted for experimentation with the airplane and the mechanical refrigerator. After initial production of the mechanical refrigerator at Detroit, the General Motors Corporation established its subsidiary for producing that product at Dayton.

The location of new industries may be influenced somewhat by the availability of capital. In a newer industrial area, capital may be accumulated very rapidly and may therefore be risked more willingly in new industrial ventures. Capitalists in newly developed regions (such as Oklahoma, parts of Texas, and southern California at the present time, or western Pennsylvania during the latter part of the nineteenth century) often look favorably on

the possibilities of speculative profits in new industries, whereas investors in older areas (such as Pennsylvania today and New England for the past several decades) may prefer a fixed regular return. Usually, a new industry is not initially financed by the central money markets.

When a new industry is first developed there is generally a tendency for plants to appear over a wide area. After a period of experimentation it becomes evident, through competition or through cost comparisons, that some districts are better situated for making the product than others. Rapid expansion then often follows in the more appropriate areas. Changes in the location of an industry may indicate a shift to raw materials or, over a period of time, a shift with raw materials; on the other hand, it may indicate movement to the market or with the market. Both the airplane industry and the automobile industry have shown tendencies toward increasing concentration in a few areas. It is possible, however, that future tendencies in these and other industries may be toward greater decentralization.

A few areas have attracted several of the newer industries. The Los Angeles Industrial Area, for example, dominates the motion picture industry and includes a significant proportion of the petroleum refining, the airplane, and the rubber tire industries. The Detroit Industrial Area secured the leading position in the automobile industry and has been important also in the industries making radios, airplanes, and mechanical refrigerators. These comparatively new industries have been important in contributing to high rates of growth in these two industrial areas.

Several areas with comparatively high rates of growth are dominated by one or more new industries. Outstanding examples are Akron, Detroit, Dayton, Los Angeles, and Toledo. On the other hand, some areas with low or moderate rates of growth are dominated by a single, but comparatively old, industry. The Pittsburgh and Youngstown areas may be cited for illustration. Other areas which have experienced comparatively slow growth, such as Cincinnati and St. Louis, are old areas with relatively diversified manufacturing activity. It may be that diversification is the normal form of economic structure for a large, fully matured area. Wide diversification probably precludes high rates of growth. An area dependent on one industry may experience rapid or slow growth, whereas an area with a large number of more or

less equally important industries is very unlikely to experience either very rapid or very slow growth. Though there are several exceptions, many areas could be pointed to as evidence of the fact that as an area grows older there is a tendency toward local diversification.

Type of Product and Consumer Demand

Consumers' Goods versus Producers' Goods

Although the great increases in industrial activity in metropolitan industrial areas are related primarily to the changing industrial structure of the country, to rising productivity, and to greater per capita income, they have followed also from the urbanization of the population and from the great growth in consumers' goods industries which cater to the growing population of these metropolitan areas. Since the war such industries have developed rapidly. The introduction of the radio and the mechanical refrigerator, for example, resulted in great industrial gains in the areas in which these industries concentrated. Indeed, most of the great regional increases in industry in the past three decades have occurred in areas specializing in the production of consumers' goods. These areas include New York City, Detroit, Los Angeles, Dayton, Toledo, and Akron. (Yet in decades prior to 1900 some of the greatest percentage increases in industrial activity occurred in capital goods areas. Witness the early history of the Birmingham, Pittsburgh, and Youngstown districts.) Yet most of the great regional decreases in industrial activity as well as many of the small gains took place in areas in which consumers' goods predominated. The Albany, Boston, and Providence areas and other parts of southern New England furnish examples. (Most of these districts were injured by the southern movement of the textile industry.)

On the other hand, most producers' goods areas in recent decades have been marked by continued growth, seldom at unusually high or unusually low rates. Industrial conservation in the use of raw materials undoubtedly has retarded the rate of growth in some heavy-industry areas. Greater economy in the use of coal, steel, coke, and aluminum has resulted in a considerable retardation of growth in the industries turning out these basic products. In both steel and nonferrous metal industries, this economy has consisted in the increased use of scrap and in the conserving of

metal either through development of alloys or through the more efficient organization of the consuming industries.

In sum, the distinction between consumers' goods and producers' goods furnishes a partial explanation of variations among areas in the rapidity of industrial growth and suggests that rapid gains in growth will probably continue to characterize the newer industries making nonessential consumers' goods.

Durable Goods versus Non-durable Goods

The production of durable goods, particularly durable consumers' goods, has grown rapidly since 1920. New industries of this type have become highly localized in a few industrial areas. The quick acceptance of such products has allowed these industries to expand rapidly and has accounted for remarkable increases in industrial activity in such cities as Dayton and Detroit. The rate of growth in non-durable goods industries, such as meat packing, the making of bakery products, and the production of confectionery and ice cream, is related more directly to the rate of gain in population—often local population only—although the growth of these industries is affected also by changes in the standard of living and by the mere transfer of activities from home to factory.

Shifts in Consumer Preferences

Occupational specialization has made it possible for a large percentage of the working population to produce for the market and to receive cash incomes. Accompanying phenomena have been the development of a complex geographic division of labor and of a high degree of interdependence among specialized industrial areas. This geographic specialization has made some manufacturing districts peculiarly susceptible to changes in consumer demands, especially wherever the dominating local industry turns out a nonessential consumers' good. Changes in consuming habits, whether they follow from a rising standard of living or merely from the desire for something different, result in the shifting of activity from one industry to another or in variations in the type of product made by a given industry. The substitution of electric lighting for kerosene or gas lamps was an early shift which favored the coal industry as against the petroleum industry, since most of the electrical energy has been developed by steam raised by burning coal. Many shifts in consumer preferences have

virtually caused the death of an older industry. Thus, the introduction of the automobile swept away the carriage industry and most of the wagon industry, severely injured the bicycle industry, and also had a marked influence on the railroad industry. The obsolescence of a product severely affects the rate of industrial growth of a district in which such product is manufactured. Rarely is a new product made in exactly the same region as the old product which it tends to displace. Bicycles, motorcycles, carriages, automobiles, railroad cars, and locomotives have for the most part been made in different industrial centers.

Shifts in consumer demands are an inevitable accompaniment of changes in cultural conditions as well as in living standards. The desire for variation is one of the bases of the creation and appreciation of art. Because of that fact, frequent changes in design and color are desirable, but they may result in the scrapping or premature obsolescence of valuable capital investments. These economic costs may make the price of the new product so high that only a few consumers can enjoy it. Yet a manufacturer who clings to the same model or design year in and year out, in an effort to keep costs down, may find himself losing his market to a more venturesome competitor who bases his appeal to the customer on up-to-the-minute design rather than on economy. The development of art requires changes in the form of products, but competition among industries for capital and labor prescribes limits to the actual changes which can be made at any given time.

Some industrial areas have been peculiarly aided by shifts in consumer preferences and by the increase in effective consumer demand which accompanies a rising standard of living. An interesting example is the expansion of the camera industry, owing to the popularization of photography. This development has been of great importance to the Rochester Industrial Area.

Differences in Natural Advantages

Types of Natural Advantages

Transportation.—Transportation facilities have been the primary force in determining the location of important economic centers and in defining the extent of the area on which a metropolitan community depends for its economic welfare. A great industrial and commercial city usually has been located at same natural break

in a transportation route, such as the junction of river valleys, the mouth of a navigable river, the end of a lake, or the intersection of trunk railroad lines. Although the junction of railroads is not altogether determined by the geographic characteristics of a region, it is usually related either to the location of river valleys or sizable bodies of water or to the location of cities directly affected by these natural advantages.

The confluence of rivers helped determine the importance of Pittsburgh, St. Louis, Kansas City, Cincinnati, Springfield, Troy, and many other interior cities. In the first place, the existence of navigable streams facilitated the development of commerce and manufacture. Furthermore, the river valleys determined the routes which canals and, later, railroads were to follow. Major highways also followed river valleys. Many of the great seaports have been located near the mouths of navigable rivers. New York, New Orleans, and San Francisco are outstanding examples.[82]

Geographic factors have determined the location of important industrial and commercial cities on the Great Lakes. Outstanding examples are Buffalo at the eastern end of Lake Erie, Cleveland and Toledo at the mouths of rivers draining into the lake, and Chicago at the lower end of Lake Michigan. The commanding position of Chicago in the economic life of the Mississippi Valley results in large measure from its abundant transportation facilities, both water and rail. The industrial importance of Detroit is in part a result of its location between two of the Great Lakes and on a river at one of the few points where a crossing from south of the lakes to Canada is comparatively easy. Natural advantages in waterways and in other means of transportation, by determining

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[82] The geographic position of New York City in large measure accounts for its dominating position in American industrial and economic life. Located at the mouth of a navigable river and on a well protected deep-sea harbor, New York was a logical point for the development of a great metropolis; it had ease of access to foreign trade as well as to the trade with the interior. Equally important were the Mohawk River Valley extending westward from Troy and the low pass between the Appalachian Plateau and the Adirondack Mountains leading toward the Great Lakes. This comparatively low-altitude route into the interior of the country became of great importance to New York on the completion of the Lake Erie Canal. Construction of railroads over this route from New York to the West gave the city the earliest access to the interior of the country and assured it of being the dominant national metropolis. Today the Mohawk Valley remains the greatest avenue of commerce and travel between the Atlantic coast and the interior. *Encyclopaedia Britannica,* 14th edition, Vol. 22, p. 717.

trade routes between different sections of the country, have dictated the location of large manufacturing establishments, primarily because the cost of assembling materials was less at certain favored points.

Nearness to Fuel- or Power-producing Sections.—Power has always been required in the manufacturing process: man power, wind, water power, steam, and electrical energy. Early manufacturing industry in this country depended for fuel primarily on timber, which was widely available. Most of the early iron was smelted with charcoal. The later discovery and exploitation of anthracite coal in eastern Pennsylvania resulted in the shift of heavy industry to that district, notably to Philadelphia where anthracite coal came to tidewater. The development of iron and steel districts around Pittsburgh and Youngstown was determined largely by the existence of high-quality coking coal in western Pennsylvania. Greater economy in the use of coal and comparatively cheap freight rates have facilitated the westward movement of the iron and steel industry and the location of producing centers at considerable distances from coal fields. The location of cement manufacture and other industries is influenced by the accessibility of coal.

Local supplies of petroleum are of much less influence in determining the location of manufacturing districts than are coal fields. The discovery of petroleum and more particularly the perfection of methods for using petroleum in manufacturing are comparatively recent events. Already most heavy manufacturing industries had been located with reference to coal. Moreover, petroleum is easily transported to industrial centers by pipe line, tank car, or tanker. Nevertheless, the existence of large supplies of petroleum products has contributed to the rapid development of the Los Angeles area and the more recent development of industrial districts in Texas and Oklahoma.

Nearness to supplies of natural gas early had a considerable bearing on the location of some industries, especially on the making of glass. Cheap supplies of natural gas furthered the expansion of that industry in and around Pittsburgh. The natural gas fields of Ohio and Indiana are characterized by a great diversity of products made from clay and sand.

The local existence of water power also has facilitated industrial growth. Early textile mills in New England were located at

waterfalls. More recently the use of water power to develop cheap supplies of electricity has in part led to the development of manufacturing activity in the Buffalo area, the Seattle and Los Angeles areas, and even later in the southern Piedmont region. Those industries requiring large amounts of cheap electric power are likely to be grouped around important hydroelectric properties. Perhaps the most significant example in recent years has been the aluminum industry; the location of plants at Massena, New York, and near Lake St. John in Canada has been determined by the availability of large amounts of water power.

Nearness to Metal-producing Sections.—The location of iron ore near coal resources accounted for the initial development of the iron industry in eastern Pennsylvania and also around Pittsburgh. Later in western Pennsylvania it became apparent that ore from the upper lakes region, despite transportation costs, could be used more economically than local low-grade ores and that it would produce a more consistent quality of metal. Ore mining in western Pennsylvania stopped. In the eastern part of the state, however, local ore is still used.

A small iron and steel industry has developed at the upper end of Lake Superior near the ore field, but the major effect of the discovery of iron ore in that region was that of pulling the iron and steel industry to the southern shores of the Great Lakes. Prior to the discovery of Lake Superior ore, practically no iron was made in the Great Lakes region, except small amounts of charcoal iron. At the present time iron and steelmaking is distinctly an industry of the Pittsburgh-Great Lakes district. The growth of this industry and the advantage of cheap water transportation on the lakes have resulted in the development of great manufacturing districts, especially on Lake Michigan and Lake Erie.

Nearness to supplies of nonferrous metals has exerted comparatively little effect on the geographical pattern of manufacturing industry. Nonferrous metals are of relatively high value and consequently can be shipped great distances to consuming industries. Connecticut, the leading state in the production of nonferrous alloys, is not a copper-, lead-, or zinc-producing state.

Nearness to Agricultural Sections.—Most manufacturing industries based on the use of agricultural products must be located near the source of raw materials mainly because of the great

reduction in bulk in the manufacturing process. The proximity of great supplies of cereal grain has been a prerequisite to the development of the milling industry, the breakfast food industry, and other food industries. Consequently, these industries are concentrated in the Midwest, especially along the eastern edge of the Great Plains region. They are of considerable local importance in the Chicago, Minneapolis, and Kansas City areas. Expansion of the meat-packing industry in Chicago and Kansas City, and to a lesser extent in other midwestern manufacturing districts, has been dependent on the nearness of pastures and districts producing other feeds for the fattening of livestock brought in from the western plains.

Few manufacturing industries have developed in or near the wool-producing sections of the country, partly because of the early importance of New England in woolen manufactures and partly because of the extensive facilities for preparing and treating wool which have developed around the woolen-goods industry in that section. The comparatively high value of wool, the ease of drawing on foreign sources of supply, and the nearness to clothing manufacturers have resulted in the shipping of American wool to New England and in the concentration there of the yarn and cloth industries. With respect to cotton, the other important fiber, local sources of supply in the South have attracted the major portion of the processing industry. New England now leads in the manufacture of only a few of the more valuable types of cotton goods. Note, however, that the original cotton industry of this country developed in New England and that the southern shift in activity in the industry is perhaps even more related to the existence of low wage rates in the South than to proximity to raw materials.

Other important industries have developed around the local supply of agricultural materials. Extensive operations in the food-canning industry in California, Illinois, and Indiana are additional examples of the effect of nearness to agricultural products on the development of manufacturing industries. Food-canning activity around Philadelphia and Baltimore is based mainly on the large supply of fruits and vegetables from the sandy-loam plains around Delaware and Chesapeake bays.

In summary, most manufacturing industries that process agricultural products must be located in or near farming districts,

mainly because transportation costs are less if the products are processed before shipment to the market. Many agricultural products are low in value in comparison to bulk, and processing often results in a great reduction in volume. Moreover, if manufacturing operations yield by-products for use on the farm, such as fertilizers or feeds, these can be returned more cheaply if the factory is located near the farming area. In addition, many foods are perishable and therefore can be treated most economically near the growing districts. On the other hand, when the product is comparatively valuable and the wastage small and when the transportation cost on the finished product is comparatively high, the factory is likely to be located in a consuming center. Witness the woolen and leather goods industries.

Nearness to Sections Supplying Other Materials.—The importance of the canning of sea food in Pacific Coast states is attributable to bountiful supplies of sardines, salmon, and tuna. In recent years the three far western states have accounted for half the nation's output in this industry. New England still prepares large quantities of cod for outside markets.

The present outstanding position of the Pacific Northwest in the lumber industry results from the exhaustion of forest reserves in older parts of the country. The last extensive supply of merchantable virgin timber is located in Washington and Oregon. For the last two decades these forests, together with those in Canada, have supplied most of the American lumber market. The Seattle and Portland districts have profited from the existence of forest reserves, and many cities in the two northwestern states are dependent almost entirely on the lumber industry. Other building materials are scattered rather generally throughout the country and consequently contribute to the development of local industries. Nearly every industrial area supplies much of its own stone, brick, and artificial stone. The cement industry, on the other hand, tends to concentrate in districts containing valuable lime rock. The dominating position of Allentown, Pennsylvania, in the industry is a result of the exploitation of this mineral.

Climate.—The comparatively mild climate of some areas has been an aid to industrial growth. Los Angeles furnishes the most notable example. The great amount of sunshine and the comparative absence of rainfall during much of the year have contributed to the localization of the motion picture and airplane in-

dustries in that district. Originally, a humid climate was of considerable value to manufacturers spinning and weaving cotton and wool. The high humidity along the New England coast was helpful. More recently, however, textile mills have been able to control the humidity by artificial means, and consequently part of the natural advantage of the New England coast has been lost. With respect to other effects of weather conditions, it has been maintained that climatic factors influence mental and physical efficiency.[88]

Average Effect of All Locational Factors on a Given Industry.—Comparatively low costs of production require a combination of advantages. The most favorable location for an industry is determined by assembly costs, marketing costs, availability of labor, and requirements peculiar to the industry. Variations among competing areas in total costs are affected in general by distance to points supplying raw and semifinished materials, relative use of waterways, fuel and power charges, and distance to markets. (Actually, railroad rates may vary considerably from a mileage basis and thus discriminate among competing areas.) Regional differences in the availability of the required type and amount of labor may be important for a time. But for the most part labor is comparatively mobile, whereas deposits of raw materials and other natural advantages remain fixed.

Relation of Natural Advantages to Rate of Growth

By and large, the rate of industrial growth in an area will depend on the extent of its natural advantages and on the rapidity with which these advantages are exploited. Regional differences in rate of growth might appear, however, solely because of differences in the time at which industrial expansion begins. In any given period two areas may be in different stages of development.

Where the major advantage of an area is the existence of important natural resources, the exhaustion of these resources will

[88] A medium year-round temperature, relatively high humidity, and a wide range of cyclonic storms (rain, snow, and other forms of precipitation with accompanying changes in barometric pressure) have been held to be peculiarly suitable for mental as well as physical effort. Professor Ellsworth Huntington of Yale University has studied the effect of climate on working efficiency and has decided that climatic differences may result in great differences in output. The Pacific Northwest he finds to be one of the most favorable spots in the world in terms of climate. Ellsworth Huntington, *Civilization and Climate*, p. 137.

end the period of industrial expansion; and, unless other forms of industrial activity replace the old mineral or forestry industries, a decline in productive activity will follow. Geographic shifts in agricultural output have much the same effect, for in reality they move the source of raw materials farther from the older industrial plants. The westward movement of farming resulted in a comparable shift of those industries dependent on grain as a raw material. After the livestock-producing region had spread into the Great Plains, the meat-packing industry largely deserted Cincinnati in favor of Chicago and Kansas City. Furthermore, the transfer of farming activity caused the agricultural machinery industry to relocate in the West.

The rapidity of industrial growth may be checked also by changes in the importance of an area's natural advantages. When rail transportation largely superseded water transportation, the industrial growth of Pittsburgh, Cincinnati, and Louisville was somewhat retarded. The partial substitution of petroleum products for coal injured those industrial areas with important supplies of coal and stimulated industrial and manufacturing developments in petroleum-producing districts, particularly in Texas, Oklahoma, and southern California. In other words, any shift in the relative value which industry places on a raw material or on any other natural advantage will affect the rate of growth of the areas possessing it.

Relation of Natural Advantages to Possible Maximum Size

The extent of natural advantages possessed by an industrial area will determine the maximum industrial size of that area. Particularly important are supplies of fuel, agricultural products, metals, and other raw materials. The maximum capacity of the transportation system, both water and rail, also may be of equal weight in setting an upper limit. Practically, however, it is impossible to determine the maximum possible size of even a single industry in an area, not to mention total industrial activity; for knowledge of resources is imperfect, methods of using resources change, and the value of given resources vary as a result of substitution among finished products or among raw materials. All that can be said is that, granted about the same industrial age, areas with vast resources are likely to be larger and to remain larger than areas with more limited resources.

Size of Economic Hinterland

The economic area which a metropolis can claim as its own varies with the form of economic activity. The trade area is likely to be larger than the manufacturing area, and the financial area over which the metropolis exercises priority will probably be even larger. Although the industrial territory of a metropolis cannot be determined accurately, it is related to the transportation facilities of one center in comparison with those of competing centers. In other words, the size of a manufacturing area is determined by the relative costs of production plus the relative costs of distribution. Any improvement in transportation facilities actually leading to lower costs, not followed by similar changes in and around other areas, will lead to an extension of the economic hinterland.

The economic region which contributes to the growth of the New York Industrial Area is much larger than that which contributes to the development of any other American industrial area. The great importance of New York City in the economic life of the nation results in part from the fact that its manufacturing area is the most important in the country, but New York's unique position depends even more on the importance of the metropolis as the greatest financial center of the country and consequently as the great central location for head offices of national industrial concerns. As defined by the United States Bureau of the Census, the manufacturing region of New York City includes an area extending roughly fifty miles out from Manhattan, but in many respects New York City dominates the larger manufacturing region extending along the Atlantic seaboard from Boston to Baltimore. In general, this is a consumers' goods district and the manufacturing plants reach their market mainly through New York City. In terms of management control and finance, New York's hinterland comprises the entire country.

The Pittsburgh manufacturing area, on the other hand, is much more restricted, although in many respects it is larger than the four counties assigned it by the Bureau of the Census. Corporations with their main administrative or operating offices in Pittsburgh dominate manufacturing localities in western Pennsylvania, the panhandle of West Virginia, and east central Ohio. In general, these sections make up a homogeneous area specializing in the production of coal, iron and steel, heavy machinery, and glass and clay products. From a broad economic point of view the

Wheeling and Youngstown industrial areas form a continuation of the Pittsburgh manufacturing district. With respect to financial control, however, Youngstown is more closely tied to Cleveland than to Pittsburgh. The distributing area about Pittsburgh is probably about the same size as its wider mining and manufacturing area. Much larger is the region which depends at least in part on Pittsburgh for financial services.

In comparison with the two areas mentioned above, the Los Angeles Industrial Area is definitely delimited. With respect to both marketing and manufacturing, southern California is set off by itself. It is nearly surrounded by mountains, deserts, and the ocean. Changes in transportation facilities and in the costs of marketing cannot materially extend the Los Angeles area, although improved water transportation by way of the Panama Canal did help tie this area into the national economy and facilitated the marketing of products from that area in the populous eastern section of the country. By contrast, relative changes in transportation costs may exert a far greater influence toward widening the economic hinterland of Pittsburgh.

Differentials in Cost Factors

New or Old Differences

Past regional differences in cost factors were primarily responsible for determining the location of industries now relatively old, though in some instances lack of information or mistakes in estimating costs probably resulted in the building of manufacturing establishments at inappropriate points. On the other hand, present regional differences in production and marketing costs determine the location of new establishments, particularly in new industries for which possible parts manufacturers and suppliers of miscellaneous services are not already concentrated in certain areas. Furthermore, changes in cost differentials may lead to the shift of an industry and the actual removal of establishments from one part of the country to another.

Most of the aforesaid influences bearing on regional differences in the rate of industrial growth help explain either why old industries shift from one area to another or why new industries are localized or tend to be localized in certain areas. With the exception of regional differences in natural advantages, those causal factors

are of little assistance in explaining why industries already located in several areas have grown more rapidly in some areas than in others. This question is most profitably discussed in terms of differences in cost factors.

Consolidation of the Operations of a Concern Having Several Plants

When a concern decides to install modernized equipment of such kind that one complete operating unit expands capacity so much as to necessitate scrapping old machinery at some of its remaining manufacturing plants, a relatively small difference in estimated cost may result in the installation of the new equipment at one of the concern's mills and the subsequent closing down of other mills or of comparable units in other mills. The modernization of production facilities often results in a great expansion of the potential capacity of an individual unit as well as in an improvement in quality. Fewer plants are required by concerns having several manufacturing units. Changes of this sort have occurred recently in the making of plate and window glass and in the rolling of steel sheets. Consequently, slight cost disadvantages may result in the loss of a plant to some areas and may therefore decrease the rate of local industrial growth. Practically the same result may follow from the consolidation of mining operations. A coal company, especially an amalgamation of a large number of previously independent units, may find it desirable to close high-cost mines and to concentrate activity in a few comparatively efficient mines.

Cost Factors

In this section several elements in manufacturing cost will be treated with particular reference to the influences which change the relative importance of these elements.

Power.—The widespread substitution of electric motors for the direct driving of shafting by steam has increased greatly the importance of power costs in manufacturing and in industry generally. Higher efficiency in electric power production has resulted in declining power rates, and cheaper rates have facilitated mechanization of many operations previously accomplished by hand. In some districts, however, the decrease in power rates has been small, and it may be questioned whether the full advantages of efficient production of electric power been passed on to the con-

sumer. In most areas the production of electricity is a private monopoly, subject to state supervision, especially with respect to rates. But the attempt of governmental regulatory bodies to set rates based on estimated costs has not been a very satisfactory substitute for the competitive determination of prices. In at least four important industrial cities [84] competition between municipal utilities and private utilities has been associated with comparatively low power rates.

Fuel.—Economy in the use of fuel not only decreases the cost of production of many products, but to some extent it has tended to free industries from the necessity of locating near supplies of fuel. In other words, fuel economy has made it possible for industries to locate farther from coal, gas, and oil fields and nearer the market or sources of raw materials. The introduction of new fuels, more economical for some uses, has stimulated a more rapid growth in some districts than in others. For example, when natural gas was first introduced in glass manufacture a rapid growth in production occurred in the districts possessing that fuel. Any new production process that requires less fuel per unit of output or which can use a cheaper fuel will tend to displace older processes and to result in regional differences in the rate of growth in manufacturing unless the new processes are immediately adopted by all competing regions. Even if competing areas adopt the new process contemporaneously, differences in the rate of growth will continue to characterize fuel-producing sections because of the importance of other cost factors.

Raw Materials.—Total costs may decrease and the different cost factors vary in relative importance as the result of economy in the use of raw materials or the substitution of cheaper for more expensive materials. More economical use of raw materials may follow from better preparation of these materials for the manufacturing process. In the iron and steel industry, for instance, the cleaning and concentration of iron ore make possible the transportation of lighter loads and the consumption of less coal, although of course the concentration of ore requires power. The effectiveness of the smelting process has been further increased by the mixing of iron ores of different chemical composition; more

[84] Cleveland, Los Angeles, Seattle, and Columbus. See Federal Power Commission, *Rates for Electric Service to Commercial and Industrial Customers*, pp. 116, 124, 125, 128.

uniform coke has been produced by mixing coals of different volatility. The introduction of cheaper raw materials has materially changed the locational factors applying to some industries; this kind of substitution has contributed to differences in the rate of growth among regions. The substitution of paper composition and other plastic materials for iron and steel, of steel for nonferrous metals, and of rubber for textile fabrics are examples of this type of change.

On the other hand, economy in the use of the other elements of production may increase the relative importance of raw materials. In the tobacco industry, the mechanization of the making of cigars and cigarettes very greatly reduced the relative importance of wage expenses and increased the relative importance of expenditures on materials and power. The rapid expansion of this industry since 1919 in North Carolina, Virginia, and Kentucky is largely to be explained in terms of the movement to source of raw materials.

Labor.—Differences in wage rates also may lead to regional variations in rates of industrial growth. Moreover, as between two areas the margin may be growing or decreasing. The major effect of these differentials will not be felt until the area with cheaper wage rates begins to produce in volume for the outside market. The existence of wage differentials appears to have been the primary explanation for the movement of the cotton textile industry from New England to the South. The increasing centralization of the making of cigars and cigarettes in southern states between 1914 and 1919 was related to the same factor.[35] There is still a marked difference between wage rates in the North and the South. In July, 1936, the average hourly entrance rate for adult male common laborers in 16 manufacturing industries was 45.1 cents in the North and 32.6 cents in the South.[36] An

[35] Centralization of the cigars and cigarettes industry in the South continued from 1919 to 1929, but during that decade the primary influence appears to have been nearness to raw materials. In 1914, wage expenses were about one-half as much as cost of materials, containers, fuel, and purchased energy; in 1919, about one-third as much; and in 1929, about one-fourth as much. See United States Bureau of the Census, *Manufactures, 1929*, Vol. II, p. 1376.

[36] United States Bureau of Labor Statistics, *Monthly Labor Review*, April, 1937, p. 949. Between July, 1935, and July, 1936, the margin between rates for the North and the South narrowed in four manufacturing industries and widened in five manufacturing industries and building construction. *Monthly Labor Review*, March, 1936, p. 704, and April, 1937, p. 949.

indication of the variation of wage rates among states can be seen from the entrance rates for common street and sewer laborers in cities of 10,000 or more; in September, 1935, these rates ranged from 20.3 cents in Georgia, 21.6 cents in South Carolina, and 26.7 cents in North Carolina to 61.2 cents in Massachusetts and 66.5 cents in Illinois.[87]

Related differences in unionization also affect the regional rate of growth.[88] One of the factors explaining why the Los Angeles Industrial Area has grown more rapidly than the San Francisco area may be that the nonunion labor in southern California has accepted lower wage rates. The difference in rate of growth between the New York and Chicago areas also may be related to differences between the two areas in the extent of unionization.[89] On the other hand, unionization might be a stimulus to local growth if it led to more efficient plant operation and at the same time to improved working conditions for its members. Collective bargaining might regularize employment, improve employe training, and in general facilitate increased output.

Local differences in skill may develop after a number of years and for some time tend to hold an industry to its original location. The importance of large numbers of skilled laborers, however, is being lessened by the mechanization of industry. Less-skilled employes are being substituted for more-skilled employes, and industry is becoming freer to move from one part of the country to another. In some New England areas, this change has resulted in the loss of industrial activity.

Management.—The importance of management as a cost factor has increased materially in the past few decades with the increase in the size of the manufacturing unit and with the develop-

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[87] United States Bureau of Labor Statistics, *Monthly Labor Review*, November, 1936, pp. 1228–32. These rates probably are influenced by differences in the size of the cities in each state.

[88] Glenn E. McLaughlin, "Regional Differences in Wage Rates and in the Extent of Unionization of Labor as Attractions for New Industries," *Pittsburgh Business Review*, July, 1936, pp. 1–5.

[89] The shifting of industrial operations in order to avoid unionization may be restricted by the application of the Wagner Act which created the National Labor Relations Board. In the case of the S. & K. Knee Pants Company, Inc., that Board ruled that the removal of a plant from one community to another in order to avoid collective bargaining was an unfair labor practice under the Wagner Act and that the offending company would have to transfer its old employes to the new plant for employment there. *Pittsburgh Post-Gazette*, June 11, 1937, p. 1.

ment of giant industrial concerns operating many plants. Any special local gains in efficiency in production and selling, whether attributable to management or not, affect intercompany competition and indirectly interregional competition.

Changes in the efficiency of internal plant transportation, such as the introduction of systems for moving materials by gravity, belt, or other modernized equipment, may increase the optimum size of an establishment and, in a multi-plant concern, allow a consolidation of operations at fewer points. The closing of branch plants would exert a dampening effect on the rate of growth in the areas affected.

The development of new products by a concern may stimulate the rate of industrial growth in the area or areas in which the concern operates. Yet many large American corporations with important research divisions appear to have developed new products at the home plant and to have organized the manufacture of these products at other points. For example, the efforts of the automobile industry in branching out into other forms of production have not always resulted in the establishment of new factories in the Detroit area. General Motors manufactures electric refrigerators in Dayton, Ohio. Furthermore, the two great electrical manufacturing companies develop new products at their home plants but often manufacture them elsewhere. Thus, neither Schenectady nor East Pittsburgh is an important center for the production of electrical household appliances.

Scale of Production.—In any industry the scale of production is determined by both the size of the most efficient unit of equipment and the size of the market. The effect of mechanization and of changes in the optimum output per plant have been discussed above. Equally important in determining the most efficient scale of output and the competitive position of local industry are the size of the market and changes in the extent of the market. A rapid growth of the local population will lead to something like a corresponding increase in the demand for consumers' goods; to the extent to which local markets can be reserved for local manufactures, this increase in demand will result in greater local activity and, under conditions of decreasing costs per unit of output, in more efficient production. The growth of population in an area may make it possible for an industry to locate in the area, or it may allow a local industry to sell over a much wider market because of

the reservation of a local market sufficient to allow optimum size of production. Part of the outside market, in so far as it can be differentiated from the local market, may be obtained by cutting prices, and under such circumstances this cutting is made possible by the lower per-unit cost at the higher scale of output. The production of most producers' goods, however, will probably be stimulated very little, because the market for these goods is usually not restricted to the local area.

Changes in transportation cost either extend or contract the market for a given product and affect the scale of operation of a local industry. These changes may result in a more-than-proportional effect on the profitable operation of plants in the industry. A slight contraction in the local territory may make operations unprofitable or a slight expansion may result in great increases in net gains. In other words, the relationship between rate of return and the scale of production is not necessarily a directly proportional one.

The scale of production is affected also by the intensive development of the market. Rising standards of living may expand the local market as effectively as population influxes or decreases in transportation costs. Local industrial production may be restricted by increased competition among products whenever commodities gaining in favor are not made in the area.

Marketing Costs.—Marketing costs also are influenced by population shifts and by changes in transportation costs. The size of the area is determined both geographically and in terms of the density of consumers. Recently changes in transportation efficiency have been the primary determinant of marketing costs and hence of the marketing area attached to each metropolis. The increased use of the motor truck and its apparent advantage over rail transportation for certain traffic has lowered transportation costs sufficiently to lead to the centralization of manufacturing operations in home plants and to the discontinuance of branch plants within a wide zone around the home factory. The most notable example of this change in the marketing and manufacturing setup is that of the Ford Motor Company. Assembly plants at Pittsburgh, Columbus, and other centers at approximately the same or at a lesser distance from Detroit have been closed, and the Ford automobiles sold in these territories have been trucked or to some extent shipped by rail from home factories in the Detroit

area.[40] This change has resulted in a considerable decrease in manufacturing activity in Pittsburgh and certain other cities and in a greater increase than would otherwise have occurred in the Detroit area. The present tendency to increase the taxation of motor trucks may lead to a reversal of this movement and to the re-establishment of assembly operations at some distributing points.

Governmental Action.—The mention of taxation leads to the consideration of the effect of governmental action on marketing costs; for the decisions of regulatory or legislative bodies on taxes, railroad rates, or construction of highways and canals have a great effect in defining the marketing area of a given metropolis and in determining whether a large manufacturing concern can exploit a distant market more economically from a home base or from a subsidiary plant in that market.

Regional Differences in Leadership

Relation to Regional Differences in Industrial Growth

Variations in local leadership may help explain regional differences in the expansion of industrial operations. Evidences of leadership may appear in the field of innovations, in promotional activity, or in industrial management; superiority in any one of these spheres will stimulate the industrial life of an area. Do regional differences in such ability exist? If so, it is clearly impossible to measure accurately the extent to which expansion in local manufacturing is the result of unusually capable leadership.[41] Even to establish the existence and beneficial effect of local leadership, it would be necessary to show that business men have achieved more than was to be expected from local resources.

Industrial leaders in some areas inherit almost ideal conditions for carrying on manufacturing operations; in other areas many of the prerequisites for industrial expansion are lacking. For example, New York City was destined by nature to be a great manufacturing center regardless of the quality of its leadership; on the other hand, Los Angeles, though possessing an attractive

[40] During summer months the Ford Motor Company ships automobiles by lake freighters to Buffalo and from there by truck or rail to Pittsburgh and cities farther east.

[41] Herbert von Beckerath, *Modern Industrial Organization* (1933), pp. 200–10.

climate, lacked adequate rainfall for agriculture, had no nearby supply of water for domestic and industrial use, possessed no natural harbor, had a very poor hinterland definitely delimited by deserts and by mountains, and was far removed from supplies of coal. Yet, by dint of great engineering efforts and much advertising of its major advantage, climate, Los Angeles has become a great population center and an important manufacturing district. The rapid development of Houston, Texas, in the past decade is related to the construction of the ship channel to Galveston Bay, which resulted in industrial gains for Houston mainly at the expense of Galveston.

Some areas offer far greater scope for the exercise of leadership than do others; much depends on the degree of local independence. Manufacturing industry in the New York Industrial Area is almost completely independent of enterprisers in other industrial areas. Few manufacturing establishments there are branch establishments of concerns with head offices elsewhere. The major financial and management policies of industry in that area are determined locally. All the other industrial areas are partially dependent for business leadership on the New York City area, though the Chicago, Boston, and Philadelphia areas probably have a considerable measure of independence in this respect. Some areas are almost completely dependent on distant offices for the determination of local policies. The industrial life of Johnstown, Pennsylvania, for example, is dominated by two great iron and steel plants, which are branch establishments of companies with head offices located elsewhere. Even such a great industrial area as that surrounding Pittsburgh is in a sense an industrial colony of New York City, for the financial plans and the major management policies of the United States Steel Corporation are determined in that city. This giant concern is by far the most important company operating in the Pittsburgh district.[42] Likewise, the automobile industry of the Detroit area is partially controlled and operated from New York City, particularly in financial matters; but in that industry local leadership plays a more important role than it does in the iron and steel industry in the Pittsburgh district. The Ford Motor Company is a Detroit concern.

[42] In 1930, one out of every six employes attached to mining or manufacturing concerns in the 11-county area in southwestern Pennsylvania was on the payrolls of subsidiaries of the United States Steel Corporation.

Moreover, the business managers and many of the directors of the General Motors Corporation live and work in Detroit, whereas only occasionally is a Pittsburgher chosen as a director of the United States Steel Corporation.[43] An industrial district in which manufacturing activity is dominated by branch factories operated by executives with little responsibility for major business decisions is not a favorable place for independent leadership to develop. The Pittsburgh area is not altogether of this type, for, aside from the United States Steel Corporation, most of the large manufacturing establishments are owned and operated by local business men.

Inventive Effort

Although no conclusive information is available, local differences in inventive effort probably exist. New England, for example, has been famous for this type of ability. In the past, districts including many small machine shops appeared to bring forth inventions more readily than districts dominated by a few very large industrial establishments.[44] The development of the automobile industry at Detroit, although partially accidental, owing to the local residence of the inventors Olds and Ford, was nevertheless related to the vigor of the machine shop industry in Detroit. More recently the machine tools industry in that district has given an outlet for local inventive effort.

Promotional Activity

The ability to produce and sell new products and to expand the output of both new and old products is one of the tests of business leadership. Regional differences in promotional activity are related to the age of an area, for the age in large part determines the extent to which the natural advantages of a district already have been exploited. If an industrial area is not mature but is still growing rapidly, the very atmosphere of change stimulates efforts to promote new factories and to attract new industries as well as new establishments in old industries. As already indicated,

[43] Since 1928, only one Pittsburgher has served as a director of the United States Steel Corporation.

[44] Yet in recent years the development of subsidized research in large establishments has resulted in the development of many new products; note the prominence of the laboratories of the Bell Telephone Company.

industrially young areas actually appear to attract the new industries; at least, there is a surprising concentration of the newer industries in the Detroit and Los Angeles areas. Crucial considerations are the natural advantages of the area and the favorableness, in other respects of cost factors. In young areas the successful promotion of many ventures may perhaps be related to the attraction of unusually large groups of younger men with a less-rigid training than that characteristic of junior business executives brought up in the affairs of large corporations. Routinized business procedure is probably the characteristic experience of this latter group of men, a group which is far more numerous in older areas.

The accessibility of capital is as necessary for successful local industrial ventures as are the existence of adequate organizing ability and the local appropriateness for the particular industry. Much may depend on the resources and attitudes of local banking groups. If the industry of an area is dominated by a single banking organization and if that organization is conservative, promotional efforts are likely to be at a minimum even though opportunities for new ventures exist. The comparative absence of new industries in an old industrial area may be related not only to the fact that the major natural advantages of the district already appear to be exploited but also to the existence of a few conservative banking houses backed by comparatively conservative investors with the desire to obtain a steady, safe return rather than to chance the possibility of profits in a new venture. In rapidly growing areas the accumulation of capital from profits as well as the influx of capitalists leads to a willingness to risk funds in local ventures. The intensive promotional activity in a new area probably results in the waste of some capital; yet this loss may in part be the necessary cost of developing new establishments and industries.

Management Ability

Regional differences in management ability are not so much differences in quality as differences in type of ability. They arise from dissimilarities in racial background, natural resources, and industrial age of the area, although such differences resulting from diverse national origins are probably pretty well wiped out. New England probably has been the most clearly differentiated industrial

section of the United States. The ingenuity and practical skill of her manufacturers have been coupled with a shrewd commercial sense of what could be profitably disposed of. These qualities had their origins in a long continued economic struggle with niggardly assistance from nature. Likewise, the thoroughness, thrift, and technical skill of the Pennsylvania Dutch help explain some of the characteristics of industry in Pennsylvania.[45]

A mature economic area with few year-to-year changes in the local industrial structure is likely to attract men skilled in the management of routine affairs. On the other hand, a younger area with a rapid growth in both number and size of establishments can be expected to draw to it men with greater initiative and with more willingness to redefine the methods of industrial organization.

The kind of business leadership required by a community appears to vary with the stage of development of the area and of the individual concern. The extent to which the prevailing type of leadership influences the rate of industrial growth cannot be determined. Probably the influence is significant, although it is clear that the kind of business ability required is a product of the stage of industrial development.

Relative Importance of Several Explanatory Factors

The nine factors that have been discussed above as explanations of regional differences in the rate of industrial growth, as indicated at the outset, are not mutually exclusive but rather are closely interrelated and even overlap to a considerable extent. Probably the influences which have borne most directly on local rates of growth in industry have been differences in natural advantages and related differences in the comparative costs of producing and marketing manufactured products. Moreover, richness of natural resources and relative production costs have determined the ability of a manufacturing center to attract new industries as well as to retain old ones. Although the rate of industrial expansion is directly related to extent and availability of natural resources and to comparative costs of assembling materials and marketing finished products, much still depends on the time when industrial efforts begin, that is, on the stage of development. An old area

[45] Von Beckerath, *op. cit.*, p. 203; von Beckerath's description of entrepreneurial skill in various parts of Germany applies equally well to certain sections of the United States.

and a new area may be growing at different rates, regardless of the extent of natural advantages or relative costs. If the stage of development is the same for two areas, then differences in the rate of growth may be said to be primarily related to the two salient factors.

The influences which account for the development and expansion of the Pittsburgh area are much the same as those applying to any other area. Rapid expansion of manufacturing and of industrial activity generally in the area during the latter part of the nineteenth century followed from the peculiar appropriateness of this district for the production of iron and steel. The primary explanation lies in the local existence of great reserves of high-quality coking coal, economically accessible. Other natural advantages contributed to the rapid development of the area at that time; important among these were the existence of valuable sands and clays for use in the glass and clay products industries, the existence of important waterways, the convergence of river valleys leading into Pittsburgh, and the existence of local deposits of iron ore (important before the discovery of the Lake Superior ores). Furthermore, the movement of population into the districts which lie west of Pittsburgh was also an important influence. Moreover, there is the question of the influence of business leadership. Did such men as Carnegie, Frick, and Westinghouse determine the local industrial tempo, or were they products of the times and the existing state of industrial technique? No doubt their influence was important. But to what extent was it causal?

The retardation of industrial expansion in and around Pittsburgh also appears to be related to the factors enumerated in this chapter. In this respect changes in the production and marketing cost factors applicable to industries represented locally were probably most important. These changes were evidenced by the westward movement of the centers of activity in the iron and steel, glass, and electrical machinery industries. The center of consumption of many steel products is now located west of Pittsburgh. For example, the geographical center for the consumption of sheets and strip is located not far from Toledo.[46]

As indicated throughout the chapter, some of the other explanatory factors have exercised a dominating influence in particular

[46] American Iron and Steel Institute, *Steel Facts*, May, 1935, p. 2.

areas. Population shifts, for instance, have been of very great assistance in maintaining the rapid upward trend in industrial activity in the Los Angeles area. On the other hand, population has grown relatively slowly in many districts in the old industrial Northeast. In Pennsylvania, the gain in population has been less than the excess of births over deaths; in other words, there has been a net migration. The geographical shift of an old industry largely accounts for the rapid industrialization of the South and for relative and even absolute losses in New England. The localization of new industries has accentuated the rate of gain in the Detroit and Los Angeles areas and has made the rate of growth in areas specializing in old industries seem comparatively small. Among the large industrial areas, the difference in the stage of development is probably the greatest between Los Angeles and Boston. The growth of Los Angeles is still rapid because of the newness of the area, and Boston's present growth is slow because of the age of the area.

Since the Pittsburgh Industrial Area is a mature industrial district, having exploited its major natural advantages to a considerable degree, the slow rate of growth in this area since the war was to have been expected. That the low rate of growth in the Pittsburgh area appears unusually small results in large measure from the comparatively rapid gains made in newer industrial areas, many of which have attracted a great percentage of the total activity in a new and hence rapidly growing industry. Furthermore, the competition of other areas in the iron and steel industry, in the glass and clay products industries, and even in the electrical machinery industry has served to dampen the rate of expansion in the Pittsburgh area.

CHAPTER 6

POPULATION AND INDUSTRIAL PRODUCTION IN THE PITTSBURGH DISTRICT

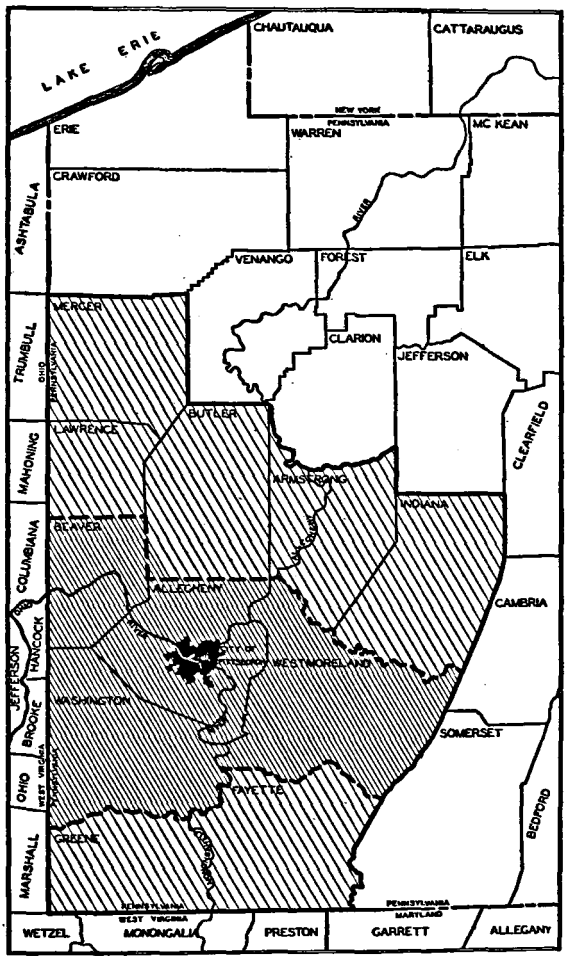
In Chapter 2 the population growth of the Pittsburgh Industrial Area from 1870 to 1930 was compared with population gains in other large industrial areas. For the entire 60-year period the Pittsburgh area was found to be properly classified in the group of industrial areas with medium or average rates of gain. From 1870 to 1910 the population of the Pittsburgh area grew at a rate approximating 3.5 per cent per year. In the two decades following 1910 the annual rates amounted to only 1.8 per cent and 1.4 per cent, respectively; for all census industrial areas combined, the corresponding rates were 2.3 per cent and 2.6 per cent. It is the purpose of this chapter to compare population changes in several parts of western Pennsylvania and to analyze some of the economic factors which have influenced the growth of population in this district.

Population Growth in Various Pittsburgh Industrial Areas

For the purposes of this chapter, four different Pittsburgh areas have been used, in addition to the separate consideration of Allegheny County. The first of these areas is the "Pittsburgh Industrial Area," defined by the United States Bureau of the Census and consisting of the four counties of Allegheny, Beaver, Washington, and Westmoreland (Chart 47). For the second, three additional counties are added—Armstrong, Butler, and Fayette. This area has been used for certain measurements by the Chamber of Commerce of Pittsburgh. For the third area, four additional counties—Greene, Indiana, Lawrence, and Mercer—are added; this 11-county area is used by the Bureau of Business Research in many of its measures of economic fluctuations. The fourth area consists of these 11 counties and the five which follow: Cambria, Clarion, Clearfield, Jefferson, and Somerset. This 16-county area accounts for practically the entire output of bitu-

CHART 47

THE PITTSBURGH INDUSTRIAL AREA AND A SELECTED 11-COUNTY AREA IN WESTERN PENNSYLVANIA



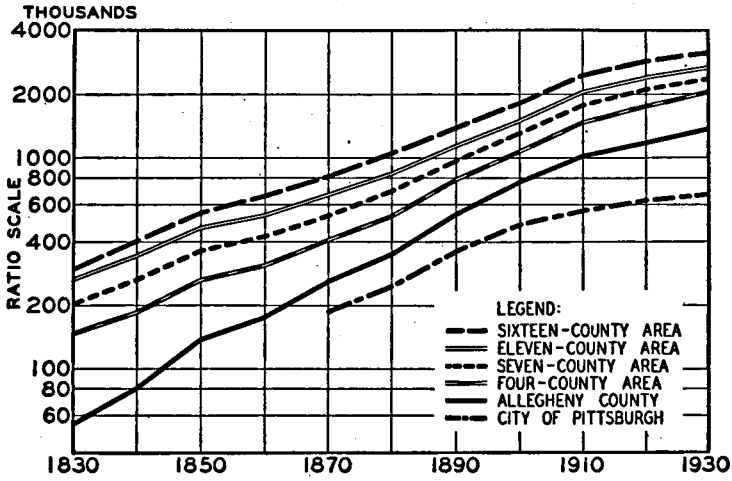
minous coal in Pennsylvania—97.4 per cent in 1929 and 96.9 per cent in 1935. Moreover, of the state's production of finished hot-rolled iron and steel, this area contributed 82.7 per cent in 1933, the last year for which these data were compiled. The rates of

population growth in these various-sized Pittsburgh areas have shown considerable similarity, although among individual counties there are wide variations.

In every decade since 1870 the rate of population growth has been greater in Allegheny County than in the city of Pittsburgh; the county has gained steadily with respect to the city, and the gains have been especially rapid since 1900. Note the widening margin between the two population curves in Chart 48.[1] Furthermore,

CHART 48

POPULATION IN SELECTED COUNTY AREAS OF WESTERN PENNSYLVANIA AND IN THE CITY OF PITTSBURGH, 1830–1930



during most of the 100-year period between 1830 and 1930, Allegheny County has grown more rapidly than the 4-county Pittsburgh Industrial Area (Table 38), the only exception being the two decades between 1900 and 1920. Up to 1870 the county was growing much more rapidly than the 4-county area, but since then the two have grown at about the same rate. Allegheny County compares in about the same way with the 7-county area, the 11-county area, and the 16-county area; the three larger areas have grown in each decade at rates approximating that for the 4-county

[1] It has been possible to adjust the population figures for Pittsburgh for annexations from 1870 onward; figures in Table 37 and those plotted in Chart 47 are for the 1930 area of the city.

area.[2] These comparisons reflect both the similarity of rates of population growth in the several parts of southwestern Pennsylvania and the dominating position of Allegheny County in the Pittsburgh district, however defined. For the purpose of measuring population growth in the Pittsburgh district, the 4-county area is large enough to reflect the rates of change roughly characteristic of the coal and steel counties of southwestern Pennsylvania, although in nearly every decade the relative gain in the 4-county area has exceeded that in any of the three other areas.

Population Growth in Selected County Groups

The uniformly high rate of population growth in Allegheny County stands out more clearly if the county is compared with those groups of counties which have been added to Allegheny County each time in obtaining a larger Pittsburgh district (note subtotals in Tables 37 and 38). Beaver, Washington, and Westmoreland counties have been added to secure the 4-county area; Armstrong, Butler, and Fayette counties to secure the 7-county area; Greene, Indiana, Lawrence, and Mercer counties to secure the 11-county area; and Cambria, Clarion, Clearfield, Jefferson, and Somerset counties to secure a 16-county area.

With four exceptions, the decade rates of population growth in Allegheny County exceeded the rates for each of the four groups of selected counties (Table 38 and Chart 49). During the 1870's, growth was more rapid in the group consisting of Cambria, Clarion, Clearfield, Jefferson, and Somerset counties. In that decade the oil and gas industry developed rapidly in Clarion County, the iron industry in Cambria County, and the coal industry in all five counties. From 1900 to 1910 the rate of growth in Allegheny County was exceeded by that in the group comprising Beaver, Washington, and Westmoreland counties and also by that in the

[2] With the addition of the group of three counties to the Pittsburgh Industrial Area the rate of growth in the total from 1830 to 1930 falls slightly; it falls again with the further addition of four counties (Table 38). Yet if the area is extended over 16 counties by the inclusion of Cambria, Clarion, Clearfield, Jefferson, and Somerset counties, the rate rises slightly. These five counties are somewhat less closely tied to the economic life of Pittsburgh, because the Johnstown iron and steel district, which dominates these five counties, is in some respects a separate industrial area with peculiar problems of its own. Moreover, much of the coal from Cambria, Clearfield, and Somerset counties is low-volatile coal which finds its main market along the Atlantic seaboard and not in southwestern Pennsylvania.

TABLE 37

POPULATION OF A 16-COUNTY AREA IN WESTERN PENNSYLVANIA AND ITS SUBDIVISIONS, 1830–1930

County and County Groups	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930
Allegheny	50,552	81,235	138,290	178,831	262,204	355,869	551,959	775,058	1,018,463	1,185,808	1,374,410
Pittsburgh[a]	.....	.....	.....	.....	*186,700*	*247,300*	*366,000*	*428,600*	*566,400*	*588,400*	*669,817*
Beaver	16,772[b]	20,000[b]	26,689	29,140	36,148	39,605	50,077	56,432	78,353	111,621	149,062
Washington	42,784	41,279	44,939	46,805	48,483	55,418	71,155	92,181	143,680	188,992	204,802
Westmoreland	38,400	42,699	51,726	53,736	58,719	78,036	112,819	160,175	231,304	273,568	294,995
Subtotal	*97,956*	*103,978*	*123,354*	*129,681*	*143,350*	*173,059*	*234,051*	*308,788*	*453,337*	*574,181*	*648,859*
4-County Total	148,508	185,213	261,644	308,512	405,554	528,928	786,010	1,083,846	1,471,800	1,759,989	2,023,269
Armstrong	12,000[b]	20,000[b]	29,560	35,797	43,382	47,641	46,747	52,551	67,880	75,568	79,298
Butler	14,581	22,378	30,346	35,694	36,510	52,536	55,339	56,962	72,689	77,270	80,480
Fayette	29,172	33,574	39,112	39,909	43,284	58,842	80,006	110,412	167,449	188,104	198,542
Subtotal	*55,753*	*75,952*	*99,018*	*111,500*	*123,176*	*159,019*	*182,092*	*219,925*	*308,018*	*340,942*	*358,320*
7-County Total	204,261	261,165	360,662	419,812	528,730	687,947	968,102	1,303,771	1,779,818	2,100,931	2,381,589
Greene	18,028	19,147	22,136	24,343	25,887	28,273	28,935	28,281	28,882	30,804	41,767
Indiana	14,252	20,782	27,170	33,687	36,138	40,527	42,175	42,556	66,210	80,910	75,395
Lawrence	13,004[b]	16,141[b]	21,079	22,999	27,298	33,312	37,517	57,042	70,032	85,545	97,258
Mercer	14,136[b]	26,100[b]	33,172	36,856	49,977	56,161	55,744	57,387	77,699	93,788	99,246
Subtotal	*59,420*	*82,170*	*103,557*	*117,885*	*139,300*	*158,273*	*164,371*	*185,266*	*242,823*	*291,047*	*313,666*
11-County Total	263,681	343,335	464,219	537,697	668,030	846,220	1,132,473	1,489,037	2,022,641	2,391,978	2,695,255
Cambria	7,076	11,256	17,773	29,155	36,569	46,811	66,375	104,837	166,131	197,839	203,146
Clarion	7,000[b]	12,500[b]	23,565	24,988	26,537	40,328	36,802	34,283	36,638	36,170	34,531
Clearfield	4,100[b]	6,800[b]	12,586	18,759	25,741	43,408	69,565	80,614	93,768	103,236	86,727
Jefferson	2,000[b]	7,000[b]	13,518	18,270	21,656	27,935	44,005	59,113	63,090	62,104	52,114
Somerset	17,762	19,650	24,416	26,778	28,226	33,110	37,317	49,461	67,717	82,112	80,764
Subtotal	*37,938*	*57,206*	*91,858*	*117,950*	*138,729*	*191,592*	*254,064*	*328,308*	*427,344*	*481,461*	*457,282*
16-County Total	301,619	400,541	556,077	655,647	806,759	1,037,812	1,386,537	1,817,345	2,449,985	2,873,439	3,152,537
Shenango Valley[c]	*43,912*	*62,241*	*80,940*	*88,996*	*113,423*	*129,078*	*143,338*	*170,861*	*226,084*	*290,954*	*345,566*

Source: United States Bureau of the Census.

[a] Adjusted figures for the 1930 area of the city.

[b] Estimated. The totals for these counties have been adjusted to correct for changes in county boundaries. The changes were: Lawrence County was formed from parts of Beaver and Mercer counties in 1849; Elk County was formed from parts of Clearfield, Jefferson, and McKean counties in 1843; and Clarion County was formed from parts of Armstrong and Venango counties in 1840.

[c] Shenango Valley includes Beaver, Lawrence, and Mercer counties.

TABLE 38

PERCENTAGE CHANGE IN THE POPULATION OF A 16-COUNTY AREA IN WESTERN PENNSYLVANIA AND ITS SUBDIVISIONS, BY DECADES, 1830–1930

County and County Groups	Percentage Increase or Decrease										
	1830 to 1840	1840 to 1850	1850 to 1860	1860 to 1870	1870 to 1880	1880 to 1890	1890 to 1900	1900 to 1910	1910 to 1920	1920 to 1930	1830 to 1930
Allegheny	60.7%	70.2%	29.3%	46.6%	35.7%	55.1%	40.4%	31.4%	16.4%	15.9%	2,618.8%
Pittsburgh[a]	.....	.....	.....	.....	*38.5*	*48.0*	*31.9*	*17.4*	*10.9*	*6.8*	.....
Beaver	19.2[b]	33.4[b]	9.2	24.0	9.6	26.4	12.7	38.8	42.5	33.5	788.8[b]
Washington	−3.5	8.9	4.2	3.6	14.3	28.4	29.5	55.9	31.5	8.4	378.7
Westmoreland	11.2	21.1	3.9	9.3	32.9	44.6	42.0	44.4	18.3	7.8	668.2
Subtotal	*6.1*	*18.6*	*5.1*	*10.6*	*20.7*	*36.2*	*31.9*	*46.8*	*26.7*	*13.0*	*668.4*
4-County Total	24.7	41.3	17.9	31.5	30.4	48.6	37.9	35.8	19.6	15.0	1,262.4
Armstrong	66.7[b]	47.8[b]	21.1	21.2	9.8	−1.9	12.4	29.2	11.3	4.9	560.8[b]
Butler	53.5	35.6	17.3	2.6	43.9	5.3	2.9	27.6	6.3	4.2	452.0
Fayette	15.1	16.5	2.0	8.5	35.9	36.0	38.0	51.7	12.3	5.5	580.6
Subtotal	*36.8*	*30.4*	*12.4*	*10.7*	*29.1*	*14.5*	*20.8*	*40.1*	*10.7*	*5.1*	*548.7*
7-County Total	27.9	38.1	16.4	25.9	30.1	40.7	34.7	36.5	18.0	13.4	1,066.0
Greene	6.2	15.6	10.0	6.3	9.2	2.3	−2.3	2.1	6.7	35.6	131.7
Indiana	45.8	30.7	24.0	7.3	12.1	4.1	0.9	55.6	22.2	−6.8	429.0
Lawrence	24.1[b]	30.6[b]	9.1	18.7	22.0	12.6	52.0	22.8	22.2	13.7	647.9[b]
Mercer	84.6[b]	27.1[b]	11.1	35.6	12.4	−0.7	2.9	35.4	20.7	5.8	602.1[b]
Subtotal	*38.3*	*26.0*	*13.8*	*18.2*	*13.6*	*3.9*	*13.7*	*31.1*	*19.9*	*7.8*	*427.9*
11-County Total	30.2	35.2	15.8	24.2	26.7	33.8	31.5	35.8	18.3	12.7	922.2
Cambria	59.1	57.9	64.0	25.4	28.0	41.8	57.9	58.5	19.1	2.7	2,770.9
Clarion	78.6[b]	88.5[b]	6.0	6.2	52.0	−8.7	−6.8	6.9	−1.3	− 4.5	393.3[b]
Clearfield	65.9[b]	85.1[b]	49.0	37.2	68.6	60.3	15.9	16.3	10.1	−16.0	2,015.3[b]
Jefferson	250.0[b]	93.1[b]	35.2	18.5	29.0	57.5	34.3	6.7	−1.6	−16.1	2,505.7[b]
Somerset	10.6	24.3	9.7	5.4	17.3	12.7	32.5	36.9	21.3	− 1.6	354.7
Subtotal	*60.8*	*60.6*	*28.4*	*17.6*	*38.1*	*32.6*	*29.8*	*30.2*	*12.7*	*− 5.0*	*1,105.3*
16-County Total	32.8	38.8	17.9	23.0	28.6	33.6	31.1	34.8	17.3	9.7	945.2
Shenango Valley[c]	*41.7*	*30.0*	*10.0*	*27.4*	*13.8*	*11.0*	*19.2*	*32.3*	*23.7*	*13.8*	*687.0*

Source: Computed from reports of the United States Bureau of the Census.
For footnotes, see Table 37.

group comprising Armstrong, Butler, and Fayette counties. Each of the three counties in the first group grew in population at high rates during this decade—practically the highest rate for each of these counties for the 100-year period. Growth in the steel industry was the dominant influence in Beaver County during the decade; and growth in coal and steel, the major influence in Washington and Westmoreland counties. Of the three counties in the second group the gain in population from 1900 to 1910 was most pronounced in Fayette County, where coal production had been expanding rapidly since 1894. From 1910 to 1920, each of the three counties in the group including Beaver, Washington, and Westmoreland counties gained in population at a higher percentage rate than Allegheny County. The percentage increase in Beaver County in that decade was the highest for any of the 16 selected counties in western Pennsylvania.

In Allegheny County, population growth has gone through several stages of development since 1830. The gains were very rapid up to 1850; this period was one of agricultural settlement and commercial expansion. In the following years, during the development of the iron and iron products industries, growth was less rapid, but the rate of increase remained high. As a result of the tremendous expansion of the steel industry, large numbers of people were attracted to the county during the 1880's, the decade increase amounting to 55 per cent. Population growth slowed down during the next two decades and was sharply restricted after 1910.

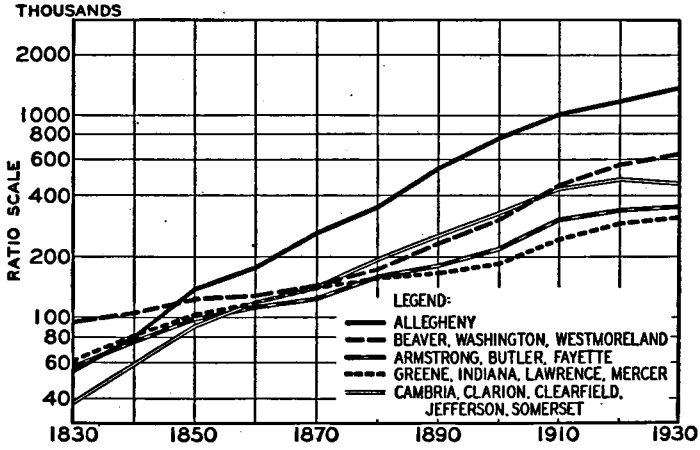
For each of the selected groups of counties the population curve ascends comparatively rapidly during the first few decades after 1830 and then rounds off noticeably; after about 1880 approximately the same movement is repeated (Chart 49). Thus, the population curve for the group consisting of Cambria, Clarion, Clearfield, Jefferson, and Somerset counties shows retarded growth by 1870, then accelerated growth until 1910, followed by another rounding off. The curve for Beaver, Washington, and Westmoreland counties combined shows a rapid gain in population after 1880 and a rounding off after 1910. For the other two groups of counties the curves are of essentially the same type, both indicating two upward movements between 1830 and 1930. During the second such movement, population growth in three of the four groups of counties reached maximum rates in the decade from

1900 to 1910, whereas the maximum had been reached between 1880 and 1890 in Allegheny County and between 1870 and 1880 in the group of five outer counties.

Only one of the four groups of counties lost in population in any decade after 1830. This loss occurred between 1920 and 1930 in the group of five outer counties. All counties in this group lost in population except Cambria County, in which there was a very slight gain. In two other groups of counties the population increase from 1920 to 1930 was very small. Although each of the

CHART 49

POPULATION IN SELECTED COUNTY GROUPS OF WESTERN PENNSYLVANIA, 1830–1930



three counties of Armstrong, Butler, and Fayette gained slightly in population during the decade, the average for this group was only 5 per cent. In the group comprising Greene, Indiana, Lawrence, and Mercer, the gain in population was somewhat greater; but one of the counties—Indiana—actually lost population. Unless a new industry develops or some revolutionary change occurs in an old industry, these three groups of counties—the one with an actual loss between 1920 and 1930 and the two with very low rates of gain—are likely to show decreases or greatly reduced gains in population between 1930 and 1940. On the other hand, Allegheny County and the group made up of Beaver,

Washington, and Westmoreland counties are likely to continue to grow; but an extension of the curves for each of these two areas consistent with past changes indicates that the rate of gain will be relatively much lower than that in any decade since 1860 and for Allegheny County probably lower than that in any decade since 1800.

Stages of Economic Development—an Example

Within the Pittsburgh district a few counties have grown in population at analogous rates in nearly every decade since 1830; in some other counties growth has been similar but has lagged 10, 20, or even 30 years. The explanation for these relationships lies in the fact that a few counties felt the impetus of the development of the coal industry or of the iron and steel industry at approximately the same time, whereas other counties experienced industrial expansion a decade or more later.

The relative growth of population in Westmoreland County and that in Fayette County, for example, are about the same, although the population in Westmoreland County has usually been between one-third and one-half greater than that in Fayette County. (Note that the curves for these two counties in Chart 50 are nearly parallel.) The initial population influx into these two counties, which resulted largely from agricultural settlement, ended about the middle of the nineteenth century. It was followed by a retardation in the rate of growth until about 1870, when the exploitation of the bituminous coal fields in these two counties was undertaken on a large scale. As a result of the expansion of coal mining and, to a lesser extent, of manufacturing industries, these two counties gained rapidly in population between 1870 and 1910. In each of the four decades during this period of rapid growth, population increased by about one-third. After 1910 there was a considerable retardation, and between 1920 and 1930 the annual rate of growth in these two counties averaged only 0.65 per cent. In the main this retardation in population gains resulted from a slowing down and finally a cessation in growth of the local coal industry.

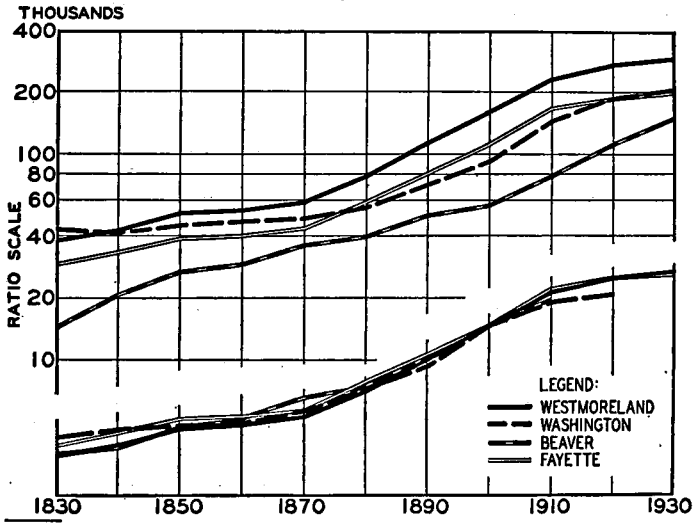
Washington County, on the other hand, first felt the effect of the development of the coal industry about 1880. For at least three decades, migration into the county was greatly stimulated by the expansion of coal production. The period of high per-

centage gains in population in this county also lasted 40 years. Not until after 1920 did a severe drop in the rate of growth occur. Important population accessions between 1900 and 1920 are related to the development of the iron and steel industry, especially at Donora.

Beaver County grew in population at a moderate rate from 1850 until about 1900, owing partially to expansion in small iron

CHART 50

POPULATION IN BEAVER, FAYETTE, WASHINGTON, AND WESTMORELAND COUNTIES, 1830–1930



NOTE: For explanation of lower part of chart, see p. 262.

and steel plants. The significant gains in population after 1900 resulted principally from important developments in the iron and steel industry at Aliquippa and Ambridge.[3] Between 1920 and 1930 the population was still growing markedly.

The population growth in Beaver County seems to have lagged roughly one decade behind that in Washington County and two decades behind that in each of Westmoreland and Fayette counties.

[3] Thus, of a population gain of 33,268 in Beaver County between 1910 and 1920, 19,812 were accounted for by the two boroughs, Aliquippa and Ambridge; and of a gain of 37,441 from 1920 to 1930 these two boroughs accounted for 18,187.

If the population curve for Beaver County be shifted back 20 years and that for Washington County 10 years and the curves for all four counties be shifted vertically so that they intersect in 1900, the four curves (Chart 50) lie sufficiently close to each other to suggest that the four counties have gone through approximately the same stages of growth but at somewhat different periods. Thus, Beaver County in 1930 appeared to be at about the same stage of development as were Westmoreland and Fayette counties in 1910. If Beaver County continues to follow the other two counties it will show a considerable decrease in rate of population growth between 1930 and 1940 and a further decrease between 1940 and 1950. The type curve or belt of curves suggests also that the rate of growth of population in Washington County during the 1930's will be very low—lower even than that during the 1920's. If the rates of growth in Westmoreland and Fayette counties show continued retardation, population will increase very little in these counties between 1930 and 1940, if actual losses do not occur.

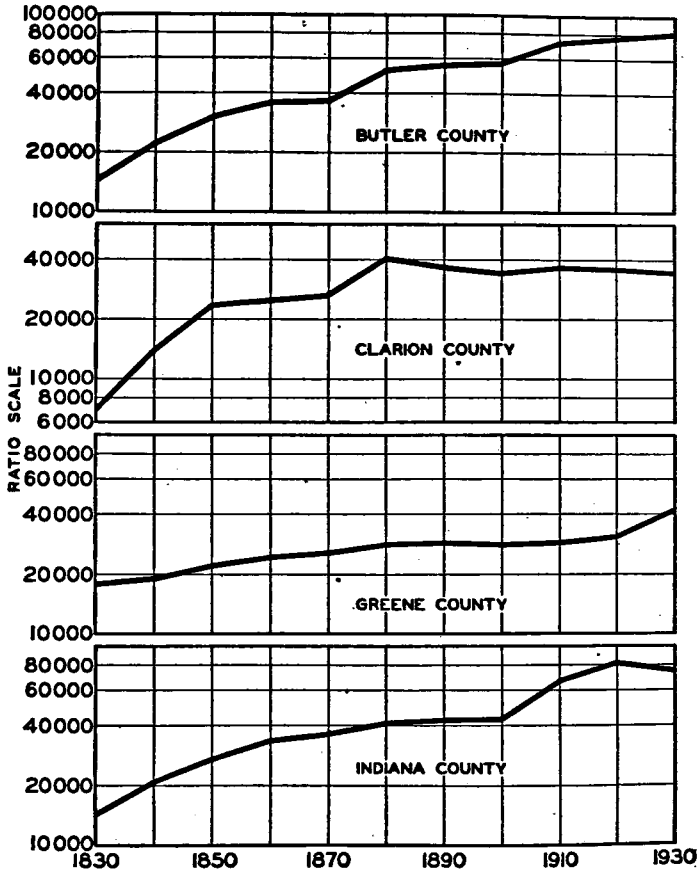
Influence of Particular Economic Stimuli on Population in Four Selected Counties, 1830–1930

In some counties in southwestern Pennsylvania the relationship between change in population and change in industrial activity is a very close one, and a sudden change in population can be attributed very directly to the development and expansion of a single industry. This simple relationship applies with full force to counties in which coal and oil fields have been opened up. In other counties, the activities of a single manufacturing concern have had a direct influence on the rate of population growth.

The population curve for Butler County from 1830 to 1930 reflects three periods of rapid growth, each followed by a period in which the rate of gain fell off markedly (Chart 51). During the first part of this 100-year period the growth in population resulted mainly from agricultural settlement. There was a great influx into the county between 1830 and 1840; but afterwards agriculture attracted fewer and fewer people, and no material change occurred in the number of persons in the county from 1860 to 1870. The next decade witnessed a boom in the oil and gas industry, during which the production of crude oil rose from 1,000 barrels in 1865 and 45,000 barrels in 1869 to 5,500,000

CHART 51

POPULATION IN BUTLER, CLARION, GREENE, AND INDIANA COUNTIES, 1830–1930



barrels in 1877. A somewhat less-pronounced boom in the natural gas industry occurred at the same time. These tremendous gains were followed by a sharp rise in the population of the county. During the decade 1870–1880, 16,000 people were added to the 37,000 reported in 1870. But the boom in the oil and gas industry did not continue; annual production of crude oil varied

between two and three million barrels during the 1880's. Consequently, there was no additional impetus to population growth from this source; and, since no other important factor entered the economic life of the county, there was a great retardation in the rate of growth during the next 20 years. Between 1890 and 1900 there was only a negligible increase in total population.

Manufacturing and mining first became of importance in Butler County between 1900 and 1910. The expansion in the mining industry is probably attributable in part to the increased demands for coal by two steel plants which were located in the city of Butler during this decade. These were the factories of the Standard Steel Car Company and the Forged Steel Wheel Company. (The latter became a part of the American Rolling Mill Company in 1927.) The Standard Steel Car Company in 1910 was the largest railroad car manufacturing plant in the United States and during the previous decade had produced as many as 36,000 cars in a single year. Expansion of manufacturing in this county was reflected by the gains in the number of manufacturing wage earners. The number rose from 1,100 in 1899 to 6,800 in 1919 (no 1909 figure is available), by far the largest relative increase during this period for any one of the 16 selected counties in southwestern Pennsylvania. Coal production increased sharply between 1900 and 1910 and also furnished a basis for population gains, which tended to lag a few years behind changes in coal production. About 234,000 tons of coal were produced in 1897 and 222,000 tons in 1900; production for 1907 amounted to 903,000 tons and that for 1910 to 1,018,000 tons. Growth in manufacturing activity slowed down materially after 1910; population of the country likewise showed a lower rate of increase. By 1930—and for the third time during a century—the population of the county was again practically stationary.

In Clarion County the history of population growth is in many respects similar to that in Butler County (Chart 51). An initial period of rapid agricultural settlement, which ended about 1850, was followed by a sharp retardation in population gains. With the oil and gas boom of the 1870's occurred another rapid movement of people into the county. (Clarion County lies just north of Butler County, and the oil fields in these two counties are adjacent.) Production of crude oil in Clarion County increased from 3,000 barrels in 1866 to 2,400,000 barrels in 1877.

Also there was a comparable boom in the natural gas industry. These developments led to a subsequent increase in the population of the county, a rise during the 1870's from 26,000 to 40,000.

After 1878 there was a sharp decline in the petroleum industry in Clarion County; production of crude oil amounted to only 300,000 barrels in 1882, about one-eighth of what it had been five years earlier. By 1890 the population of the county had fallen, and subsequently it has remained below the number reported for 1880. The county has had no new industrial development important enough to initiate another major upward movement of population. After 1897 there was a small expansion in the coal industry, which appears to have been followed between 1900 and 1910 by moderate population gains. Since 1880 the trend of population in Clarion County has been definitely downward.

Indiana County was primarily an agricultural county up to 1900 (Chart 51). A period of rapid settlement ended about 1860. The next three decades were characterized by steadily falling rates of gain. From 1890 to 1900 the population in the county remained practically unchanged. With the methods and types of agricultural production prevailing at that time the county could look forward to little expansion from that source. In the later 1890's, however, a rapid development of the coal industry was initiated. Coal production rose from 542,000 tons in 1897 to 7,636,000 tons in 1907. This rapid exploitation of the coal deposits of Indiana County had its effect on the number of persons in the county, which rose from 43,000 in 1900 to 66,000 in 1910. The expansion in the coal industry continued, but at a lower rate; output of coal in 1917 amounted to 12,054,000 tons. The population of the county likewise grew less rapidly after 1910. It totaled 81,000 in 1920. During the following decade, coal production in Indiana County reflected a declining trend, production in 1927 amounting to 9,415,000 tons. This decline is related to a loss in population during the 1920's of about 5,000. Population changes appear to have lagged about three years behind changes in coal output. If coal production continues to decline, it is likely that population will do likewise. Agriculture in the county, however, will continue to support a sizable population. The relationship between changes in coal production and changes in population in Indiana County and other Pennsylvania bituminous coal counties is discussed in subsequent sections of this chapter.

In Greene County the slow growth of population from 1830 to 1880 (Chart 51) depended largely on expansion in agriculture. During the next four decades the number of persons in the county remained practically unchanged. Since about 1870 it has been known that Greene County contains large reserves of bituminous coal. Extensive mining operations, however, were not begun until during the war. The opening of the coal fields at that time was soon followed by a marked increase in population, the first material gain which the county had experienced since 1830. Coal production rose from 290,000 tons in 1914 to 900,000 tons in 1917 and 6,743,000 tons in 1927, the all-time peak, and population increased from 31,000 in 1920 to 42,000 in 1930. The extensive working of coal veins, mainly near the Monongehela River, was almost entirely responsible for the 35.6 per cent gain in population.

In this section, four counties (Butler, Clarion, Greene, and Indiana) have been used to illustrate the general relation between change in industrial activity and change in population. Since 1880 the great industrial gains in western Pennsylvania have occurred in coal and steel; these two industries have been the most important factors in attracting new population. The next two sections will discuss the varying degree to which population changes have been related to changes in production in these two industries and the apparent differences in the lag of population changes behind changes in production.

Population and Coal Production, 1880–1935

Large deposits of high-grade bituminous coal in southwestern Pennsylvania furnish the main basis for the economic importance of the region. As soon as the iron industry outgrew the small furnaces which had been in use up to about 1880, anthracite became unsatisfactory as a fuel. It was becoming both wasteful and expensive. Coke, on the other hand, was relatively cheap and would hold up a far heavier charge of ore without excessive crumbling. It supplanted anthracite for much the same reasons that anthracite had previously supplanted charcoal. Coke made from bituminous coal in the Connellsville district was often used for the smelting of iron as early as 1860, about the time when Lake Superior ores first reached western Pennsylvania. Twenty-five years later it was clear that for use in the iron and steel industry coke was far more satisfactory and far more economical

than any other type of fuel. Furthermore, of all known deposits of bituminous coal in the country the seams in southwestern Pennsylvania supplied the best material for the beehive process of making coke. (The by-product process did not become of major importance in Pennsylvania until after the World War.) This advantage in fuel, plus the fact that the smelting of each ton of Lake Superior ore required considerably more than one ton of coal, made it certain that the Pittsburgh region would become of outstanding importance in the iron and steel industry as well as in the coal industry. Because of the dominating and basic importance of coal in most of the counties of southwestern Pennsylvania, changes in coal production in those counties might be expected to have an influence on changes in total population. Attention will now be directed to that relationship.

For the purpose of comparing changes in the rate of growth, the population and coal production data for each county have been plotted on the ratio scale, the major characteristic of which is that equal vertical distances represent equal percentage gains or equal percentage losses.[4] The results are presented in Chart 52. For all counties except Clarion County it will be observed that there is a general relationship between the movement in coal production and the movement in population. The most consistent response of change in rate of growth in population to change in rate of growth in coal output appears to have occurred in Cambria County. This response, it will be noted, was not immediate but took place only after a number of years. The most rapid growth in coal production occurred between 1884 and 1902, whereas the most rapid gains in population occurred between 1890 and 1910. Indeed, during the whole period since 1880 there seems to have been a lag of about eight years in population.[5] Evidence that this population lag occurred to a greater or lesser extent appears for all the 13 coal counties except Allegheny. (The curves for Allegheny County are not presented, since the more significant relationship for that county is between its population and coal produc-

[4] For a more refined analysis of the relation between changes in industrial production and related changes in population, see Glenn E. McLaughlin, "Population and Industrial Production in the Pittsburgh District," *Pittsburgh Business Review*, January, 1937, pp. 20–31.

[5] The closeness of the correspondence between the two variables as well as the extent of the population lag can be seen much more clearly from a chart in the article referred to; *ibid.*, p. 25.

CHART 32

POPULATION AND COAL PRODUCTION IN SELECTED COUNTIES IN SOUTHWESTERN PENNSYLVANIA

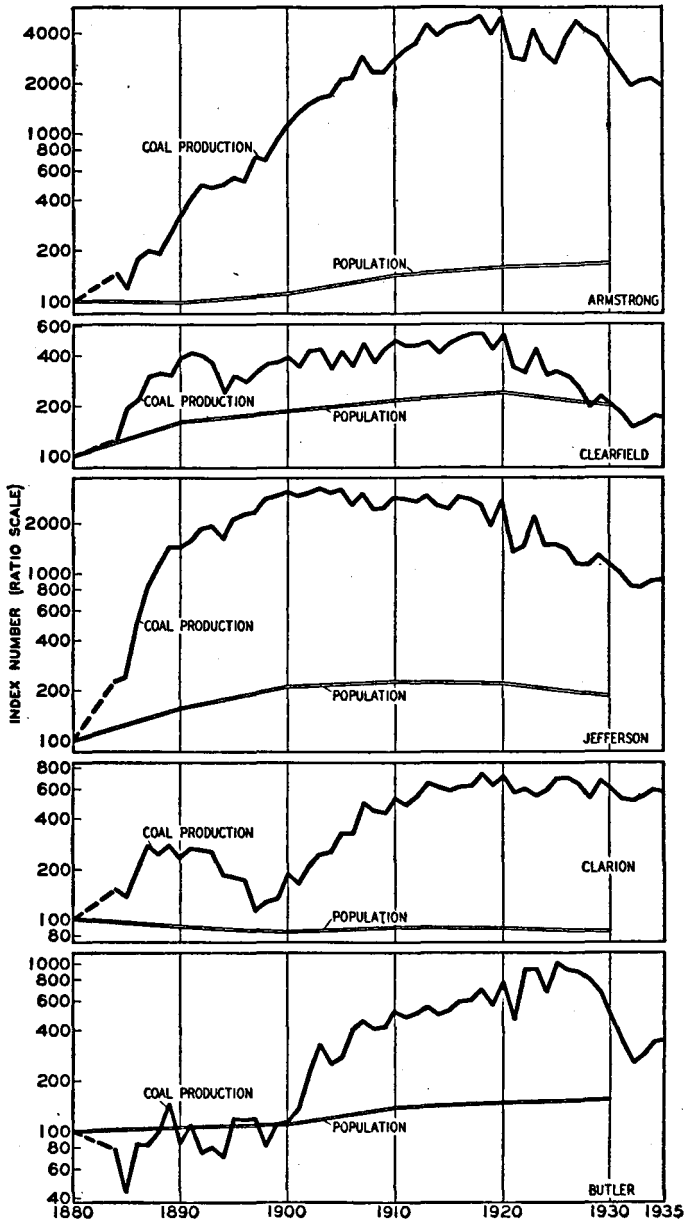


CHART 52 (*Continued*)

POPULATION AND COAL PRODUCTION IN SELECTED COUNTIES IN SOUTHWESTERN PENNSYLVANIA

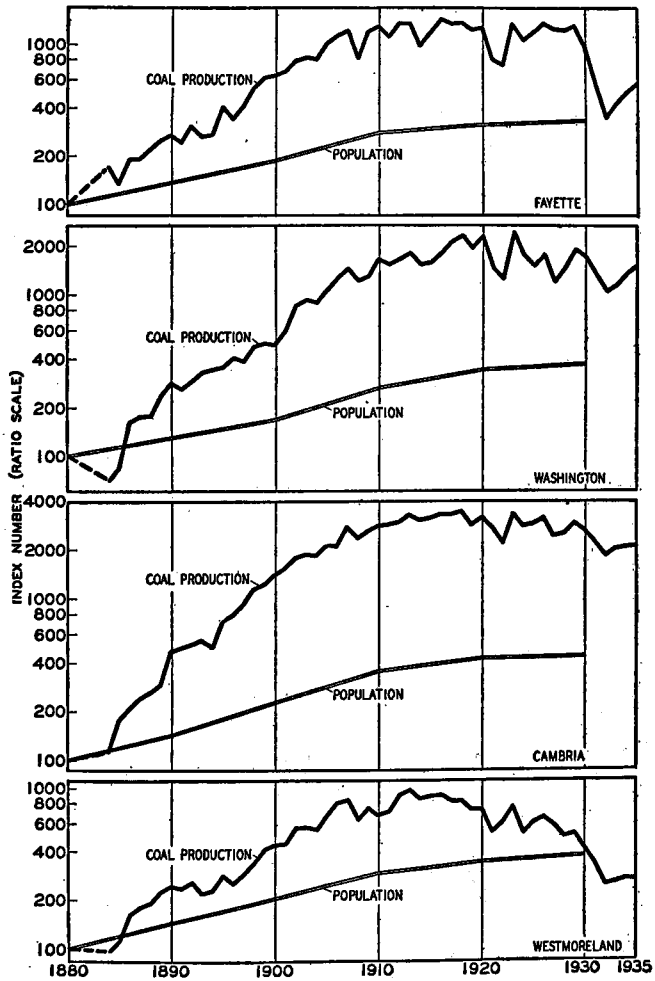
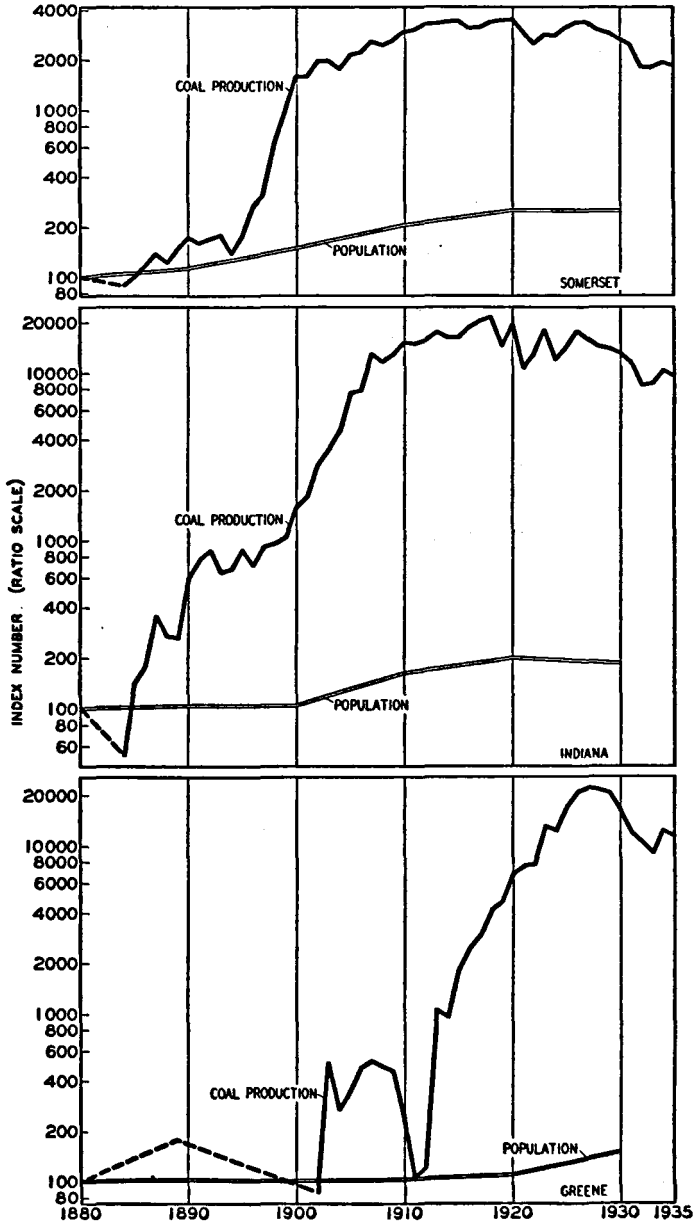


CHART 52 (*Continued*)

POPULATION AND COAL PRODUCTION IN SELECTED COUNTIES IN SOUTHWESTERN PENNSYLVANIA



tion, pig iron production, and manufacturing activity in larger areas; see Chart 53.)

The delayed movement of people attached to, or expecting to be attached to, the mining industry in acting upon significant changes in the rate of growth in coal production—in many counties the most important industry—indicates that a mining population is reluctant to leave old mining districts, even where output is declining, and to move either to areas with an upward trend in coal production or to areas with expanding output in other industries. Miners are known to resist a change in work so long as there is any possibility that they may be re-employed in their old occupation.[6]

Other factors help explain the lag of population movement behind changes in coal production. Workers from other pursuits do not appear to have been attracted into the mining industry immediately upon report of its growth. Before giving up their old occupations and moving into mining areas, men were likely to wait until the possibility of employment in mining seemed reasonably permanent. Moreover, population growth has lagged behind the expansion of mining operations, partly because the development of related industries has been delayed. Various service industries as well as local industries consuming coal have not appeared until coal mining itself was of some importance.

Why the mining population, and directly or indirectly nearly the total population, should respond to a change in the rate of growth within the industry apparently much sooner in some counties than in others is not altogether clear. One explanation may lie in the fact that population data are available only every

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[6] Some indication of the extent to which miners move and of the extent to which they wait for the demand for their services to reappear may be obtained from a study made in connection with a rate hearing before the Interstate Commerce Commission. The output of bituminous coal in Pennsylvania fell from 172 million tons in 1923 to 131 million tons in 1924 and recovered to 137 million in 1925 and 153 million in 1926. On July 1, 1923, 20 coal companies in southwestern Pennsylvania reported 5,822 company houses as being occupied by family groups with men working in the coal industry. Three years later, 3,111 of these families were no longer supported by the industry; of the number, 1,205 had moved and 1,906 were still living in company houses. The number that had moved in three years was less than the number waiting for re-employment. The severe decrease in output from 1923 to 1924 would indicate that many of the workers involved had been unemployed for two years. Lake Cargo Coal Rates, 1925. Interstate Commerce Commission Docket No. 15007. *Interstate Commerce Commission Reports*, Vol. 126, April–May, 1927, p. 309.

10 years and consequently cannot indicate the exact year in which the rate of growth changed markedly. But this incompleteness of data may not be so serious, since the purpose is to compare trend in population with trend in coal output. Another explanation appears to lie in variations in the relative importance of coal mining in the several counties. There is some tendency for the lag of population behind coal production to vary with the proportion of the total population employed in coal mines in 1920. (The year 1920 is taken because in most counties it marks approximately the peak of coal output.) At least, when a drop in coal production has occurred the downward adjustment in population has been delayed longer in those counties in which a large percentage of the population was dependent on coal than in those counties in which only a small percentage of the population was dependent on that industry.

There are variations among the counties in the relation between growth in coal production and growth in population. In some counties from 1890 to 1930 the rate of gain in population was about one-half of the rate for coal production, whereas in other counties the rate for population was relatively very small. For Clearfield County, for example, it can be seen from Chart 52 that population has been influenced in large measure by the expansion and contraction of the coal industry. On the other hand, in Butler County the increase in coal production has been followed by a comparatively small change in population.

Variations in the effect of increase in coal production on population appear to be explainable by differences in the relative employing importance of the mining industry near the beginning of the period under consideration. Where a large proportion of the population was employed in mining coal in 1890, a gain in coal production exerted a relatively greater effect on population change. Thus, in Clearfield County 13.4 per cent of the total population was employed in coal mining in 1890, whereas in Butler County less than 1 per cent of the total population was employed in coal mining in that year.[7] If the entire population had been dependent

[7] For coal counties the percentage ratio of number of persons actually employed in coal mining to the total population in 1890 was: Allegheny County, 1.64; Armstrong, 1.41; Butler, 0.57; Cambria, 6.24; Clarion, 2.55; Clearfield, 13.40; Fayette, 8.13; Greene, 0.70 (estimated); Indiana, 1.58; Jefferson, 9.02; Somerset, 1.73; Washington, 6.53; Westmoreland, 10.71.

directly or indirectly on the coal industry, presumably the rate of growth in coal and that in population would have been equal.

The relationship between coal output and population growth is inverse in Allegheny and Armstrong counties after 1918 and in Westmoreland County after 1921. Possible explanations of this relationship in Allegheny County will be discussed in the following pages. Growth of population in Westmoreland and Armstrong counties after 1920 is based partly on the growth of manufacturing activity and partly on the expansion of other occupations, especially of service occupations. Within manufacturing activity the most important gain in Westmoreland County from 1919 to 1929 came in the aluminum industry. Of a total increase in population of 21,427 persons in the decade 1920–1930, 10,650 were accounted for by the group of aluminum communities—New Kensington, Arnold, Parnassus, and Lower Burrell Township.[8] There was little industrial employment in those areas other than in aluminum plants. Armstrong County was the only county in southwestern Pennsylvania to report a significant increase in manufacturing employment from 1919 to 1929, the gains being concentrated in the plate glass and steel industries. Those parts of the county that gained materially in population from 1920 to 1930 contained the major plants in these industries. Indeed, except in the territory in and around Apollo (steel industry) and that in and around Ford City (plate glass industry), the county actually lost in numbers from 1920 to 1930.

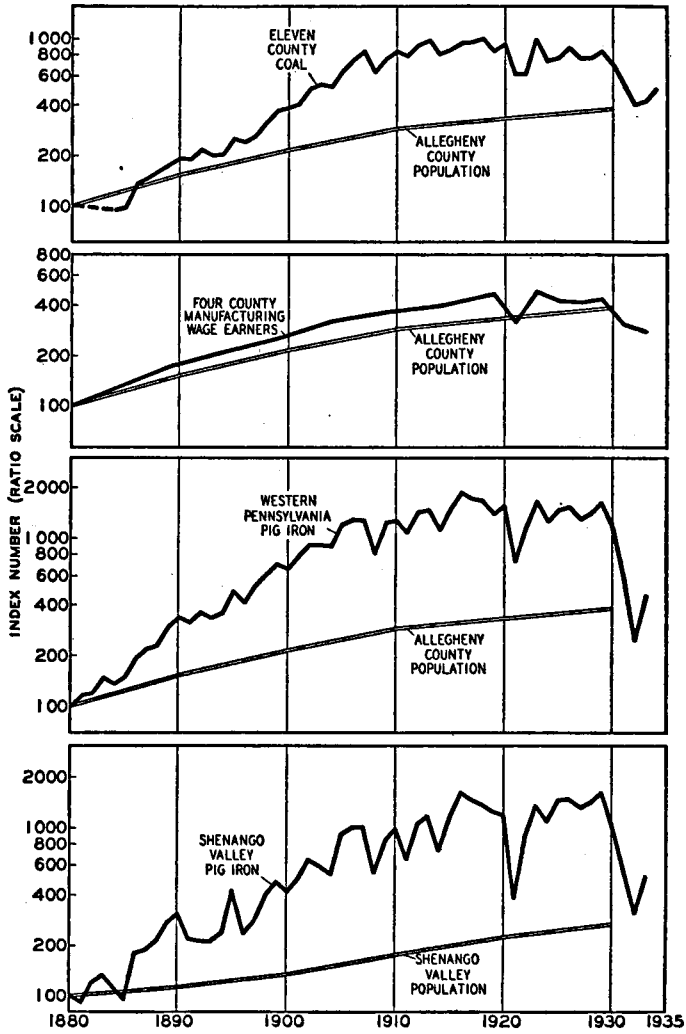
Population in Allegheny County and Industrial Production in a Larger Area, 1880–1935

From 1880 to 1930, growth in the population of Allegheny County varied more or less in concurrent relation to the trend of coal production in the 11-county area. On the average, up to about 1918 the rate of gain was twice as great for coal production as for population. (Note the spread between the two curves in the first figure in Chart 53.) Approximately the same relationship characterized Allegheny County population and coal production in the entire 16-county area. But the logical basis is less

[8] Likewise, there was an increase in population of 2,484 in Plum Township, Allegheny County, which is located just across the Westmoreland County line, and in which the only important factory is an aluminum products plant at Logans Ferry.

CHART 53

POPULATION AND INDUSTRIAL PRODUCTION, ALLEGHENY COUNTY AND THE SHENANGO VALLEY



clear, since much of the coal mined in the additional five counties lying along the eastern and notheastern edge of the area is shipped eastward, and little is consumed in Allegheny County.

After 1918 the rate of growth in coal production not only failed to remain double the rate for population, but the trend in coal production actually turned downward. Between 1920 and 1930 the population of the county increased at a fairly substantial rate—about 1.5 per cent per year. In other words, after 1918, changes in coal production no longer helped account for changes in population in Allegheny County. A discussion of the factors contributing to the continued population growth is given in the following section.

Primary explanation of the simultaneous movements of population in Allegheny County and coal production in the 11-county area doubtless is that Allegheny County constitutes the most important market for coal from that area. In the main, the 11-county coal production figures furnish a satisfactory measure of changes in the demand for coal in the manufacturing industries in Allegheny County. Therefore, it seems reasonable to assume that the relationship between population and coal output merely reflects a direct correspondence of population growth to changes in the growth of manufacturing activity. Absence of any population lag suggests that manufacturing labor is relatively mobile, much more so than mining labor.

The relationship between population growth in Allegheny County and production of pig iron in western Pennsylvania (third figure in Chart 53) is similar to that between population in Allegheny County and coal production in western Pennsylvania.[9] Again the relationship is concurrent: Allegheny County population shows no important tendency to lag behind western Pennsylvania pig iron production. After 1918 the relationship is broken, growth in pig iron production failing to keep up with growth in population.

A remarkably close correspondence between growth in population in Allegheny County and manufacturing employment in the Pittsburgh Industrial Area (the 4-county area) is indicated in the second figure in Chart 53. (It must be remembered, however, that

[9] Pig iron production was growing about two and one-half times as fast as population instead of only twice as fast.

annual figures are available for neither manufacturing employment nor population; otherwise, the curves would probably be somewhat more analogous to those in the two figures already discussed.) Again the relationship is concurrent and fails to hold during the 1920's.

Since changes in population in Allegheny County have been closely related to changes (in wider areas) in coal production, pig iron production, and manufacturing employment, and since the growth of industrial activity has been rapid, gains in the population of the county probably have arisen more from immigration into the county than from the excess of births over deaths. It appears that the increase in industrial activity has attracted and supported an increasing population rather than that the growth in population has brought about the expansion in industrial production. Indeed, a considerable percentage of the products manufactured in Allegheny County are shipped beyond the limits of the state.[10]

Causal Factors in the Growth of Population in Allegheny County from 1920 to 1930

The break about 1920 in the previously close relationship between growth in industrial production and growth in population of Allegheny County is significant. Since then the population of the county has grown notwithstanding the absence of an upward trend in employment in either manufacturing or mining. Manufacturing employment has been related somewhat more closely to population since 1920 than has either coal production or pig iron production. But the number of manufacturing wage earners decreased sharply after 1923, whereas population increased 15.9 per cent between 1920 and 1930. Probably manufacturing output in the 4-county area increased somewhat during the 1920's because of the extension of mechanized processes, but the importance of manufacturing as an employer of both wage and salaried workers was falling after 1923. Changes in coal production might have given a somewhat better fit to population growth were it not for

[10] An estimate of 33.8 per cent of mining and manufacturing output in 1923; see Pennsylvania Department of Internal Affairs, *Productive Industries, 1923*, p. 307. The proportion of certain important iron and steel products shipped outside the state was much larger: 66.4 per cent of structural iron and steel; 62.9 per cent of iron and steel bars; and 56.4 per cent of pipes and tubing. These percentages are based on value of products.

the fact that a considerable economy in the use of coal, notably in the iron and steel industry, has been effected in the postwar period. Yet this factor alone does not account for the discrepancy since 1918 between Allegheny County population and coal output in the 11-county area. Moreover, to some degree the divergence between the trend in pig iron production in western Pennsylvania and the trend in Allegheny County population is a result of the decreasing relative importance of pig iron in the iron and steel industry, which has followed from the increasing use of iron and steel scrap. Yet the relation between population and rolled iron and steel output is not materially closer than that between population and pig iron production.

TABLE 39

NUMBER AND PERCENTAGE CHANGE OF GAINFUL WORKERS, 10 YEARS OF AGE AND OVER, BY GENERAL DIVISION OF OCCUPATION, FOR ALLEGHENY COUNTY, 1920 AND 1930

Occupational Division	Number of Gainful Workers		Percentage Change, 1920 to 1930
	1920	1930	
All Occupations	473,918	536,988	13.3%
Agriculture, Forestry, and Fishing	6,115	6,547	7.1
Extraction of Minerals	17,152	13,399	−21.9
Manufacturing and Mechanical Industries	209,969	220,680	5.1
Transportation and Communication	44,394	50,371	13.5
Trade	57,849	76,717	32.6
Public Service	8,602	11,475	33.4
Professional Service	26,214	38,285	46.0
Domestic and Personal Service	41,325	55,612	34.6
Clerical Occupations	62,298	63,902	2.6

Source: United States Bureau of the Census. The 1920 data are from an unpublished tabulation.

What economic means of support were there for those persons who were added to the population of the county after 1920? The number of normal gainful workers in mining, one of the major industries in the county, fell 22 per cent between 1920 and 1930 (Table 39). In manufacturing and mechanical occupations there was a reported increase of 5 per cent, but this was more than accounted for by the increase in the number of workers in the building and construction industry, which is included in this occupational group. In manufacturing proper, there was a slight decrease. Consequently, the additional population appears to have

obtained its economic support from the building industry and from the service occupations.[11] The increase in usual employment in building occupations was somewhat more than 10,000 persons, equivalent to a gain of 20 per cent. In each service group, except clerical occupations and transportation and communication, the increase in the number of gainful workers from 1920 to 1930 was greater than 30 per cent. The greatest relative gain occurred in professional services, there being nearly half again as many workers in Allegheny County in this field in 1930 as at the beginning of the decade. To this group 12,000 workers were added during the period. The absolute gain was even greater in trade occupations—nearly 19,000—and also greater in personal and domestic service occupations—about 14,000.

Further evidence that service occupations accounted in the main for the support of the increase in the population of Allegheny County from 1920 to 1930 lies in the fact that more than half of the gain in population during this decade (about 100,000 out of 188,602) occurred in residential suburbs and in the newer outlying wards of the city of Pittsburgh. Most of these districts are some distance from manufacturing plants or coal mines. It seems reasonable to conclude, therefore, that the people moving into these districts are likely to have been employed mainly in service occupations and especially in trade and professional pursuits.

If the conclusion that these occupations have supported the increase in population is accepted, then it may be asked how these services were paid for. There are several possibilities. In the first place there probably were increases of the total of *real* wages and *real* salaries for manufacturing employes in Allegheny County during the 1920's, despite decreases in both manufacturing wage payments and number of manufacturing wage earners. Although census data are incomplete, it appears that there was a substantial increase of total money salaries in manufacturing in the county from 1919 to 1929, a period of falling prices. As a group then,

[11] The choice of these occupations may not have been entirely optional. In considerable part the great increase in number of workers in service occupations in Allegheny County from 1920 to 1930 may have indicated the lack of labor opportunity elsewhere. Many workers must have faced the alternative of accepting comparatively low earnings in service occupations or of leaving the county.

employes in manufacturing in Allegheny County—and probably also in nearby counties—were able to purchase more service in Allegheny County in 1929 than in 1919.

Another partial explanation for the expansion of service occupations may lie in the increased payment of state and Federal funds and of funds from endowment groups to agencies operating in Allegheny County. There was, for example, an expansion of Federal offices in Pittsburgh during this period; at the same time, state allotments to public and quasi-public institutions increased. Another factor of importance may be that many families during the 1920's were being supported, at least in part, by savings or by incomes from the investment of savings. Some of these investments probably were made in companies which operated outside the county and in which the returns were higher than those from the major concerns operating solely or primarily in the county. Income from manufacturing and industrial operations in Allegheny County was very high during the World War; probably these profits have made it possible for a considerable group of people to support themselves on income from investments. The relatively high total of time deposits in Pittsburgh banks lends some support to this supposition.

Another factor of importance in accounting for the rise in trade and service occupations appears to have been the expanding influence of Pittsburgh as a metropolitan center. People from greater and greater distances probably have drawn on Pittsburgh for services. Moreover, employment in local central offices for large industrial concerns has increased considerably. Also in this connection, the rate of growth in industrial activity in the panhandle of West Virginia may have been of some importance. Manufacturing employment in Hancock County, West Virginia, for example, increased from 6,400 in 1914 to 11,300 in 1929.

Population and Pig Iron Production in the Shenango Valley

A significant degree of relationship exists between changes in pig iron production and growth in population in the Shenango Valley, which comprises the three counties of Beaver, Lawrence, and Mercer. The relationship, however, is not so close as that between pig iron production and population in Allegheny County. From 1870 to 1890 the growth in pig iron production in this area

was much more rapid relative to population growth than it was during the balance of the period (lowest figure in Chart 53). This comparatively slow growth in population suggests that early expansion in the pig iron industry was accomplished mainly by the use of local workers. After 1890, however, the growth in the pig iron industry was accompanied by a more or less constantly related growth in population. During the 1920's the relationship between pig iron production and population in this area was much closer than that between population in Allegheny County and pig iron production in western Pennsylvania. In both instances population has tended to grow with the iron and steel industry and not to lag behind it.

Population Forecast for Major Coal Counties

In the important coal-producing counties in western Pennsylvania the problem of forecasting population may be said to depend primarily on five considerations—namely, the past trend in coal production, the lag in population movement behind trend in coal production, the ratio between relative change in coal production and relative change in population, the effect of the recent depression on alternative employment, and the future demand for Pennsylvania coal.

The trend in coal production is downward in each of the major coal counties except Greene and possibly Butler. Greene County is the most recently developed of the coal-producing counties; both coal production and population grew more rapidly there between 1920 and 1930 than in any other county in western Pennsylvania. Of the 12 coal counties in this section, therefore, Greene County is the most likely to gain in population between 1930 and 1940. In fact, none of the other 11 counties appear very likely to gain; perhaps in Butler County the coal trend is not too unfavorable to allow slight population growth. Coal production trends are falling rapidly in Jefferson, Clearfield, and Indiana counties; these declines will probably lead to sizable decreases in population in these counties between 1930 and 1940. Declining trends in mining output also indicate, in so far as that influence is effective, the likelihood of population losses in Armstrong, Cambria, Clarion, Fayette, Somerset, Washington, and Westmoreland counties. Yet in Armstrong and Westmoreland counties growth in other industries may be sufficient to offset the effect of an unfavorable

trend in coal. In Fayette County the coal trend was only slightly downward during the 1920's.

Of the 12 counties the most immediate responses of population to changes in coal production appear to have occurred in Butler, Clarion, Greene, and Indiana counties. If past relationship persists, the upward trend in coal production in Greene County would within a few years be followed by an increase in population. On the other hand, the downward trend in Clarion and Indiana counties would comparatively soon lead to a fall in population. The lag of population behind coal production is very great in Fayette, Cambria, Somerset, and Washington counties. Previous interdependence suggests that the population of each of these counties will fall during the 1930's as a result of a downward trend in coal production during the preceding decade.

Changes in coal production have had a greater proportional effect on changes in population in those counties which near the beginning of the period under study were more dominated by mining activity. Thus, in 1890 the proportion of the population employed in coal mining in Clearfield County was 13.4 per cent, the maximum among Pennsylvania bituminous coal counties, and during the following 40 years changes in coal production in that county exerted the greatest relative effect on population growth. On the other hand, in 1890 the relative importance of coal mining employment was small in Butler and Greene counties, and in following decades relative gains in coal output had a much smaller effect in stimulating increases in total population. The effect of future changes in coal production on population will undoubtedly be great in those counties which in 1930 had high percentages of local workers employed in coal mining. In that year, much more than one-third of all gainful workers were attached to coal mining in Somerset and Fayette counties and nearly one-third in Indiana and Greene counties. (This fraction understates the importance of the coal industry, because many of the workers in service occupations are indirectly dependent on that industry; probably in these four counties much more than one-half of the total population was directly or indirectly employed because of mining operations.) In these counties, rapid growth in coal output would lead to high percentage gains in population; rapid losses in coal output, to high percentage losses in population. The near future depends heavily on the coal industry. In the light of known tendencies, consider-

able population decreases are likely to occur in three of the counties and a considerable gain in Greene County. In three additional counties, Cambria, Washington, and Clearfield, in which approximately one-fourth of all gainful workers in 1930 were attached to coal mining, the downward trend in that industry probably will be the primary influence in determining the future population.

Even though changes in coal production appear to have been the major determinant of changes in population in most mining counties in western Pennsylvania and even though the downward trend in coal production in some of these counties has been followed by a downward trend in population, it does not follow necessarily that the downward trend in coal production during the late 1920's and the early 1930's has been followed in the past few years by a related decrease in population. To a great extent the recent depression eliminated the possibility of alternative employment. Although coal production has been falling off, the unemployed population probably has refrained from moving because of the lack of any demand for industrial employment elsewhere. In the depression years following 1929 there was no significant outlet for miners from distressed areas. The labor markets in major manufacturing areas were crowded with local unemployed workers. Consequently, miners and their families had to remain where they were and to depend on relief or some assistance from agricultural pursuits. Indeed, the depression was so severe in the heavy industries of Allegheny and other iron- and steel-producing counties that there appears to have been some migration of unemployed workers to agricultural counties—districts that already contained a large number of unemployed miners. Moreover, the granting of relief to the unemployed made it likely that many of them would remain where they were. The number of people on relief has been relatively greater in the more distressed coal-producing counties (Clearfield County, for example) than in Allegheny or Beaver counties. Consequently, the drop in coal production since about 1926 probably has not been followed by a related drop in population.

In the summer of 1937 it appeared possible that the demand for labor in the manufacturing sections of western Pennsylvania and nearby states was again sufficient to furnish an important outlet for the populations of those mining districts in which production was not recovering rapidly and perhaps in which whole communities

still remained stranded.[12] The previous relation between changes in coal production and subsequent changes in population may be re-established, though it may be somewhat modified by the extension of mechanization and consequent increased output per miner. By 1940 large numbers of people may have moved out of counties with materially declining trends in coal output.

Any general change in the trend of bituminous coal output in Pennsylvania will be reflected in the size of population in the coal-producing counties. If, during the remainder of the 1930's, the sales of Pennsylvania coal tend to rise, the population of these counties in 1940 will probably be greater than now seems likely. There are, in fact, some possibilities that production trends may turn upward. In the first place, up to 1932 Pennsylvania improved her relative position in lake-cargo coal shipments.[13] While it is unlikely that Pennsylvania's share of the total will continue to grow unless railroad rate differentials are changed to the state's advantage, it is possible that the upward trend in shipments will continue, owing to the rapid growth in total lake-cargo shipments. Any improvement probably would be of greatest significance to Washington County, which far outdistances other Pennsylvania counties in the lake-cargo coal trade. In the second place, the local iron and steel industry, because of the possession for the first time in more than two decades of mills as modern as those in any other district, may be entering a period of long-time growth in production, which would necessarily be accompanied by increased consumption of western Pennsylvania coal. Such gains in coal output would accrue mainly to Fayette, Washington, and Greene counties, from which coal is obtained by local iron and steel companies. In the third place, a readjustment of transportation rates may readmit bituminous coal from certain Pennsylvania counties to markets formerly served by these counties. For ex-

[12] During the latter part of the recovery, the gains in coal production were comparatively great in those counties dominated by captive mines—mines owned by and supplying coal exclusively to steel concerns, utility companies, or other industrial consumers. The main example is Fayette County.

[13] Pennsylvania's share of total lake-cargo coal, including fuel, rose from 9.7 per cent in 1925 to 30.8 per cent in 1932 and 30.4 per cent in 1934, then dropped to 24.7 per cent in 1936. Shipments from Pennsylvania rose from 10,941,000 net tons in 1934 to 11,222,000 net tons in 1936. The state's share of national output reached its lowest point in 1933 at 23.8 per cent; the figure for both 1934 and 1936 was 25.0 per cent. United States Bureau of Mines, *Bituminous Coal Tables, 1935–36* (mimeographed release).

ample, the Commonwealth of Pennsylvania repeatedly has represented the interests of the northeastern bituminous coal counties before the Interstate Commerce Commission in an effort to lower rates from this district to tidewater relatively to rates from southern West Virginia to tidewater. (This change would be important in reaching the New York City and southern New England markets for coal.) The allowance of a material comparative advantage in rates probably would lead to additional coal production in this part of Pennsylvania. Great increases in output, however, are unlikely, because practically all the thicker veins of coal in Clearfield, Indiana, Jefferson, and some adjoining counties have been removed.[14]

On the other hand, the trend for bituminous coal production in the United States promises to remain unfavorable, partly because efforts to economize in the use of coal will likely persist and partly because bituminous coal will probably continue to lose markets to other fuels, although the latter tendency may be less effective in the Pittsburgh district than elsewhere because of the requirements of coal in the iron and steel industry. Consequently, any sizable improvement in local coal production will have to be obtained and held at the expense of other areas. In the main, that area would be southern West Virginia. Such actions might prove very difficult, because costs are generally higher in Pennsylvania than in southern West Virginia. Pennsylvania has mined more of its best and cheaply obtainable coal than has any competing state.[15] Even so, the Pittsburgh district is nearer most major consuming areas and probably would be able to extend its marketing territory if all railroad rates on coal were on a mileage basis.

In summary, of Pennsylvania bituminous coal counties, Greene County is the most likely to report population gains in 1940. Considerable relative losses are likely to occur in Jefferson, Clearfield, Indiana, and Clarion counties. Probably very little net change between 1930 and 1940 will be registered in Somerset, Cambria, Fayette, Washington, Westmoreland, Armstrong, and Butler counties. In all these seven counties changes in coal output indicate that decreases in population are more likely than gains, but only in Westmoreland County is the trend in coal production markedly

[14] Commonwealth of Pennsylvania, Department of Internal Affairs, *Monthly Bulletin*, February, 1936, p. 6.
[15] *Ibid.*, p. 7.

downward. As will be noted in a later section, manufacturing exerts a considerable influence in the economic life of some of these counties, and at least in Armstrong, Butler, and Westmoreland counties the long-time tendency in manufacturing activity is rather more favorable to population gains than is the trend in coal. In Cambria County, manufacturing and mining are so closely interrelated that the respective production trends are similar; neither indicates the likelihood of gains in population. As a group the 12 coal-producing counties will probably include a smaller population in 1940 than in 1930.

Annual Population Changes, 1920–1936, and Population Forecast for Allegheny County

The primary factors involved in making estimates of the future population are likely changes in birth and death rates and variations in migration. The future birth rate will depend on the changing age distribution of the female population, the marriage rate, and the spread of information on birth control. Variations in the death rate are related to changing age distribution of the total population and to the efficacy of preventive medicine and public health measures. The direction and intensity of migration among geographic areas are determined for the most part by comparative industrial trends.

For Allegheny County the only published population forecasts are those computed in 1934 by Frederick F. Stephan, then Director of the Bureau of Social Research of the Federation of Social Agencies of Pittsburgh and Allegheny County. His estimates were for the years 1940, 1950, and 1960 and were based on the relationship between births and deaths through 1933 and on previous changes in the age distribution of the population; no attempt was made to approximate population changes resulting from migration.[16] The last three census counts and Stephan's estimates

[16] Frederick F. Stephan, "Population Trends Predict the Future of Pittsburgh and the Pittsburgh Market," *Greater Pittsburgh*, February, 1934. He assumed that the relative decrease in the portion of the population under 21 years of age would continue at least up to 1960. In 1920, 41.8 per cent of the total population were minors, i.e., under 21 years of age. The estimated figures for 1960 account for only 18.9 per cent of the population in that age group. Consequently, an increasing percentage of the population will fall within working age groups. According to the estimates the number of people 21 years of age and over will continue to increase up to 1960, the number rising from 711,000 in 1920 to 1,065,000 in 1960. The increase in

for the county are as follows:

Census Enumerations		Estimates	
1910	1,018,000	1940	1,471,000
1920	1,186,000	1950	1,440,000
1930	1,374,000	1960	1,320,000

These estimates indicate that for census years the maximum population of Allegheny County—1,471,000 persons—will be reached in 1940. On the basis of the trend in births and deaths, Stephan concluded that, by 1940, births will approximately equal deaths. In 1930 the reported excess of births over deaths in the county was 11,591; although some of the data (27,785 births and 16,194 deaths) may have applied to inhabitants of outside counties.[17] During the preceding decade the largest annual excess was 16,812 in 1921, and the smallest, 10,386 in 1929 (Table 40). After 1930 the excess of births decreased rapidly to 1933, amounting to only 6,713 in that year. With the greater absolute rise in deaths than in births, the natural increase fell to 5,422 in 1936. Probably it will continue to drop, because the increasing average age of the population will lead to a continuance of the rise in deaths—though not necessarily regularly—and in addition the long-time downward trend in births is not likely to be reversed. Very probably then, as Stephan estimated, excesses of births over deaths will be small in 1940.

But, on the basis of vital statistics, especially those for the three years 1934–1936, an estimated natural increase in population of 96,000 between 1930 and 1940 appears to be somewhat too high. The cumulated excess of births over deaths from January 1, 1930, to January 1, 1937, amounts to 52,649. With the liberal assumption that the excess in each of the following three years will average as much as during the preceding seven years, the total decade gain from natural increase will amount to 75,213. Thus, a 1940 population of 1,471,000 for Allegheny County will have required

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the number of gainful workers in the county will doubtless continue for some time after the population reaches a maximum, depending in part on any future tendency not to employ workers in the older age groups.

[17] In 1935—the first year for which such information was tabulated by the Federal Census Bureau—the vital statistics for Allegheny County overstated the births of children of residents by more than 500, about 2.5 per cent, and overstated the deaths of residents by more than 150, about 1 per cent. United States Bureau of the Census, *Vital Statistics Summary for Pennsylvania: 1935*, p. 424.

an inward migration of more than 20,000. The next problem to consider is the measurement of population movement into or out of the county.

Annual population estimates can be made from changes in school census totals. This census is taken as of the end of October each year throughout the county and shows the total number of children in three age groups: 6–7, 8–13, and 14–15. Rather than base the estimates of the annual population entirely on these data

TABLE 40

POPULATION ESTIMATES FOR ALLEGHENY COUNTY, 1920–1936

Date	Population	Births for Year	Deaths for Year	Natural Increase during Year	Estimate of Migration during Year	Population Estimate
Jan. 1, 1920..	1,185,808					1,186,000
Dec. 31, 1920..		30,612	17,562	13,050	−15,000	1,184,000
Dec. 31, 1921..		32,047	15,235	16,812	−12,000	1,189,000
Dec. 31, 1922..		29,276	15,342	13,934	0	1,203,000
Dec. 31, 1923..		30,121	17,286	12,835	8,000	1,224,000
Dec. 31, 1924..		31,048	17,182	13,866	8,000	1,246,000
Dec. 31, 1925..		30,571	16,551	14,020	27,000	1,287,000
Dec. 31, 1926..		29,286	16,493	12,793	15,000	1,315,000
Dec. 31, 1927..		29,718	15,837	13,881	6,000	1,335,000
Dec. 31, 1928..		28,484	18,055	10,429	13,000	1,358,000
Dec. 31, 1929..		27,365	16,979	10,386	3,000	1,371,000
Apr. 1, 1930..	1,374,410	*6,924*[a]	*4,144*[a]	*2,780*[a]	*700*[a]	1,374,000
Dec. 31, 1930..		27,697	16,575	11,122	4,000	1,386,000
Dec. 31, 1931..		25,576	16,517	9,059	−1,000	1,394,000
Dec. 31, 1932..		22,829	15,361	7,468	−2,000	1,399,000
Dec. 31, 1933..		20,443	13,730	6,713	−7,000	1,399,000
Dec. 31, 1934..		21,214	14,606	6,608	−14,000	1,392,000
Dec. 31, 1935..		21,213	14,956	6,257	−11,000	1,387,000
Dec. 31, 1936..		21,256	15,834	5,422	−10,000	1,382,000

Source: Population figures for 1920 and 1930 from reports of the United States Bureau of the Census; birth and death data from Bureau of Vital Statistics, Pennsylvania Department of Health; and estimates of migration based on school census totals supplied by Pennsylvania Department of Public Instruction.

[a] Estimates for the first three months of 1930. These figures were used only to indicate that population on April 1, 1930, was 1,374,410.

it appeared more conservative to compare them with the estimated number of children that would be entering each year of age, if all surviving children born in the county remained in the county. These estimates were arrived at by using appropriate available mortality data for different age groups, chiefly those for Pittsburgh. (Data on births and deaths before 1920 are not shown in Table 40, but they were used in estimating the age composition of the population after 1920.) The annual migration of children aged 6–15 was approximated from successive differences in the

excess of the number reported by the school census over the estimated number of surviving children native to Allegheny County. To each approximation, a factor was applied to obtain the estimate of annual net migration. This factor was a ratio of the actual net migration of all persons from 1920 to 1930 to the estimated net migration, during the same period, of children aged 6–15.[18]

Resulting estimates indicate that since 1920 the greatest population influx occurred in 1925 and 1926 (Table 40). Perhaps this movement was related to the collapse of the beehive coke industry in Fayette and Washington counties and to the rise in building activity in Allegheny County. Greatest loss by migration appears to have occurred in the years 1934–1936. The population of Allegheny County, according to these calculations, reached a peak of 1,399,000 on December 31, 1932. During each of the next four years the population is estimated to have decreased, the indicated figure for December 31, 1936, being 1,382,000. These decreases are derived from the decreases in the number of children reported by the annual school censuses. The accuracy of the population estimates depends in considerable part on those censuses.

Migration has been an important factor in the increase in population in Allegheny County. Of the gain of 168,000 persons between 1910 and 1920, about 60,000 were accounted for by migration into the county;[19] and, of the gain of 189,000 from 1920 to 1930, migration accounted for about 54,000. Continued revival of industrial activity may prove sufficient to attract many migrants. During the years 1933–1936 a rising business volume seems to have been accompanied by a declining population. But annual population estimates show that, after the depression of 1921, the return flow of population waited until 1923, a year of great prosperity. Perhaps a similar lag will characterize the current period. In any case, the declining excess of births over deaths indicates that the possibility of a greater population in 1940 than in 1930 depends primarily on gains in industrial production and the resulting attraction of more workers and their families.

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[18] Because of the fall in the birth rates since 1929, the relative number of children in the total population has been falling. If an increasing ratio were used for estimating migration, it would lead to smaller population estimates for the years following 1930. Thus the estimates may be somewhat too high.

[19] C. Warren Thornthwaite, *Internal Migration in the United States*, p. 30.

Over the long run, however, the trends of industrial production do not appear to favor net migration into the county or into the Pittsburgh district as a whole.[20] Indeed, from 1920 to 1930 there would have been migration from the county and a drop in total population if population had followed as closely as previously to changes in either coal output or pig iron production in western Pennsylvania. The increase in population appears to have been facilitated by the expansion of service occupations and to a lesser extent by the continued upward trend in total industrial production, slight though it was. Actually the rising output per industrial worker has meant that service occupations have had to absorb some industrial workers as well as other workers sufficient to support the increased population. But as already noted another great increase in these occupations is unlikely soon to occur, for the numbers employed in them cannot continue to expand irrespective of production trends in the major industries of the district. A downward trend in mining and manufacturing output would sooner or later lead to decreases in employment in service industries and hence to a falling population, although for a time it is possible that greater concentration of the area's service functions in the central metropolitan district may lead to a rising population in Allegheny County.

In the 11-county Pittsburgh district the trend in iron and steel production appears to be rising very slowly (Chart 57). Only slightly more rapid is the increase in the trend of total production. The annual increment in this trend during the 1920's amounted only to about 0.5 per cent per year, whereas the trend in population in Allegheny County was advancing at a rate of 1.5 per cent per year. Since another great expansion of service occupations is not immediately probable, the maintenance of population gains in Allegheny County at the rate of the 1920's would require a great rise in the rate of long-time growth in industry. Moreover, to support a given rise in population, industry will need to create more positions than formerly, both because the output

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[20] Dr. Warren S. Thompson, of the Scripps Foundation for Research in Population Problems, in estimating the future population of Pennsylvania, concluded that in the future there would be net migration out of the state. Without considering migration he held that the population would continue to increase up to 1960, but with allowance for migration he estimated a maximum population in 1955. See Commonwealth of Pennsylvania, Department of Health, *Vital Statistics Bulletin*, May, 1935, pp. 5–6.

per worker will probably continue to rise and because the number of persons in employable ages will be increasing faster than the total population. This last-named factor will mean that a given increase in employment will be accompanied by a smaller increase in total population than formerly, since the number of dependents per worker will be dropping. A change in industrial trend adequate to support an annual increase in population in Allegheny County of 1.5 per cent does not appear imminent. The greater probability favors the maintenance of something like the present low rate of industrial growth.[21] If the population of Allegheny County is larger in 1940 than it was in 1930, the gain probably will be relatively small.

Population Forecast for Other Iron and Steel Counties

In the Shenango Valley a comparatively steep trend in iron and steel production has been accompanied by high rates of population growth. Since 1900 the gains in each instance have been greater in Beaver County than in Lawrence and Mercer counties. Shifts of industrial activity within the larger Pittsburgh district have contributed much to the rapid population growth of these counties. The construction and expansion of steel mills along the southern boundary of Beaver County in considerable part repre-

[21] It is well to remember that in the face of the economic handicaps which the Pittsburgh district suffered between 1920 and 1930, the trend in industrial production held up remarkably well. The system of basing steel prices throughout the country on prices in Pittsburgh, i.e., Pittsburgh Plus, was broken in 1924. Although the seriousness of this change can be overemphasized, it probably operated to the disadvantage of Pittsburgh producers in some markets. The district suffered another blow in the collapse of the local beehive coking industry and in the widespread adoption of the by-product process for making coke. Other districts not only began to make their own coke but to use cheaper grades of coal than those mined in the Connellsville district. Relatively cheaper coke elsewhere meant a comparative handicap to the local steel industry. The use of coal from other districts led to the loss of markets to the local coal industry. Moreover, mainly as a result of wage differentials but partly because of changes in freight rates which materially lowered the district's relative rate differential, West Virginia coal displaced Pennsylvania coal in first position in the lake cargo coal trade in 1922, and in 1924 and succeeding years West Virginia has remained first. Furthermore, during the 1920's each of the two major products of the area was meeting stiff competition: coal from petroleum and natural gas; and steel, to a lesser extent, from nonferrous metals.

On the other hand, the change in process of making coke was of great advantage to the local steel industry, for it led to much greater use of waterways. For the most part, coal is now obtained from mines along the Monongahela River and shipped by barge to riverside coke plants.

sented a transfer by a few iron and steel companies of productive activity from Allegheny County. From 1910 to 1920 the population of Beaver County increased by 33,268, or by about 42.5 per cent. This was the decade in which the Jones and Laughlin Steel Corporation located its second plant at Aliquippa. Of the total increase in population during that decade, only 6,678 resulted from the excess of births over deaths, whereas nearly four times as many persons, or 26,590, migrated into the county.[22] From 1920 to 1930, migration into the county was both relatively and absolutely less than in the preceding decade; the gain from migration was 20,193, and that from excess of births, 17,248. The increase in excess of births more than offset the drop in population influx. Nevertheless, the percentage gain was less from 1920 to 1930 than from 1910 to 1920. For the current decade a still smaller relative gain seems probable. Migration into the county will likely decrease somewhat further. As judged by growth in pig iron production, the trend in iron and steel output does not seem to favor the attraction of additional workers as rapidly as in the past. Moreover, the excess of births over deaths doubtless will continue to fall. In spite of these tendencies, between 1930 and 1940 the population of Beaver County probably will increase considerably, for in that county iron and steel production is still growing at a fair rate. Perhaps the most encouraging factor is the expansion of iron and steelmaking capacity since 1930 both at Aliquippa and elsewhere. In the light of these improvements and the comparative highness of the percentage gains in population in the previous decade, it is possible that among the 16 selected counties relative population growth from 1930 to 1940 will be the highest in Beaver County.

In Lawrence and Mercer counties the upward trend in iron and steelmaking is not so steep as in Beaver County. In the history of tonnage steel production the two northern counties in the Shenango Valley are comparatively old. This fact is reflected in recent percentage population gains. Since 1910, growth has been much less rapid in Lawrence and Mercer counties than in Beaver County. This difference is likely to persist at least for another decade or two. There is little reason to expect rapid expansion in industrial activity in the two northern counties. On the con-

[22] For changes in population resulting from migration, see Thornthwaite, *op. cit.*, p. 30.

trary, there is some evidence that growth in industrial output will continue to slow down. Not only were there no increases in iron and steelmaking capacity in these two counties between 1930 and 1935, but a considerable amount of capacity actually was abandoned, including the large plant of the Carnegie Steel Company at New Castle. On the basis of industrial trends it appears that population changes in each of these two counties from 1930 to 1940 will be relatively small. Gains are perhaps more to be expected in Mercer County than in Lawrence County.

In both Washington and Westmoreland counties, population changes have been influenced by the expansion of iron and steel production. Growth in this industry slowed down after the war, the trend in coal output definitely turned downward, and migration out of these counties exceeded migration into them. Population gains from natural growth—excess of births over deaths—increased considerably. From 1910 to 1920 the population of Westmoreland County increased by 42,264—31,403 by natural growth and 10,861 by migration. In the following decade the excess of births over deaths was 47,350; but there was a net outward migration of 25,923. Thus on balance there was an increase in the population of Westmoreland County of 21,427, an absolute gain just half that recorded in the preceding 10 years.

Essentially the same population movements occurred in Washington County. From 1910 to 1920 there was a total increase of 45,312—14,334 by natural increase and 30,978 by migration. During the next decade there was a loss by migration of 12,835 but a gain of 28,645 by natural increase, these changes resulting in a net gain of 15,810. The excess of births over deaths probably will not disappear so soon in these two counties as in Allegheny County, because in the former a larger percentage of the population is rural. (Rural populations customarily have higher birth rates and higher net gains from births than have nearby urban populations.)

Total industrial production in Washington and Westmoreland counties probably will fail to rise materially between 1930 and 1940. An important factor is the lack of any material increase in iron and steel capacities in either of those counties and the abandonment of considerable capacity in Westmoreland County, including plants of the American Sheet and Tin Plate Company at Leechburg and New Kensington and a plant of the United States

Pipe and Foundry Company at Scottdale. During the 1930's, industrial gains again are unlikely to be sufficient to absorb the natural increase in population. In that event, migration, especially to Allegheny County, will continue. Possibly the increase in economic activity in these two counties will be inadequate even to maintain the present population; with renewed prosperity in growing industrial districts there may be a migration from each county greater than the local excess of births over deaths.

Two remaining counties, Butler and Cambria, produce important amounts of iron and steel. In the former, the trend in steel production is likely to favor continued population gains. Since the trend in coal output is not definitely downward, Butler County may report a fair rate of population growth from 1930 to 1940. On the other hand, in Cambria County, changes in both steel and coal appear unfavorable to population gains but not so unfavorable as to lead to a probable 1930–1940 population loss of more than 5 per cent.

Conclusions

The comparatively higher rates of population growth in Allegheny County than in the surrounding counties from 1830 to 1930 can be expressed in terms of the growing proportion of the population in western Pennsylvania accounted for by Allegheny County. Of the total population in the 16-county area, that part concentrated in Allegheny County rose from 17 per cent in 1830 to 44 per cent in 1930. As the dominant form of economic activity shifted from agriculture to manufacturing, the unusually favorable locational advantages of Allegheny County for the production of iron and steel (chiefly high-grade coal economically accessible through river transportation) began to exert a strong influence in attracting more industry and, hence, in stimulating the movement of population into the county.

In every decade from 1830 to 1900, Allegheny County increased in population more rapidly than any of the various-sized Pittsburgh areas or—with one exception—any of the selected county groups discussed in this chapter. (The single exception concerns the decade between 1870 and 1880 when the percentage gain in Clarion, Cambria, Clearfield, Jefferson, and Somerset counties combined exceeded that in Allegheny County.) On the other hand, in the two decades after 1900 the percentage gains in popula-

tion in Allegheny County were less than those in each of the four various-sized Pittsburgh areas, mainly because of comparatively high rates of population growth in Beaver, Washington, and Westmoreland counties. During the decade of the 1920's, however, the rate of population increase in Allegheny County again exceeded that in any Pittsburgh area or in any of the groups of selected counties. Indeed, only two of the 16 counties in western Pennsylvania reported a higher percentage gain from 1920 to 1930—Greene County, which witnessed its first boom in coal mining, and Beaver County, in which steel production increased markedly.

Few counties lost in population in any decade between 1830 and 1920. During the next 10 years, however, six of 16 counties lost population, and five additional counties gained less than 6 per cent. All the selected groups of counties gained in population in every decade from 1830 to 1920. But from 1920 to 1930 one group lost population and in another group the decade gain was the smallest since 1830. For the various-sized Pittsburgh areas the relative increase from 1920 to 1930 was in each instance the lowest for any decade since 1830, mainly because the decade gain in Allegheny County was also the lowest since 1830. It is clear then that in the steel counties as well as in the coal counties of western Pennsylvania, decade rates of gain in population had fallen to very low levels by the 1920's.

In the important coal-producing counties in western Pennsylvania, changes in population have been related to the trend in coal production, to the lag of population changes behind changes in the trend of coal production, and to the ratio between relative changes in coal production and relative changes in population. From 1880 until the end of the World War nearly all these mining counties experienced rapid growth of coal production followed by significant gains in population. Since the war the trend in coal production has been downward in all the coal counties except Greene County and possibly Butler County. In Jefferson, Clearfield, and Indiana counties, the trend in coal production has been falling very rapidly, and these are the counties which suffered considerable losses in population from 1920 to 1930. Continued population gains during this decade in most other mining counties appear to have been related to expansion in manufacturing and to increases in service occupations. Moreover, unemployment of coal miners probably increased during this 10-year interval.

A population lag of only three years behind changes in the trend of coal production was found for Butler, Clarion, Greene, and Indiana counties, whereas lags of eight or nine years appear to have occurred in Cambria, Somerset, Washington, and Fayette counties. The time required for population to respond to changes in coal production, notably to losses, appears to have varied directly with the proportion of all gainful workers in the county which was attached to the coal industry. Changes in coal production have had a greater proportional effect on changes in population in those counties which in 1890 (near the beginning of the period examined in this chapter) were more dependent on the coal industry for economic support. In the iron and steel counties the growth in pig iron production up to 1916 was accompanied by repeated increases in total population. Moreover, in the group of three counties in the Shenango Valley both pig iron production and population continued to grow during the 1920's.

In Allegheny County, population gains from 1870 to 1920 appear to have been closely related to changes in western Pennsylvania in coal production, in pig iron production, and in manufacturing employment. Since the iron and steel industry has been the great integrating influence in the economic life of Allegheny County and since that industry rests fundamentally on coal, it is not difficult to see why these three factors—coal production, pig iron production, and manufacturing employment—were all closely related to changes in the total number of persons in the county from 1870 to 1920. During the decade from 1920 to 1930, however, Allegheny County's population continued to increase, notwithstanding a downward trend in each of these three phases of industry. The actual increase in population in the twenties was based mainly on significant gains in employment in service occupations.

The question arises whether future population changes in southwestern Pennsylvania will be related primarily to changes in the production of coal and steel or to some other form of economic activity. Although in many counties the relative importance of these industries is decreasing somewhat, it appears likely that they will remain the dominant influences on population change. It is difficult to see how the population of a county in this region could continue to expand unless mining or manufacturing grows. Service occupations will probably increase further, but a great gain comparable to that of the 1920's seems improbable. Unless the

local industrial structure alters materially, it is probable that the population of most counties will vary to a considerable degree with coal or steel production.

Between 1930 and 1940, only a few counties in the Pittsburgh region appear likely to gain population. A further population gain in Greene County seems to be indicated by the local trend in mining. Of the manufacturing counties, Beaver will undoubtedly obtain additional population, owing in major part to the expansion of steel production. The increasing tendency to take over service functions for the balance of the region may lead to a population gain in Allegheny County between 1930 and 1940; but industrial trends suggest that the gain will be very small if it appears at all. All other counties in the selected area appear less likely to attract additional net population. Indeed, only one of the other counties grew by as much as 10 per cent during the 1920's; that was Lawrence County in which considerable steelmaking capacity has been dismantled since 1930. In the light of trends in production of the major types of industry represented in each county, it appears probable that eight of the 16 selected counties will report only minor changes in population between 1930 and 1940. In four of these counties, Cambria, Fayette, Lawrence, and Westmoreland, losses appear somewhat more likely than gains; on the other hand, in Armstrong, Butler, Mercer, and Washington counties, gains seem more probable than losses. In five of the coal-producing counties, population seems very likely to decrease. These counties are Clarion, Clearfield, Indiana, Jefferson, and Somerset. In each of these counties, the trend of mining output is downward, and present marketing factors are unfavorable to a change in trend. Each of these counties lost population between 1920 and 1930.

The major postwar changes affecting the industrial structure of the Pittsburgh district have been the decrease in coal production, especially along the eastern edge of the district; the marked slowing down of the expansion in manufacturing output, most noticeable in the iron and steel industry; exceedingly rapid increases in service activities; the continued shift of manufacturing operations from the nucleus city to the smaller industrial cities along the Ohio, Monongahela, and Allegheny rivers; the increasing centralization of the district's service functions in Allegheny County, and mainly in Pittsburgh; and in many counties the decreasing relative

importance of employment in mining and manufacturing, and within manufacturing industries the decreasing relative importance of the iron and steel industry. Some of these diverse tendencies within the Pittsburgh district had their counterparts within the nation and thus reflected a general shift in the national economy under which fewer workers were required in coal mining and manufacturing and more in the manifold and growing trade and other service functions which rising living standards and increasing specialization demand. Other changes represent the rise of a metropolitan economy and co-ordination of the various activities of the district on a changed basis. Thus, the increase in the number of persons engaged in service functions in Allegheny County reflects the growing extent to which the nucleus city and its environs take over trade and other service functions for a large metropolitan area and tributary economic region—functions concerned not merely with management control and financial direction but also with all the varied recreational, cultural, governmental, health, and social activities that go to make up the life of a region. On the other hand, the continued growth of manufacturing output in that part of Allegheny County outside the central city and in the southern part of Beaver County at the same time that output was decreasing in Pittsburgh itself signifies a suburban transfer of heavier economic activity, which has been repeated—usually to a lesser extent—in nearly every industrial area in the country.

Some of the industrial changes occurring in the Pittsburgh district, however, were in part peculiar to this region; at least they were not general throughout the industrial parts of the nation. No other major industrial area has suffered postwar declines in mining output accompanied by a marked retardation in growth of other industrial production. This slowing down of the rate of expansion in the two basic industries which dominate the economic life of the Pittsburgh district is largely responsible for the accompanying or somewhat delayed falling off of the rate of growth in total population, so that between 1920 and 1930 only three counties grew by more than the excess of births over deaths, and the net gain in number of inhabitants in the entire 16 selected counties was far less than the natural increase in the population.

CHAPTER 7

THE POSITION OF THE PITTSBURGH DISTRICT

Summary of Trends

Population

For the Pittsburgh Industrial Area the maximum rate of increase in population—at least for any decade since 1830—came during the 1880's, when the annual gain averaged 4.0 per cent, or half again as great as the rate for the preceding decade. The larger part of this great increase was accounted for by immigration, not by natural increase from excess of births over deaths. The explanation for the influx is to be found mainly in the rapid expansion of the iron and steel industry and in accompanying increases in coal production. In the Pittsburgh district, great Bessemer converters and extensive crucible steel plants were constructed during this and the preceding decades. Demand for steel was growing very rapidly, owing mainly to the substitution of steel for iron in the making of railroad rails and structural forms. The Pittsburgh area was in a stage of rapid growth, a stage reached many decades earlier by Philadelphia and other older industrial areas. During the 1890's the development of the open-hearth process greatly improved the quality of steel and led to further increases in output. In the Pittsburgh area these gains were almost sufficient to maintain the rate of population growth, which in that decade averaged 3.3 per cent per year, or somewhat lower than in the preceding decade. In the decade 1900–1910 the average rate fell to 3.1 per cent per year. Expansion of the local iron and steel industry began to slow up, and immigration into the area was retarded. By 1910 the era of rapid population growth in the Pittsburgh area had ended. The average yearly rate of increase in the ensuing decade was only 1.8 per cent; and in the decade ended in 1930 the annual rate fell to 1.4 per cent.

During each of the first four decades after 1870 the rate of gain in the Pittsburgh area exceeded that for the group of 33 industrial areas; in each of the two decades from 1910 to 1930 the rate of growth in the area was considerably less than that for the

all-area group. For the entire 60-year period the Pittsburgh area grew at a rate almost exactly the same as that for all areas; in that sense, for the period 1870–1930 as a whole, it may be termed the average American industrial area. From 1910 to 1930, however, the Pittsburgh area ranked among those areas that recorded low average annual rates of increase.

Variations in the decade-to-decade rates of growth in Allegheny County are similar to those for the 4-county area; yet since 1830, with the exception of the two decades 1900–1920, the relative gains in population in Allegheny County exceeded the relative gains in the 4-county area. Estimates based on school census data show that the population of Allegheny County probably reached a peak in 1933 and that it fell in each of the three succeeding years. Since 1880, population has grown less rapidly in the city of Pittsburgh (present limits) than in either Allegheny County or the Pittsburgh Industrial Area; indeed, since 1870 that part of Allegheny County outside the present limits of Pittsburgh has grown more rapidly than any county in southwestern Pennsylvania.

Gainful Workers

In the Pittsburgh Industrial Area the relative extent of gainful employment was comparatively low in 1930. Of the 32 other industrial areas only three reported lower percentages of the total population usually employed. The relatively low position of the Pittsburgh area in the proportion of the population in gainful employment reflects chiefly the relatively large number of children in the population and the comparatively low degree of gainful employment among women. Gainful employment among females, however, appears to have increased from 1870 to 1930, whereas the relative gainful employment of males increased only from 1870 to 1910 and decreased in the following two decades. (These changes were actually recorded for Pittsburgh; they also characterize the state and appear to have occurred in the 4-county area.)

Manufacturing Wage Earners

As a consequence of marked expansion in the iron and steel industry the rate of increase in manufacturing employment in the Pittsburgh area reached a maximum during the 1880's. Relative

gains, however, remained high until 1909. The census for that year indicated that the rate had started to fall. The growth curve continued to round off, the peak in factory employment coming in 1918. (Federal census reports were not issued for that year, but the Pennsylvania census of production indicates that for the Pittsburgh district 1918 ranked above 1923, the peak year in manufacturing employment as shown by Federal census records.) The local postwar trend has been definitely downward, owing primarily to increased mechanization and secondarily to retardation of growth in quantity output. Up to about 1920 the growth in manufacturing employment in the Pittsburgh area was similar to that in population. From 1920 to 1930, however, there was a downward trend in manufacturing employment accompanied by continued gains in population.

The rate of increase in manufacturing employment from 1869 to 1929 was somewhat greater for the Pittsburgh area than for the group of 33 industrial areas. During the first half of the period, manufacturing employment grew more than half again as rapidly in the Pittsburgh area as in all areas combined; after 1899, however, the number of manufacturing workers in the Pittsburgh area grew less rapidly than the total for all areas, and after 1919 it decreased more rapidly. Owing to the dominant local influence of the capital goods industries the percentage decrease from 1929 to 1933 was greater in the Pittsburgh area than in the total for all areas combined. As a fraction of the national figure, manufacturing employment in the Pittsburgh area reached a peak in 1904 at slightly more than 3 per cent. Since that year the expansion of employment in manufacturing industries in this area has been considerably less rapid than that for the nation. Consequently, the district's share of the national total fell to 2.57 per cent in 1929.

Value Added by Manufacture

In the Pittsburgh area, changes in rate of growth of value added by manufacture since 1869 are on the whole similar to changes in the rate of growth in number of manufacturing wage earners. Although the maximum rate of gain in net values created by manufacturing operations in this area—and in nearly every other area—occurred between 1914 and 1919, the very rapid increase in that period resulted largely from the price inflation which took

place during and after the war and only secondarily from increase in output.[1] With the exception of the 1914–1919 period, the greatest relative gain in value added occurred between 1879 and 1889, the same decade in which the relative gain in manufacturing employment was at a maximum. The growth curve for value added bends over slightly about 1899 and bends somewhat more pronouncedly about 1909. Thus, the year 1910 approximately marked the end of rapid growth in value added by manufacture as well as in population and manufacturing employment. (The great 1914–1919 inflation increase was in considerable part cyclical.)

In the Pittsburgh area the postwar trend in value added by manufacture as well as that in manufacturing employment is turned downward. Of the 13 large areas, only Pittsburgh and Boston were characterized by falling trends in value added after the war. But, since the price level fell from 1919 to 1929, there probably was a slight upward trend in adjusted value added by manufacture in both areas.

Growth in value added was slightly greater in the Pittsburgh area from 1869 to 1929 than in all areas combined. For the first half of the period, however, the rate of gain was much greater in the Pittsburgh area; for the latter half of the period, considerably less. If the net manufacturing values in the Pittsburgh area are expressed as percentages of the corresponding totals for the United States, it is evident that the national importance of the area was rising more or less regularly from 1869 to 1899, the greatest gain being made during the 1890's.

In 1899 the Pittsburgh area's share of net values in manufacturing proper (excluding building and hand trades) stood at 3.76 per cent of the national total. This marks the peak relative importance of the area. (In number of manufacturing wage earners the peak relative importance of the area was reached in 1904.) By 1929 the area's share was only 2.69 per cent. During the depression the national importance of the area dropped sharply, and the percentage of value added by manufacture stood at 1.85 per cent in 1933; this, however, is not a characteristic figure, being determined in large part by the fact that the depression was more severe in the Pittsburgh area, a producers' goods area, than in the country

[1] Thus, in the United States the quantity of manufactured goods increased about 26 per cent from 1914 to 1919, whereas the value of these goods increased 159 per cent. Prices, therefore, increased about 100 per cent.

as a whole.[2] The change in national importance of the Pittsburgh area from 1899 to 1929 was not analogous to changes for the group of 13 large areas nor to the changes for all 33 areas; both of these groups gained in national importance during this 30-year period.

Coal Production

The stages of growth in coal production in western Pennsylvania—for either an 11-county or a 16-county area—are roughly similar to those for manufacturing employment in the 4-county Pittsburgh Industrial Area: the period of rapid expansion ended around 1910, the production curve rounding off sharply between that time and the end of the war, and then the trend turned definitely downward. The *rate* of growth for coal production, however, far exceeded that for manufacturing employment during the period 1870 to 1914, and losses in coal production exceeded those in manufacturing employment after 1923. High rate of growth in coal output between 1870 and 1880 was related to the rising importance of bituminous coal or coke as the major blast-furnace fuel. During the 1870's the annual rate of gain averaged 8.6 per cent for coal output in the 11-county area and 3.5 per cent for manufacturing employment in the 4-county area. From 1880 to 1890 the percentage gain in manufacturing employment nearly equaled that in coal production; this decade witnessed a boom in the iron and steel industry and the construction and putting into operation of many Bessemer converters. From 1889 to 1914 the rate of growth again averaged roughly twice as much for coal production as for manufacturing employment, the two average annual rates being approximately 6.2 per cent and 3.3 per cent, respectively. The demand for Pennsylvania bituminous coal was affected not only by the expansion of the local steel industry but also by the expansion of the steel industry elsewhere, because Connellsville coke was used by furnaces through the Midwest. After the war the local coal industry lost many of its outside markets; consequently, it failed to maintain its operations as well as did local manufacturing. In the 11-county area the peak in coal production came in 1923, although the 1918 figure was practically as

[2] On the other hand, the relative importance of the area in 1929 was probably accentuated by the peak output of capital goods. A comparison of the percentages in Table 32, however, indicates that the 1929 figure is more nearly normal than the 1933 figure.

large; in the 16-county area the record output came in 1918. After the war the five counties in the eastern part of the area lost their markets more rapidly than did the rest of the Pennsylvania bituminous coal area, largely owing to rising competition along the North Atlantic seaboard with West Virginia coal coming by tidewater from Hampton Roads.

General

The Pittsburgh area is a mature economic region, one which ended its stage of rapid growth both in population and in industrial activity around 1910. Since that time there has been growth but at a decelerated rate. On the basis of trends summarized above, and with consideration for the present stage of development of the industrial arts and their economic organization, it is reasonable to conclude at this point that the Pittsburgh district is likely to experience a period of slowly expanding industrial output. The following sections will examine the factors which have determined industrial growth in the past and those likely to influence growth in the future.

Factors Bearing on Past Trends

Geographic Factors

The early economic importance of Pittsburgh resulted from the fact that the city was located on navigable waterways at the point where the Allegheny and Monongahela rivers join to form the Ohio River. At Pittsburgh, river routes and land routes converge. Consequently, the city early became the trading center for western Pennsylvania as well as the fitting-out point for settlers who were moving farther west. These people, chiefly from the Atlantic seaboard, came to Pittsburgh either by horse and wagon or, after 1834, by way of the combination rail-canal route. They crossed the mountains with as little heavy equipment as possible and at Pittsburgh purchased implements and supplies for the comparatively easy voyage down the Ohio River. Much of the great westward movement of population in the latter part of the eighteenth century and during the first half of the nineteenth century was down the Ohio River to the lands in the southern parts of Ohio, Indiana, and Illinois, and the northern part of Kentucky. Most of the early movement of people into the old Northwest Ter-

ritory after it was released by the proprietor states for settlement came by way of this route. The districts adjacent to the Ohio River, owing to the presence of considerable forests and of navigable rivers, were settled several years before the great movement of population led to the occupation of the plains south of the Great Lakes. The Ohio River was the first major route of communication and transportation in the area west of the Allegheny Mountains, and until 1825 it was the main highway between the East and the West. The larger western communities in the period from 1800 to 1850 were located on the Ohio or the Mississippi.[3] Pittsburgh benefited materially by this population shift. The city became one of the main trade and distribution centers in the New West.

Furthermore, the early importance of manufacturing at Pittsburgh resulted from the fact that its geographic position facilitated the assembly of raw, and partially worked, materials.[4] Its location at the junction of the Allegheny and Monongahela rivers early led to the bringing together at that point of the materials for making hardware and other iron products. The regions up the rivers furnished adequate supplies of coal and iron ore. During the early part of the nineteenth century most of the pig iron manufactured in western Pennsylvania was made in local charcoal furnaces scattered throughout the western half of the state. Later, coal became the major fuel, and furnaces were constructed near coal mines farther to the south and to the west. The pig iron was brought to Pittsburgh usually by river; and rolled, forged, or recast in that city. Necessary fuel for working the iron was brought from nearby mines, often by water. Timber also was early brought down the rivers to Pittsburgh and used by the growing industries in the city.

When the market for raw iron became primarily industrial, as contrasted with a previously agricultural demand, it was necessary

[3] In 1830 the population, in thousands, of the main cities on the Ohio and Mississippi rivers were: Pittsburgh, 15; Cincinnati, 25; Louisville, 10; St. Louis, 11; and New Orleans, 46. The figures for Great Lakes cities were: Buffalo, 9; Cleveland, 1; Detroit, 2; Milwaukee, 0; and Chicago, 0. (In 1830, Milwaukee and Fort Dearborn, i.e., Chicago, were small trading posts, each containing only a hundred persons or so.) As late as 1850 the smallest of the five Ohio-Mississippi river cities was larger than the largest of the five Great Lakes cities. In 1860, Chicago was still smaller than New Orleans, Cincinnati, or St. Louis.

[4] Louis C. Hunter, "Influence of the Market upon Technique in the Iron Industry in Western Pennsylvania up to 1860," *Journal of Economic and Business History*, February, 1929, pp. 241–81.

to produce large amounts of cheap metal of uniform quality. By 1850 the nature of the market for pig iron was changing; the requirement for small amounts of high-grade bar iron to be used in local forges or foundries was being supplanted by a requirement for large quantities of cheap iron to be made into industrial products at the factory. This change forced the rolling mills in Pittsburgh to control the production of pig iron itself. After 1860, therefore, blast furnaces were built in Pittsburgh in connection with the local rolling mills. In order to produce good quality iron consistently, these plants found it advantageous to use the high-grade iron ore of the Lake Superior region. For these reasons the iron industry first became integrated in Pittsburgh, where Connellsville coal or coke was used with Lake Superior ore. Thus, the main geographic advantages of the city in the iron industry consisted in its location near supplies of coal and near enough to Lake Erie to obtain at relatively low freight costs the necessary supplies of ore. Furthermore, since at that time much more coal than ore was required to produce a ton of pig iron and still more coal to process it and since water transportation made it possible to move ore from Lake Superior to ports on the lower lakes at a cost less than for the rail haul from Pittsburgh to those ports, the optimum (most desirable) location for the iron industry was relatively near coal.[5]

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[5] If at that time coke or coal for blast furnaces had been moved primarily by water down the Monongahela and Ohio rivers, presumably the optimum location for the iron and steel industry would have been at that point on the Ohio where the rail haul from a Lake Erie port was the shortest. Most of the blast-furnace fuel, however, was coke shipped by rail from Connellsville. If all the coke had been shipped by rail the optimum location would have been either at Connellsville or on Lake Erie, depending on market factors. (At one time the Carnegie Steel Company purchased at Conneaut, Ohio, about 5,000 acres of land suitable for mill sites; recently, most of this land was said to be offered for sale. *Daily Metal Trade*, April 10, 1937, p. 1.) Actually in the 1870's and 1880's, however, the lower Monongahela valley was probably the most advantageous place to make and process pig iron. In the first place, adequate supplies of natural gas and some coal were available near the furnaces. Moreover, some additional supplies of coal were transferred to the plant by water, added to other supplies obtained by rail from mines nearer than Connellsville, and coked at the plant in beehive ovens. In addition, the Pittsburgh district was a heavy consumer of iron long before the furnace industry developed, owing to the concentration in and around the city of a large number of rolling mills. Yet, during the 1870's and 1880's the advantage which Pittsburgh had over Youngstown was probably not great. The narrowness of the cost differential at that time helps explain why Youngstown became a great steel-producing area. Assembly costs did not become materially less at Pittsburgh until local producers began to make full use of the rivers in assembling coal.

Major Dependence on Coal and Steel

Approximately 49,000 gainful workers in the Pittsburgh Industrial Area were reported in 1930 as normally attached to the coal mining industry, a number equal to 6.5 per cent of all gainful workers in the 4-county area. Allegheny and Beaver counties, however, are predominantly manufacturing counties; the percentages of the total dependent on coal mining in Washington and Westmoreland counties were much larger, being 25.9 per cent and 17.7 per cent, respectively. The percentage is even greater in some of the adjacent counties. In Somerset County, for example, nearly 39 per cent of all workers in 1930 were normally employed in coal mining.

Iron and steel plants in the Pittsburgh Industrial Area in 1930 accounted for nearly 117,000 gainful workers, or 15.4 per cent of the area total. Thus, the heavy industries, coal and steel, were responsible for 21.9 per cent of the area's gainful workers. Moreover, plants making further finished iron and steel products contributed nearly 45,000 gainful workers, or an additional 5.9 per cent of the total.

Within the 4-county area approximately 40 per cent of the gainful workers in manufacturing in 1930 were dependent on the iron and steel industry and an additional 15 per cent on industries that further manufacture iron and steel products. Among counties in western Pennsylvania, Cambria County had the greatest concentration of manufacturing employment in iron and steel plants in 1930, about 67 per cent of all gainful workers in manufacturing in that county being reported as normally employed in these plants. In Beaver County the proportion was about 60 per cent. In the past, rates of growth in industrial activity and population in the Pittsburgh district have reflected primarily the expansion in these two basic industries—coal and steel. The major advantages of the Pittsburgh area in heavy steel production have consisted of the large supplies of excellent coking coal and the river transportation system by which at very low cost this coal was delivered to manufacturing plants in and around the city.

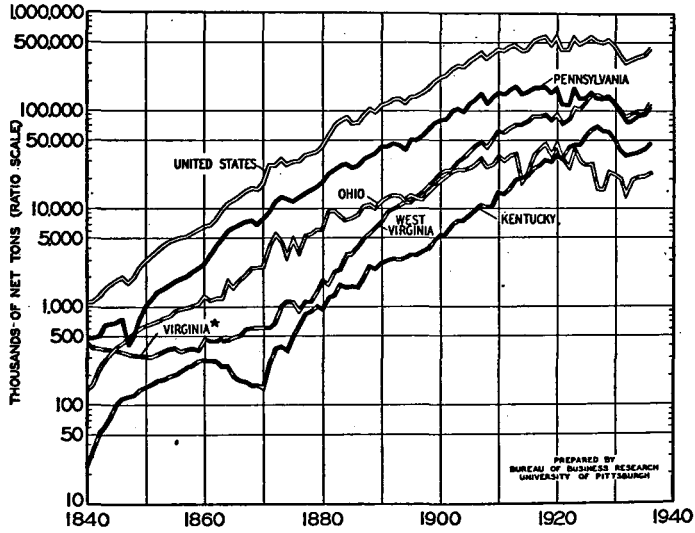
Now, however, these two industries are comparatively mature. Their advances in the Pittsburgh area in the past 60 years have been great indeed; but during the past decade the growth in these two industries—both nationally and locally—has been unfavorable. Nationally the trend in bituminous coal production has been

slightly downward since the war. Locally the trend in this industry is more markedly downward (Chart 54). For the steel industry the national trend is still rising a few per cent a year, whereas the trend for western Pennsylvania has become nearly horizontal (Chart 55).[6] Both of these industries attained importance early in the history of western Pennsylvania and in a measure furnished the basis for expansion in this and other industrial areas. Yet, in the past few decades there has been increasing

CHART 54

BITUMINOUS COAL PRODUCTION IN MAJOR PRODUCING STATES, 1840–1936

Source: United States Bureau of Mines



* West Virginia was part of Virginia before 1863.

competition among the several producing sections of the country; moreover, both industries have experienced increasing competition from substitute products. The coal industry of western Pennsylvania has had to contend not only with losses of markets to other fuels but also with losses to West Virginia coal. Likewise, the local steel industry, at the same time that it faced the competitive threats of nonferrous metals industries, was facing sharper com-

[6] If the Shenango Valley industry, which is more closely related to Youngstown than Pittsburgh, is omitted, the trend probably would rise slightly.

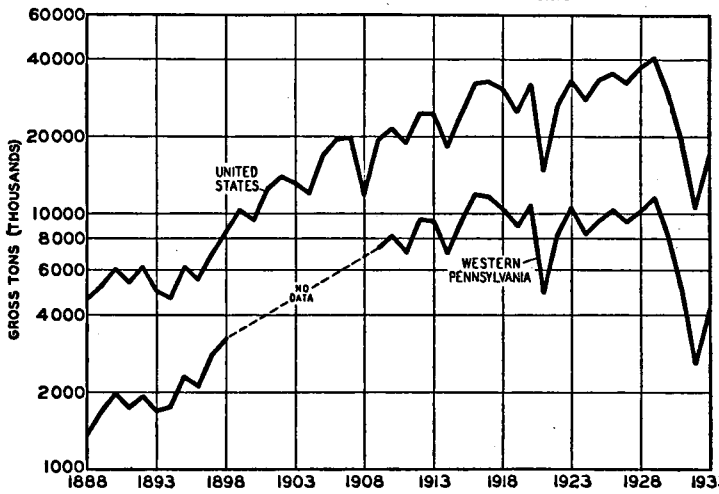
petition from the more rapidly growing iron and steel areas farther west.

The markets for coal and steel are primarily industrial, and a large part of the industrial demand is concentrated in the capital goods industries. Moreover, the long-time growth of coal and steel production is dependent on that part of the capital goods market farthest removed from the final consumer. Local establishments have until very recently specialized even within the steel industry in the heavier products and have depended to a consider-

CHART 55

FINISHED HOT-ROLLED IRON AND STEEL PRODUCTION IN THE UNITED STATES AND WESTERN PENNSYLVANIA, 1888–1933

Source: American Iron and Steel Institute



able extent on the demands for steel in the construction and railroad industries. To a surprising extent this has been a builders' area; some of the largest industrial construction firms in the country are located in and around Pittsburgh. Furthermore, many of the leading companies that build steel-mill equipment are located in this area. These builders' industries are dependent for their business on a constantly growing market. Increasing construction activity in the country means continued activity for local builders, but as soon as the national demand for new construction slows up, structural steel builders must reduce operations drastically. The break in the upward movement in construction activity

during the past decade was reflected in a flattening of the trend of Pittsburgh steel production and hence in a change of trend in total manufacturing activity in the local area.

Another reason for the flattening of the postwar trend of steel production in this district has been the continued dependence on demand from a mature industry, railroad transportation. From 1880 to 1900 much of the expansion in this district resulted from the increased demand for steel rails and railway equipment. But since 1900 the market for such materials has grown much less rapidly. This fact alone furnishes a significant reason for the slowing up of increases in local production.

Notwithstanding the deceleration of the rate of growth of the railway industry after 1900, an increasing percentage of the iron and steel capacity in the Pittsburgh area was devoted to production for that industry. Of total finished hot-rolled steelmaking capacity in the Pittsburgh Industrial Area (Allegheny, Beaver, Washington, and Westmoreland counties), it is estimated that 22.9 per cent was accounted for by products for the railway industry in 1901 and 25.9 per cent in 1920 (Table 41). Practically all this increase took place between 1908 and 1916. In the 11 counties surrounding the 4-county area, however, the proportion of hot-rolled steelmaking capacity devoted to railroad needs fell sharply during this period, or from 30.0 per cent in 1901 to 16.3 per cent in 1920. Production in this group of counties, concentrated mainly in the Shenango Valley and Johnstown, shifted emphasis from rails to heavy plates and then to merchant bars. In the country as a whole the proportion of steel capacity devoted to the railroad industry was also decreasing. After 1920 the steel industry in western Pennsylvania materially shifted its emphasis away from the railroad market. By 1935 the proportion of hot-rolled steel capacity made up of products intended for railroads was only 17.3 per cent in the 4-county area and only 11.0 per cent in the nearby 11 counties.

The postwar increase in the percentage of steel capacity in the 4-county area devoted to products for the petroleum industry and other users of pipes and tubes served to offset the relative decrease in capacity for making railway products. There was no significant movement from 1920 to 1935 to increase the strength of the local industry in the automobile market, although slight percentage gains occurred in the capacity devoted to making sheets and strip.

TABLE 41

PERCENTAGE DISTRIBUTION OF FINISHED HOT-ROLLED STEEL CAPACITY BY PRODUCT, FOR THE UNITED STATES, PENNSYLVANIA, THE PITTSBURGH INDUSTRIAL AREA, AND 11 NEARBY COUNTIES, AT THE BEGINNING OF INDICATED YEARS

Area	Year (As of January 1)	Total Finished Hot-rolled Steel Capacity	Rails	Sheared and Universal Plates	Structural Shapes (Heavy and Light)	Hot-rolled Strip, Hoops, Cotton Ties, and Baling Bands	Black Plates Including Black Plates for Tinning	Sheets and Light Plates	Skelp, Blanks, and Pierced Billets for Seamless Tubes	Rolled Wheels and Tires	Wire Rods	Splice Bars and Tie Plates	Merchant Bars and All Others	Total to the Railroad Industry*
United States.....	1926	100.0	9.4	13.7	9.7	5.4	4.9	10.3	9.8	1.1	8.8	2.0	24.9	19.5
	1930	100.0	7.2	11.9	9.9	9.5	4.9	11.7	8.3	1.1	8.0	1.9	25.5	16.6
	1935	100.0	6.5	10.6	10.7	8.3	5.2	13.5	10.4	0.9	8.1	2.4	23.4	16.0
Pennsylvania.....	1920	100.0	11.6	19.4	15.3	3.3	4.9	4.1	7.4	1.9	8.3	1.7	22.2	25.5
	1926	100.0	8.3	17.9	17.8	3.5	5.4	5.9	9.6	2.4	8.5	2.0	18.6	23.1
	1930	100.0	6.1	17.4	16.8	4.6	5.2	6.9	9.8	2.7	8.3	1.9	20.3	20.7
	1935	100.0	6.4	13.7	16.2	4.0	5.1	6.9	11.9	1.8	8.5	2.2	22.6	19.0
Pittsburgh Industrial Area[a]	1901	100.0	8.0	28.2	14.7	5.4	3.5	5.8	4.3	0.7	14.8	1.1	13.4	22.9
	1908	100.0	8.5	22.1	14.5	4.6	2.9	7.8	7.8	2.0	8.4	1.4	19.8	22.9
	1916	100.0	14.3	15.9	10.6	4.8	5.1	5.1	7.9	1.3	10.8	2.1	22.0	25.6
	1920	100.0	13.2	17.6	12.2	3.5	5.1	5.0	9.1	1.8	10.3	2.0	20.1	25.9
	1926	100.0	9.1	14.6	13.6	3.5	5.3	5.9	13.3	2.0	10.2	2.2	20.2	21.6
	1930	100.0	6.3	15.8	14.4	3.5	5.4	5.4	13.3	2.0	10.1	2.4	21.2	19.6
	1935	100.0	6.4	11.3	13.3	4.0	5.0	5.5	17.4	1.4	9.8	2.4	23.6	17.3
11 Nearby Counties[b].....	1901	100.0	26.1	0.9	10.9	3.9	16.1	3.8	1.8	—	18.7	—	17.8	30.0
	1908	100.0	18.0	19.8	3.0	4.8	12.3	7.4	10.1	—	6.6	—	18.0	25.3
	1916	100.0	11.4	13.2	7.9	5.8	10.5	5.9	8.5	—	10.2	—	26.6	17.8
	1920	100.0	10.1	11.3	7.0	6.1	11.9	6.1	10.4	2.0	9.1	—	26.0	16.3
	1926	100.0	1.2	14.9	7.8	8.2	15.0	9.7	9.2	2.4	12.2	—	19.4	10.6
	1930	100.0	0.4	12.6	0.2	13.4	11.6	16.8	9.5	3.9	10.0	—	21.6	8.5
	1935	100.0	1.3	15.0	0.2	8.5	15.9	16.0	4.7	4.6	11.6	c	22.2	11.0

Source: Based on material published in directories of the American Iron and Steel Institute and before 1908 its predecessor, the American Iron and Steel Association. The tonnage capacity figures are given in *Industrial Databook for the Pittsburgh District* (University of Pittsburgh, Bureau of Business Research Statistical Handbooks, Number 2).

* Includes rails, rolled wheels and tires, splice bars and tie plates, one-third of the total for sheared and universal plates, and one-fourth of the total for structural shapes. For each of the last two groups of products, the proportion of capacities devoted to the railroad industry is based on an average of several yearly estimates for the industry in the whole country.

[a] The Pittsburgh Industrial Area comprises Allegheny, Beaver, Washington, and Westmoreland counties.

[b] Armstrong, Butler, Cambria, Clarion, Fayette, Greene, Indiana, Jefferson, Lawrence, Mercer, and Somerset counties. Practically all the capacity in these 11 counties was

The increased emphasis on these products came after 1935. The importance of plates decreased materially up to 1935 and that of structural shapes remained practically constant. Even in 1935 a very large proportion of local capacity was concentrated on heavy steel products. In the 11 surrounding counties, however, there was a marked shift after 1920 to sheets, light plates, and black plates and at the same time an almost complete abandonment of capacity for making rails and structural shapes. The steel industry in these outer counties adjusted its output more rapidly than did the industry in the 4-county area to changes in the relative importance of the several consuming industries. But the industry in the four central counties was by far the more important.

Pennsylvania bituminous coal has also been dependent to a large extent on an industrial market, especially the railroads and the steel industry. The flattened trends in these industries, with the added influence of a pronounced increase in the economy of combustion, led to a slowing up in the rate of growth in the coal industry after the war and to a downward trend in recent years. Prior to 1914 the major part of the country's iron and steel industry used Connellsville coal or coke; but, with the expanded use of the by-product coke process during and after the war, outside districts for the most part were freed from their dependence on supply of Pennsylvania bituminous coal and coke. Moreover, comparatively low mining costs and the declining importance of freight differentials prompted midwestern steelmakers to draw on West Virginia mines for coal requirements.[7] These conditions meant that during the twenties the local coal industry lost most of the buoyant effect of the upward trend in iron and steel activity in other districts and came to be dependent mainly on the section of the industry in western Pennsylvania and eastern Ohio and on the demands of railroads in the same general territory. Subsequent competition from the automobile has led to a further slackening of the increase in railroad traffic, and during the twenties expansion in the iron and steel industry in the Pittsburgh area con-

[7] From 1917 to 1927—except in part of 1921—differences between lake-cargo coal rates from Pittsburgh and those from southern West Virginia were held constant. Rates, however, were greatly increased. Consequently, Pittsburgh's relative advantage in rates fell. In 1917 the Pittsburgh rate was 21.2 per cent less than the Kanawha-Thatcher rate and 30.1 per cent less than the Pocahontas-New River rate, whereas from 1922 to 1927 the Pittsburgh rate was only 12.6 per cent less and 19.7 per cent less, respectively.

tinued to lag behind that in western areas. These changes help explain the postwar downward trend in western Pennsylvania coal production.

Industrial conservation has characterized the use of both coal and steel. Throughout the country in these as well as in other basic industries there has been a tendency to economize in the use of materials and to use by-products and scrap wherever possible. These efforts have led to retardation in the rates of growth of the basic industries.[8] Most industries are constantly working to conserve heat in one way or another—to cut fuel consumption; in this direction the electric power and steel industries have been very successful.[9] But the very success of such efforts entails retardation in coal output. In this connection the increasing use of iron and steel scrap has partly freed the steel industry, especially in other centers, from the necessity of using pig iron and to some extent has furnished increasing competition for the Pittsburgh district. The tendency toward a wider distribution of scrap has made it possible, within limits, for the steel industry to develop in areas in which the assembly costs for making pig iron are unfavorably high.

Effect of Other Industries

Past industrial trends and population trends in the Pittsburgh district have been influenced also by the extent of growth in several local, medium-sized manufacturing industries. For the 4-county area, in order of 1929 value added by manufacture, these industries were: electrical equipment, foundry and machine shop products, glass, coke, printing and publishing, bakery products, fabricated structural steel, and railroad repair shops. Of somewhat lesser importance were canned and preserved food, bolts and nuts, wrought pipe, clay products, and plumbing and steam-fitting equipment. Three of these industries supply consumers' goods for the local population. Otherwise, these industries together with coal and steel are primarily producers' goods industries; their prosperity requires a continued rate of growth in building and manufacturing activity, mainly in the northeastern quarter of the country.

[8] In 1929, 15,000 additional employes would have been required to produce the equivalent in pig iron of the scrap used in the steel industry. See Harry Jerome, *Mechanization in Industry*, p. 62. The consumption of scrap probably will continue to increase relative to the consumption of pig iron.

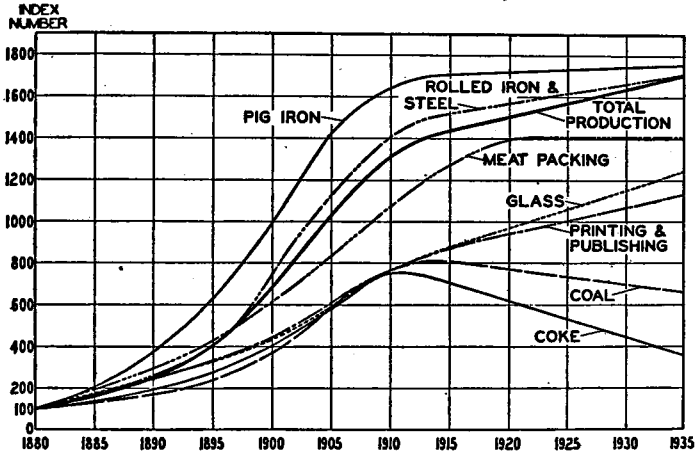
[9] United States Bureau of Mines, *Minerals Yearbook, 1936*, pp. 566–67.

A small change in the rate of growth of industries using producers' goods will be reflected in a greatly magnified change in the industries making these basic materials.[10] A continued slowing down of growth in manufacturing and building in the nation will lead to a more severe retardation of industrial production in the Pittsburgh area. But once manufacturing and building settle down to a more or less constant rate of growth—if they ever do—

CHART 56

PRODUCTION TRENDS IN SELECTED OLDER INDUSTRIES IN THE 11-COUNTY PITTSBURGH AREA, 1880–1935

(Trend point for 1880 equals 100)



local industrial output will grow accordingly. As long as there is a steady replacement demand plus any demand for new installations, the output of equipment and builders' materials will continue to grow somewhat.

Of the above-named group of medium-sized industries the making of electrical equipment has shown the greatest upward trend in the past 40 years both in the country and in the Pittsburgh district. From Chart 56 and Chart 57,[11] which present production trends

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[10] Compare John Maurice Clark, *Strategic Factors in the Business Cycle*, p. 42. Clark applies the idea to cyclical fluctuations, but it has force as regards trend changes as well.

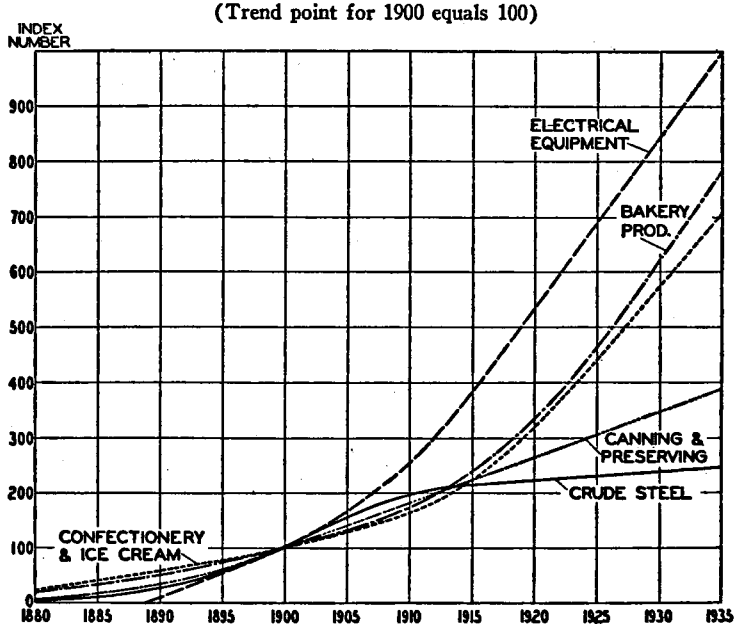
[11] These charts are taken from Wilbert G. Fritz, "Long-Time Trend of Production in the Pittsburgh District," *Pittsburgh Business Review*, November, 1934, p. 18. Although the trend lines are plotted to an arithmetic

for several industries in the Pittsburgh district, it is apparent that the growth in the electrical machinery industry since 1890 has been comparatively very rapid. The trend value for production in this industry was more than nine times as great in 1933 as in 1900. Without the electrical equipment industry the local upward

CHART 57

PRODUCTION TRENDS IN SELECTED NEWER INDUSTRIES IN THE 11-COUNTY PITTSBURGH AREA, 1880–1935

(Trend point for 1900 equals 100)



trend in industrial production would have been considerably less pronounced. Other local industries with rapidly rising production trends were those making or processing foods (Chart 57), but growth in these industries was mainly a result of the population influx that followed upon expansion in the more basic industries.[12]

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scale, it is nevertheless possible to judge relative growth in the individual industries because of the plotting of index numbers—in one chart with 1880 as the base and in the other with 1900 as the base. The trends apply to the 11-county district used generally by the Bureau of Business Research; see Chart 47.

[12] In the making of bakery products, confectionery, and ice cream, there are no important exceptions; but in the canning of food the expansion of the H. J. Heinz Company undoubtedly has resulted more from increased sales outside rather than inside western Pennsylvania.

The history of the Pittsburgh glass industry has been similar to that of the local iron and steel industry. During the latter half of the nineteenth century Pittsburgh took the place of eastern districts as the leader in the industry. Soon after the Civil War the center for the making of glassware moved from New England to the upper Ohio Valley. By 1890 this interior district led in production in most branches of the industry. Pennsylvania probably reached its strongest position in the industry during the 1890's: in 1889 the state accounted for 42 per cent of the national value of output; in 1899, 39 per cent. The glass industry then began to spread farther westward and somewhat southward. It continued to expand rapidly in Pennsylvania, but after about 1910 the marked gains in West Virginia, Ohio, Indiana, and Illinois served to check the rate of increase in Pennsylvania. As a result the state's share of the national value of output dropped from 36 per cent in 1909 to 31 per cent in 1919 and to 27 per cent in 1929. The contribution of the glass industry to the upward trend in local industrial activity was greatest between 1895 and 1910 (Chart 54). But the industry continued to grow until 1929 at a fairly high rate—a rate considerably in excess of that for the local steel industry—and its more recent contributions toward maintenance of continued industrial growth have been important. In the business recovery following 1932 the glass industry was the first important local industry to exceed average monthly production for 1929. The number of man-hours worked in the industry passed the 1929 level in October, 1935. Recent significant improvements for making glass products and the expansion of markets indicate continued growth.

Most other important local manufacturing industries have grown more slowly since the war than before. The trends of activity in railroad repair shops and in plants making railroad rolling equipment have actually been downward since about 1923. These industries suffered even more than coal and steel from a dependence on the demands of railroads. In industries making clay products, plumbing supplies, and heating equipment, production trends appear to have continued upward since 1919. Altogether these three branches of manufacturing, however, are in this area less than one-tenth as important as steelworks and rolling mills, and a very great change in their production trends would be required to influence materially the tendency of total production.

Factors Bearing on Future Trends

Need of New Industries

Barring the rare occurrence of the rejuvenation of a dying industry, new industries or new branches of old industries are required from time to time to maintain the upward trend in total industrial activity in a region, or even to keep the trend from falling. The life history of most industries indicates that after a period of rapid expansion the rate of growth slackens, and for some time productive activity tends to grow very little. In other words, the industry becomes mature. Then, gradually at first and more rapidly later, the industry begins to decay. Production may decrease until the industry has been completely abandoned or it may become stabilized again at a lower level with little change in activity from year to year.[18] Consequently, a district's total activity is likely to begin to fall unless new industries appear from time to time.

The retardation of the rate of industrial expansion in the Pittsburgh area, as already suggested, is largely related to the fact that the major branches of production in this district—coal, steel, and to a lesser extent glass—are old industries which many years ago experienced their phases of most rapid development. A comparatively new industry, the making of electrical equipment, entered the area about 1890 and has contributed much toward an upward trend in total productive activity. No new major industry has taken root in the area since 1900. In large part this deficiency explains why the trend in total activity and that in population began to show relatively less increase after 1910.

The most important new industries that have developed in the United States in the past 30 years have been of little assistance in stimulating industrial expansion and in sustaining the rate of growth in the Pittsburgh area. The radio industry perhaps exerted some effect on the economic life of the area; but, after a period of initial development, by far the most important expansion in this industry occurred elsewhere, especially in and around Philadelphia, New York City, and Chicago. Moreover, the airplane industry and the manufacture of mechanical refrigerators developed in other industrial centers: the former has been of assistance in

[18] A. F. Burns, *Production Trends in the United States since 1870* (1934), pp. 120–3.

holding up the rate of industrial growth in the Los Angeles area and also has had a stimulating effect on growth of the Seattle and Detroit areas; the latter contributed to expansion in the Dayton, Detroit, and Erie, Pennsylvania, districts.

Many of the large industries developing in this country in the past three or four decades established manufacturing plants in the Pittsburgh area early in the history of each industry. Nevertheless, after a period of experimentation or of initial development, most of these plants were closed, and in some instances activity was transferred to other districts. Several plants making automobile bodies or parts as well as a few assembly plants have existed in the city at one time or another since 1900. In 1930, the Pittsburgh assembly plant of the Ford Motor Company accounted for more than 1,000 employes. At the present time (1937), however, there is less activity in the automobile industry in this area than at any other time since the war. None of the major automobile companies now operates an assembly plant in the area. The Ford plant closed down in 1931 and is now used as a warehouse and service unit. Since the plant of the Austin Car Company in Butler, Pennsylvania, closed in 1933,[13a] activity in the industry in this area, except for the operations of one or two parts plants, has been negligible. There appears to be less direct production in the automobile industry in the Pittsburgh area than in any other leading area in the industrial Northeast. On the other hand, the automobile industry has become a market of some importance to Pittsburgh steel mills and glass plants. In the second quarter of 1934 about 8 per cent of shipments of steel mills in the Pittsburgh district was sent to the Detroit consuming district.[14]

Both the radio industry and the mechanical refrigerator industry were represented in the area during their periods of initial development; at the present time, however, neither of these industries has plants in the area. Some parts for the products of both are

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[13a] This plant was acquired by the American Bantam Car Company, and it was reported in November, 1937, that operations were being resumed.

[14] Daugherty, de Chazeau, and Stratton, *The Economics of the Iron and Steel Industry* (University of Pittsburgh, Bureau of Business Research Monographs, Number 6), p. 688. It should be noted, however, that some of the steel shipped to Detroit was for industries other than the automobile industry, whereas some of the shipments to other districts probably were for the automobile industry. Owing to the revival of the capital goods industries the relative importance of the automobile market to Pittsburgh steel producers probably fell from 1934 to 1937.

made in the East Pittsburgh plant of the Westinghouse Electric and Manufacturing Company, but even for that corporation the major part of the production of these parts has been transferred to other areas. A few airplane parts factories were established in Pittsburgh some years ago, but the most important of these has transferred its operations to another district.

Two new industries of considerable significance developed in the Pittsburgh area in the past few decades and continue to be of importance in this area. They are the aluminum industry and the stainless steel branch of the steel industry. The aluminum industry has grown remarkably since first being established in the Pittsburgh district at New Kensington in 1888. Expansion of this industry has exercised a stimulating influence on manufacturing activity in the district, the greatest effect being in the decade from 1920 to 1930. During this 10-year period the aluminum district in and around New Kensington was the major factor in accounting for an increase in population in that district equal to about half the total increase in all of Westmoreland County. Yet since the war the aluminum company has been installing an increasing proportion of its new operations in other districts, primarily in Massena, New York, where cheap water power is available.[15] Possibly much of the future growth of this industry will take place outside the Pittsburgh area, although there is no apparent reason why the making of aluminum products should leave the area.

Steel companies operating in the Pittsburgh district, notably the Allegheny Steel Company, have taken an active part in the development of stainless steel and similar steel alloys. In 1935, the district probably ranked first in the production of these high-grade steels. As yet stainless steel is relatively unimportant when compared with total steel production, but the production of alloy steels is growing rapidly and gives promise of becoming of real significance. It is likely that this branch of the steel industry will continue to operate in the Pittsburgh district and will become an important factor in determining growth in local industrial activity.

If the upward trend in productive activity in the Pittsburgh area is to be maintained, or even if the trend is not to fall, new industries must be developed or the production trends in the present in-

[15] Pig aluminum has not been made in the Pittsburgh district for many years. The Massena plant includes electric furnaces as well as modern rolling mills.

dustries must hold. When building activity in the country experiences another period of considerable expansion the steel industry in this district will probably enter another period of growth, but only of moderate degree. In the past the iron and steel industry in this district to some extent has been geared to the rate of construction expansion in the northeastern part of the country. It may be concluded that any future growth in the industry in this district will depend on a revival in the construction industry, unless of course the steel capacity in this district is readjusted to other demands, such as that for sheets used in making automobiles or mechanical refrigerators and other household equipment. Since the present tendency seems to be in that direction, there arises the question of the extent to which the local industry can capture a larger share of the sales of steel being made for these newer industries and thereby increase its output of lighter steel products.

Importance of Coal and Steel

The future trend of industrial production as well as the future trend of population growth in the Pittsburgh area will be determined in part—probably in large part—by the coal and steel industries or by related secondary industries. In the country as a whole, these two basic industries may experience a re-acceleration in growth; indeed, they appear to be recapturing some of the markets lost in the past decade. The development of alloy steels has strengthened the position of the steel industry by reducing competition from the nonferrous metals. Moreover, the introduction of the continuous rolling mill has improved the quality and lowered the production cost of sheets, strip, and plates. Increased production of these materials has been facilitated by the acquisition of markets formerly served by wood and cast iron.

Greater economy in the use of coal (especially by the method of pulverization), development of electric plants located at the mines, and continued development of by-products may mean that the coal industry will be able to regain some of the markets lost to the petroleum and natural gas industries. Greater efficiency in production should lead to lower coke prices and to lower electric power rates; these in turn might result in increased coal consumption.[16]

[16] A decrease in present electric rates, both domestic and industrial, would likely stimulate greater sales of electricity and thus increase local coal consumption. Among the rates for domestic consumption for the 15 largest

In industries in which coal is required because of the nature of manufacturing operations the consumption of coal per unit of output appears to have reached, at least for the time being, something like a minimum. Further savings are becoming difficult to attain; they probably will result more from the adoption of the best current practice among the less efficient consumers than from the development of still more economical methods of burning coal. In the past three decades the production of coal has been affected materially by the progress of efficiency in its use, notably in iron and steel furnaces, electric power plants, and steam locomotives.[17] In 1902, 6.6 pounds of coal were on the average consumed by utility power stations in the production of one kilowatt-hour of electrical energy; in 1913, only 4.5 pounds were consumed and in 1924 only 2.2 pounds. During each of these 11-year periods the amount of coal had been reduced by more than two pounds per kilowatt-hour. Such continued savings were impossible, and from 1924 to 1935 the consumption of coal per kilowatt-hour fell only from 2.22 to 1.46 pounds.

The pounds of coal consumed in blast furnaces per gross ton of pig iron fell from 3,637 pounds in 1913 to 2,978 pounds in 1930, and to 2,838 pounds in 1935. The same slowing up in the progress of efficiency in coal consumption after 1929 characterized the consumption of fuel by railroads. In 1916, 169 pounds of coal were required for a thousand gross-ton miles of freight service; in 1930, 121 pounds; and in 1935, 120 pounds. With the present heating technique, it seems unlikely that these three consuming industries can proceed very much farther in decreasing the use of coal per unit of performance. At all events the trend of coal mining will not be subjected to the restraining influences of advancing fuel efficiency as much in the foreseeable future as it has been in the past.

In the future it is possible that the coal and steel industries may grow more rapidly in the Pittsburgh district than in the country at

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cities in the country, those for Pittsburgh were, on January 1, 1935, comparatively high. Nine of the 14 other cities had lower rates for a monthly bill of 25 kilowatt-hours; 11 cities, lower rates for 40 kilowatt-hours; 10 cities, lower rates for 100 kilowatt-hours; 9 cities, lower rates for 150 kilowatt-hours; 10 cities, lower rates for 250 kilowatt-hours; and 13 cities, lower rates for 500 kilowatt-hours. Federal Power Commission, *Preliminary Report, Domestic and Residential Rates in Effect January 1, 1935, in Cities of 50,000 Population and Over.*

[17] United States Bureau of Mines, *Minerals Yearbook, 1936*, p. 567.

large; the comparative position of the district will depend on the extent to which local producers take a leading part in exploiting new markets, in recovering their relative position in old markets in which the area was once much stronger, and in increasing their share of sales in markets in which the area has been comparatively weak. In the production of stainless steel the Pittsburgh area already ranks high. The increasing diversification of the types of steel products made in the area may result in continued increases in local steel output. Important in this connection is the building of new strip and sheet mills, the evident intent being to obtain a greater share of the market for automobile steel, of selling more steel for household equipment, of expanding tin-plate production, and of taking a part in supplying steel for residential construction should the steel house come extensively into use. Whether this move will be successful and whether western Pennsylvania thereby will be able to recover the loss in relative position in the output of rolled iron and steel which it suffered from 1904 to 1934—when its proportion of the national total fell from about 40 per cent to around 25 per cent—will depend primarily on future changes in the assembly costs of raw materials going into the making of iron and steel products, on changes in other elements in manufacturing costs, and on what final attitude the Federal Government adopts toward the basing-point system of quoting steel prices.

Perhaps the main problem in the bituminous coal industry in southwestern Pennsylvania concerns the competitive position of this area with respect to southern West Virginia. Any favorable change in relative delivered costs, especially wages and freight rates, will strengthen the position of this district in the lake-cargo coal trade and contribute to an upward trend in Pennsylvania bituminous coal production. Operation of The Bituminous Coal Act of 1937 and unionization of southern fields probably will tend to level wage costs in the industry and to decrease the cost disadvantage of Pennsylvania producers. The relative volume of shipments from this district to that market increased greatly from 1925 to 1934; the former year marked the lowest volume of Pennsylvania shipments since 1910, both absolutely and relatively. Pennsylvania's share of this trade dropped sharply after 1934, although shipments were slightly greater in 1936 than in 1934. A great advantage would follow on the construction of an Ohio River-

Lake Erie Canal.[18] Moreover, an equalization of wage rates among the several coal fields and the establishment of mileage freight rates would stimulate the sales of Pennsylvania bituminous coal in most major consuming areas. Within the past few years there have been tendencies in both these directions. Since the war, production trends in the coal and steel industries in the Pittsburgh district have probably been influenced more by the competition of other districts than by competition from other industries. Moreover, in the next decade or two, inter-district competition is likely to continue to be of primary importance.

Two branches of manufacturing, the electrical equipment industry and the glass industry, are likely to contribute to the continued upward trend in industrial activity in the Pittsburgh district. In the former there are strong indications of the persistence of a considerable rate of growth. From 1899 to 1919 this industry expanded very rapidly in the country and somewhat less rapidly in the Pittsburgh district. After the war, growth was greatly retarded, and the rate of gain has been very much less in the Pittsburgh area than in the United States. The average value created in the industry per wage earner has failed to increase as rapidly in the Pittsburgh area as in the Chicago area or even in the country as a whole.[19] Local electrical equipment plants thus do not appear to have entered proportionately into those branches of the industry making the more highly developed products. Nevertheless, in terms of total increase in value added by manufacture the making of electrical equipment was the outstanding local industry during the twenties.

The westward spread of the glass industry apparently is not yet completed. For all branches of the industry the value of products in Pennsylvania, almost all of which was in western Pennsylvania, accounted for 26.7 per cent of the national total value in 1929 and 22.8 per cent in 1935. For plate glass production the growth from 1928 to the second and third quarters of 1937 was much greater for the country than for western Pennsylvania, and as a result the local proportion of total output fell from 62 per cent to 33 per

[18] Glenn E. McLaughlin, "Probable Effects of an Ohio River-Lake Erie Canal on the Competitive Position of Pittsburgh Industry," *Pittsburgh Business Review*, December, 1935, pp. 1–4.

[19] In 1929 the value added per wage earner in the making of electrical machinery was $3,300 in the Pittsburgh area, $4,000 in the United States, and $4,700 in the Chicago area.

cent.[20] Much of this drop in the importance of western Pennsylvania occurred between 1930 and 1932, when five local plants closed down.[21] For the immediate future the relative position of the Pittsburgh district is likely to remain about the same. Even though the plate glass industry grows somewhat less rapidly locally than nationally, its contribution to gains in industrial output in the Pittsburgh district may be important, for in most branches of the industry production trends are definitely upward. In two other branches of the glass industry,[22] containers and window glass, improved technique and increases in local capacity in the past few years suggest that these sections of industry will contribute to future increases in local industrial activity. Since 1929 the relative importance of western Pennsylvania in window glass production has risen materially, whereas in the containers and glassware branches of the industry the position of western Pennsylvania has weakened slightly.

Most of Pittsburgh's industries, because of their comparative age, have been influenced by the westward shift of population and of manufacturing. Present evidence indicates that those movements have spent much of their force [23] and that in the future the

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[20] Many glass plants in the Pittsburgh district were closed in March, 1936, as a result of floods. Moreover, the relative importance of western Pennsylvania both in 1936 and in the first quarter of 1937 was affected somewhat by strikes in plants of the Libby-Owens-Ford Glass Company and those of the Pittsburgh Plate Glass Company. In western Pennsylvania the two plate glass plants of the latter concern were closed from the middle of October, 1936, until late January, 1937. Hence, the middle six months of 1937 is probably the latest normal period of any length. Western Pennsylvania accounted for 33 per cent of the national output of plate glass in the first quarter of 1937 and for 28 per cent in the fourth quarter of 1937.

[21] These were the Charleroi plant of the Pittsburgh Plate Glass Company, the Glassmere plant of the Ford Motor Company, the Durant City (Elk County) plant of the American Plate Glass Company, the Blairsville plant of the National Plate Glass Company, and the Butler plant of the Standard Plate Glass Company. The last three plants were acquired by new corporations and were in operation from 1934 into 1936, but the Durant City and Blairsville plants were again closed down in 1936. The Budget Publishing Company, *Glass Factory Directory,* for various years.

[22] The values of production in the several branches of the glass industry in Pennsylvania in 1929 were: plate glass, $25.1 million; bottles and jars, $22.9 million; window glass, $6.3 million; tableware, $5.8 million; decorative glass, $3.9 million; and miscellaneous products (mainly pressed and blown ware), $24.7 million. Commonwealth of Pennsylvania, Department of Internal Affairs, *Report on Productive Industries,* 1929, p. 124.

[23] An indication of the eastward shift of consumption of wire and wire products was the transfer of the main sales office of the American Steel and Wire Company from Chicago to Cleveland. The importance of industrial uses of wire has been increasing and that of agricultural uses decreasing. *Daily Metal Trade,* April 28, 1937, p. 1.

local area's relative importance in industries in which it is represented either will fall little further or actually may rise somewhat.

Major Advantages of the Pittsburgh District

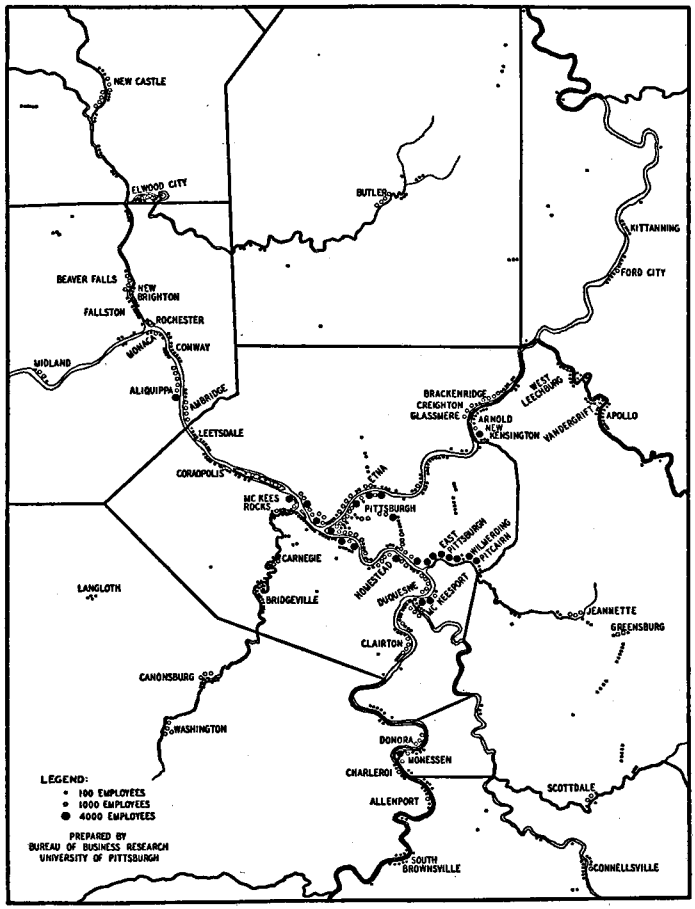
The major industrial advantages of the Pittsburgh district are low-cost fuel, power, raw steel, and water transportation. This district possesses abundant reserves of excellent coal of a quality as good as, or better than, that produced in other fields in the Appalachian region. Furthermore, the area and adjacent districts are important sources of natural gas. The present industrial requirement for power, however, is more and more in the form of a demand for cheap electric power. Consequently, it is of increasing importance to the district that the advantage of large supplies of low-cost coal be passed on to industry in the form of low electric-power rates. The direct and indirect importance of waterways in the Pittsburgh district is indicated by the concentration of manufacturing activity along the rivers (Chart 58).

To the iron and steel industry the outstanding advantages of the Pittsburgh district consist in vast local supplies of low-cost coking coal and the system of waterways which leads to unusually low transportation costs from mine to furnace and from mill to many customers in the Midwest and Southwest. Cost of coal is sufficiently low to offset the disadvantage which the district has in the assembly costs of iron ore. The only other major iron- and steel-producing area that has significantly lower assembly costs for making pig iron is the Birmingham district,[24] where all necessary materials are to be found in close conjunction and, moreover, where industrial labor rates are lower than those prevailing in the industrial northeastern section of the country; these advantages, however, are offset by Birmingham's remoteness from the chief industrial markets. In the assembly costs for making pig iron, Pittsburgh seems to have a slight advantage over Chicago. But the further steel products are processed, the more fuel is required; consequently, the greater becomes the relative advantage of the Pittsburgh district, with its cheap coal, over other northern steel-making districts. Moreover, Pittsburgh steel producers are assisted by the low cost of natural gas in this region. The existence of an adequate supply of water is important, because the produc-

[24] Daugherty, de Chazeau, and Stratton, *The Economics of the Iron and Steel Industry*, pp. 378–82; Worthing, Marion, "Comparative Assembly Costs in the Manufacture of Pig Iron," *Pittsburgh Business Review*, January, 1938, pp. 21–25.

CHART 58

LOCATION OF MANUFACTURING EMPLOYMENT IN THE PITTSBURGH AREA, 1930
(Based on *Seventh Industrial Directory of Pennsylvania*)



tion of each ton of pig iron requires about 30 tons of water for cooling, for washing gas, and for other purposes.[25] Plants in the Shenango and Mahoning valleys are handicapped in this respect; most fortunate are those plants located on the Great Lakes, not

[25] *Encyclopaedia Britannica* (14th ed.), Vol. XII, p. 653.

only because of an abundant supply of water but also because of its purity and low temperature.

The general belief has existed among economists that assembly and production costs for iron and steel were much lower at points on the Great Lakes than in the Pittsburgh district. In 1932, for example, Meredith Givens, in an article on the iron and steel industry, stated that as a result of the abandonment of the Pittsburgh-Plus system of quoting iron and steel prices "the leadership of Pittsburgh in the industry has been definitely impaired and an artificial barrier removed from the further development of the Chicago and Great Lakes district as the natural economic center of most efficient production and distribution."[26] From about 1910 to the middle twenties it probably was true that production costs were much lower at Chicago than at Pittsburgh. In 1921 the Federal Trade Commission found that, for plants of the United States Steel Corporation, mill cost at Chicago was less than that at Pittsburgh by $0.60 a ton for plate; $4.20 a ton for bars, $7.20 a ton for black sheets, and $8.40 a ton for shapes.[27] But these cost advantages resulted mainly from greater modernization of both furnaces and mills at Chicago and not from a "natural economic" advantage attributable to location on the Great Lakes, important though that location is. Ever since the first steel was produced at Gary in 1909 the Chicago district has possessed up-to-date equipment for making most steel products. Since labor expenses are the largest element in production costs, except for expenditures on materials, differences in modernization are very important.

Two important changes in production equipment affected costs in the steel industry of the Pittsburgh district during the twenties: first, the displacement of the beehive process of making coke by the by-product method; and second, the installation of modern steel-mill machinery. To the local coal industry the general adoption of the by-product coking process was a severe blow, but to the Pittsburgh steel industry the new process was of great assistance in lowering costs. The by-product method of coking coal represented an improvement for the steel industry generally, but the introduction of the method in the Pittsburgh district meant that

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[26] *Encyclopaedia of the Social Sciences*, Vol. VIII, p. 308.

[27] United States Senate, 74th Congress, Second Session, *Hearings before the Committee on Interstate Commerce on S. 4055, A Bill to Prevent Uniform Delivered Prices* (short title), p. 602.

local steel concerns were able to obtain fuel by water at exceedingly low cost. By-product coke plants were constructed at or near steel mills,[28] and mines along the upper Monongahela River were operated in preference to those around Uniontown and Connellsville. Moreover, the efficiency of transporting coal to the river was increased by using underground coal conveyors. The first of these belt systems, that connecting the Colonial mines of the H. C. Frick Coke Company with a river dock, was completed in 1924.[29] In other instances, more distant mines were connected underground by rail with adjoining river mines, so that their output in common could be delivered to river tipples. Thus, in effect was the coal mine moved to the blast furnace.

The efficiency of making steel products in the Pittsburgh district was further aided during the twenties by the installation of larger furnaces and more modern rolling-mill equipment. Of great importance was the construction of a new structural steel mill in the Munhall plant of the Carnegie Steel Company in 1927. Chicago's greatest reported cost advantage in 1921 had been in the production of structural shapes.

Notwithstanding these changes the trend of steel output in the Pittsburgh district has been nearly horizontal since the war. Perhaps the heavy dependence on the railroad and building industries was largely to blame. Or equally important may have been special advantages enjoyed by Great Lakes districts in availability of iron and steel scrap and access to growing markets. At all events, the cost advantage of Chicago over Pittsburgh probably was narrowed and perhaps eliminated during the twenties.

When faced with the 1921 cost differentials, William A. Irvin, then President of the United States Steel Corporation, denied they held in April, 1936. He pointed emphatically to the improvement of equipment in the Pittsburgh district and to the resulting effect on costs. He stated that there was practically no difference in the cost of producing pig iron in Gary or Pittsburgh, because the

[28] By-product coke production in western Pennsylvania rose from 4.3 million net tons in 1919 and 5.5 million net tons in 1920 to 11.5 million net tons in 1928 and 12.0 million net tons in 1929, whereas beehive coke production in western Pennsylvania fell from 13.5 million net tons in 1919 and 14.3 million net tons in 1920 to 3.1 million net tons in 1928 and 4.8 million net tons in 1929. United States Bureau of Mines, *Mineral Resources,* for various years.

[29] *US Steel News,* published monthly for employes of the United States Steel Corporation and subsidiaries, December, 1936, pp. 16–21.

higher transportation cost on coal to Gary was approximately offset by the extra transportation cost on ore from Lake Erie ports to Pittsburgh. Moreover, he stated that if the Corporation had similar equipment at Gary and at Pittsburgh, the cost of the finished steel products in various lines would be "about the same." [80]

Although the costs of producing steel at Pittsburgh and at Chicago may be described as roughly the same, there is nevertheless a significant difference between the extra costs of transporting coal to Chicago and the extra costs of moving ore to Pittsburgh. The great bulk of coal used in steelmaking in the Chicago district is carried by rail from southern West Virginia and eastern Kentucky at a rate of $3.09 per net ton. In 1935 approximately one-fifth of the southern Appalachian coal transported to the iron and steel industry in Chicago moved by a combined rail-water route at a saving of about $0.20 a ton.[81] The cost of moving coal from the upper Monongahela Valley mines to Pittsburgh by river barge is very low, perhaps no more than $0.20 per ton. On the other hand, from Lake Erie ports to Pittsburgh the rail cost on ore is $1.15 per gross ton. Moreover, the production of a gross ton of steel requires between 1.8 and 1.9 gross tons of Minnesota ore or its equivalent and about 2 to 2¼ net tons of coal or its equivalent in coal and other fuel. These differences seem to indicate a net advantage to producers in the Pittsburgh district of roughly $3.50 to $4.50 per gross ton of steel, a margin which can hardly be described as inconsequential.

On the other side of the ledger must be set the advantage at Chicago of cheaper iron and steel scrap collected over a wide area and shipped to Chicago by rail and lake. Since 1920 the top price for heavy melting scrap has averaged about $2.00 per gross ton cheaper at Chicago than at Pittsburgh. In the Chicago area the proportion of steel production apparently attributable to the consumption of scrap was about one-fifth in 1929 and one-half in 1933.[82]

[80] United States Senate, 74th Congress, Second Session, *op. cit.*, pp. 599 and 603.

[81] *Ibid.*, p. 599.

[82] These fractions are based on ratios between pig iron production and steel production. The margin between the output of steel and that of pig iron in 1929 was about twice as large in the Pittsburgh Code Area as in the Chicago Code Area. The relative consumption of scrap would appear to have been greater in the Pittsburgh district in 1929 and 1931 but less in 1933. In 1931 the Illinois Steel Company completed the construction of 21 new open-hearth furnaces at Gary and South Chicago. Between the first of 1930 and the first of 1935, steel-furnace capacity in the Chicago district increased

The average advantage from this source to Chicago on total output therefore must have varied between $0.40 and $1.00 per gross ton. After natural-gas pipe lines reached Chicago in 1931, open-hearth furnace fuel has been obtained at a cost below that at Pittsburgh. Moreover, the local consuming market is much larger at Chicago than at Pittsburgh.[33] With respect to access to other markets both areas are able to reach some consuming districts by water—Chicago those on the Great Lakes, and Pittsburgh those on the canalized sections of the Mississippi and Ohio rivers. No doubt, the greater advantage, at least potentially, favors Chicago because of the great consuming importance of Detroit and because of the advantage of using water transportation as far as Buffalo on shipments to the East. Yet Pittsburgh has a net delivered advantage for most steel products on rail shipments anywhere along the Atlantic seaboard, even over producers at Buffalo. Moreover, the Ohio River and its tributaries carry traffic throughout the year, whereas the Great Lakes are not navigable during the winter.

In summary, the production and distribution advantages of the Chicago area in the iron and steel industry during the twenties re-

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by 2.31 million tons, whereas blast-furnace capacity increased by only 0.36 million tons.

In terms of present capacity, then, Chicago is apparently equipped to use much more scrap than Pittsburgh. At the beginning of 1935 the Chicago Industrial Area, including all furnaces in the Code Area and those at Joliet, possessed a capacity for making pig iron of about 10.27 million gross tons and a capacity for making steel of approximately 14.72 million gross tons. On the other hand, the 4-county Pittsburgh Industrial Area had a capacity for making pig iron of about 11.56 million gross tons and a capacity for making steel of about 14.40 million gross tons. If only the two major counties in each area be compared, the difference between steel capacity and iron capacity is 1.88 million gross tons at Pittsburgh and 4.46 million gross tons at Chicago. That a variation in facilities to use scrap characterized integrated concerns can be seen from figures for the Carnegie-Illinois Steel Corporation. At the first of 1935, plants of the corporation in the Chicago area had an excess capacity for making steel of 3.40 million gross tons, whereas plants of the old Carnegie Steel Company, including a few plants in Ohio, had an excess of only 0.76 million gross tons. These interdistrict comparisons are affected somewhat by differences in the degree to which pig iron is used for other products than steel. Moreover, no information is available by areas on how much of the scrap consumed is mill scrap and how much non-mill scrap.

Production figures for pig iron and steel in both the Chicago and Pittsburgh areas suggest that the opportunity to use scrap is more important in depression than prosperity years. American Iron and Steel Institute, *Directory of the Iron and Steel Works of the United States and Canada, 1935.*

[33] Existence of large local consuming industries and ease of accessibility to scrap and ore have led C. E. Wright, Managing Editor of the *Iron Age,* to describe Chicago and Detroit steel producers as being located more favorably than most others. "The Geography of Steel: Factors Governing Location of Main Producing Areas," the *Annalist,* May 14, 1937, p. 767.

sulted primarily from differences in the modernizing of equipment, a regional factor often overlooked by students of the iron and steel industry; those advantages did not mean that the Great Lakes district was necessarily the most efficient production and distribution center for the industry, nor could they be interpreted to foreshadow a displacement of mills in the Pittsburgh district by others at Chicago, even though the Pittsburgh-Plus pricing system had been abandoned. Indeed, the Pittsburgh district is an integral part of the great inland iron- and steel-producing area. Some sections of that area can reach particular markets more economically; other sections are the logical point of supply for other markets.

At the present time Pittsburgh mills are being modernized, though apparently not to a greater extent than are Chicago mills. It appears, however, that in the immediate future most of the equipment for making iron and steel at Pittsburgh will not be inferior to that at Great Lakes centers. Furthermore, the fact that these new rolling mills tend to concentrate employment in major districts may result in the transfer to the Pittsburgh area of activity previously carried on in smaller sheet and plate mills scattered over western Pennsylvania and eastern Ohio.[84] The great investments in continuous rolling mills and other departments of steel plants made in 1936 and 1937 and the shift of capacity to more rapidly growing consuming demands may serve to maintain the rate of growth of the local industry.

With respect to technical leadership the Pittsburgh district possesses the important advantage of a large supply of skilled technicians in the chemical, engineering, and construction trades. Many of these men are graduates of the two major local institutions of higher education, which maintain strong departments for training and research in engineering, physics, and chemistry. The Mellon Institute of Industrial Research carries on investigations for several of the leading industrial concerns in western Pennsyl-

[84] The same influence will also contribute to centralization and consequent greater activity at other major iron- and steel-producing centers. Moreover, the widespread modernization of equipment presents the opportunity of transferring capacity to other districts and in general of adjusting for past or impending shifts in markets. For example, in replacing old sheet-producing equipment at Cambridge, Ohio, the United States Steel Corporation apparently decided to transfer that activity to Chicago and not to Pittsburgh, the general section in which Cambridge is located. Later installations of continuous rolling mills near Pittsburgh may have replaced other old sheet-producing units in the Midwest. United States Senate, 74th Congress, Second Session, *op. cit.*, p. 613.

vania as well as for organizations elsewhere. Studies of technical problems in the coal industry are conducted by the local branch of the United States Bureau of Mines and by the coal research laboratory of the Carnegie Institute of Technology. Moreover, extensive research laboratories maintained by several local corporations help keep them abreast of production changes in their respective industries. The most important of these laboratories are devoted to work in steel, electrical machinery, petroleum, coal, glass, and aluminum. Several of these research organizations are outgrowths of co-operative research originally carried on at the Mellon Institute.

Moreover, the long-standing specialization of Pittsburgh in steel, coal, glass, and heavy machinery has led also to the building up of a large group of workers, skilled or semiskilled in the operation of these industries. In such a place the necessary skill for various tasks has been easily acquired. Knowledge of local mechanical processes has been passed down from father to son. As Alfred Marshall, the eminent British economist, pointed out: "The mysteries of the trade become no mysteries; but are, as it were, in the air, and children learn many of them unconsciously." Invention has been fostered because of local familiarity with technical problems of the major industries. Furthermore, the existence of this specialized labor supply facilitates the expansion of these industries and also their extension into related manufacturing fields.

But the concentration of local industry has the handicap of restricting employment mainly to a single type of labor. Heavy steel districts put primary emphasis on one kind of labor, that supplied by physically strong semiskilled and unskilled men.[85] Such heavy industry centers as Pittsburgh, unless other types of production are developed, find it difficult to employ special labor reserves of women and juniors. Almost the sole economic support of the family thus is placed on adult males.

Although in Pittsburgh there are a few industries which employ considerable groups of women, notably the food industry, there are nevertheless large numbers of women not gainfully employed. In 1930 in the Pittsburgh Industrial Area only 18.7 per cent of the

[85] In June, 1933, the distribution of wage earners in the iron and steel industry according to degree of skill was estimated to be as follows: skilled 24 per cent, semiskilled 30 per cent, and unskilled 46 per cent. Daugherty, de Chazeau, and Stratton, *op. cit.*, p. 132.

female population 10 years of age and over reported themselves as gainful workers; the average for all 33 industrial areas combined was 25.9 per cent, and the maximum—Providence area—was 32.2 per cent. Development of industries employing some of these women probably would be advantageous to the area because of increases in local output and total local income. The desirability of this additional employment depends on a social evaluation of the gains in income in comparison with the losses of leisure. Such employment probably would lead to indirect gains in employment in other occupations. But since local average annual earnings of males in manufacturing are comparatively high, many women are not forced to work, at least during periods of prosperity. Hence they would enter gainful employment only if wage rates were attractive and therefore only if productivity were reasonably high. Consequently, a sizable amount of female employment in the Pittsburgh district would be possible only in certain industries.[86]

Pittsburgh's Geographic Position

The relative importance of the several geographic characteristics of Pittsburgh has changed little in the past three-quarters of a century; nearness to coal and the comparative proximity to the Great Lakes remain of crucial importance. In terms of transportation costs the Pittsburgh coal fields are closer to the iron ore of the Lake Superior region than are southern Appalachian fields, although comparative rates to lower lake ports do not fully reflect to Pittsburgh fields the advantage of their location. For the most part, coal from the Illinois, Indiana, and even Ohio fields is not satisfactory for the making of coke, although of course it is satisfactory as a fuel for the generation of electric power. These fields are also located farther from lower lake ports than are Pittsburgh fields. With respect to most markets for bituminous coal, local fields have a comparative natural locational advantage, often not reflected in railroad rates.

The Appalachian coal section and the Lake Superior ore district are in effect complementary parts of the great inland iron- and

[86] On this general problem, see Paul Douglas, *Theory of Wages* (1934), Chapters XI and XII; and Erika H. Schoenberg and Paul H. Douglas, "Studies in the Supply Curve of Labor: The Relation between Average Earnings in American Cities and the Proportions Seeking Employment," *The Journal of Political Economy*, February, 1937, pp. 45 ff.

steel-producing region. Steel plants are located at intermediate points as well as at both ends of this region. The question arises whether the optimum location for producing heavy steel products is in the Pittsburgh area or in some area on the Great Lakes. The answer must be in terms of the assembly costs of materials for making iron and steel, the transportation costs to the more important consuming markets, and the system used by the industry in determining delivered prices. Increased use of river transportation has strengthened the position of Pittsburgh. On the other hand, the increasing importance of scrap iron, the adoption of the by-product process of making coke, the increased economy in the use of fuel, and the development of larger ore boats have had in the past the result of lowering assembly costs more at Great Lakes centers than at Pittsburgh. Consequently, the advantages of Pittsburgh's geographic position have been partially offset. For iron and steel centers on the Great Lakes assembly costs in making pig iron are not materially different from those at Pittsburgh; for raw steel, assembly costs are usually higher, although at times they are significantly lower if allowance is made for the relatively greater use of scrap iron in the Detroit and Cleveland areas.

In a comparison of assembly and production costs of iron and steel the importance of low scrap prices is perhaps often overemphasized. Scrap prices are usually comparatively high in the Pittsburgh district because the local demand is great—very great indeed if steel production has been increasing more rapidly than pig iron production. Witness the peak scrap prices in January, 1937. If Cleveland were a major consuming district for iron and steel scrap, prices would probably be as high as at Pittsburgh. Even the Detroit supply of scrap would dwindle in importance if that area were a large producer of open-hearth steel. On the average for the country, about half of the supply of scrap consumed by steel plants is mill scrap—that is, scrap created incidentally by steel-mill operations. In the Detroit area the percentage of steel-mill scrap is of course very low. Yet until the steel output of the Detroit and Cleveland areas becomes large relatively to local supplies of non-mill scrap, the assembly and production costs of making steel in those areas often may, because of this advantage, be lower than costs in the Pittsburgh district.

Comparative regional strength in the iron and steel industry depends on the accessibility to markets as well as on assembly and

manufacturing costs. Changes in relative transportation costs or shifts in consuming areas may affect the competitive position of the Pittsburgh steel industry. A readjustment of railroad rates or development of new waterways is important only if effected in relation to sizable consuming areas. For this reason the importance of the canalization of the Ohio to local steel producers may at present easily be overemphasized. Shifts in the comparative importance of consuming areas may stimulate or restrict steel production in the Pittsburgh district. These shifts may be brought about by the geographical movement of an industry, by the revival of an old industry in a secondary market, or by the development of new industries.

In terms of geographic factors, the importance of the Pittsburgh district will continue to depend on its position on the Allegheny, Monongahela, and Ohio rivers, at the edge of the great bituminous coal fields, and near Lake Erie. In the next few decades the effect of the Ohio River on the economic life of the district may become greater than at any time in the past 60 years, in large part owing to the improvement of this waterway and the establishment, in 1929, of a nine-foot depth from Pittsburgh to Cairo, Illinois. Since this route furnishes very economical transportation to some midwestern and southwestern markets for iron and steel products, the Ohio River will likely be used by Pittsburgh industries to an increasing extent in the future. This inland water system also furnishes the possibility of bringing bulk goods to Pittsburgh. Already considerable amounts of sugar, molasses, iron and steel scrap, and other goods move up the rivers to this city. The recent canalization of the Missouri River from St. Louis to Kansas City and the development of navigation on the upper Mississippi River present the possibility of bringing grains to Pittsburgh and of making flour, breakfast goods, and similar products in this district. The advantages here, in this respect, are much the same as those that Buffalo has as a mill center for wheat: cheap water transportation from primary grain markets,[87] potentially low power costs, and nearness to large consuming markets. Furthermore, the year-round maintenance of a nine-foot minimum stage on the Ohio River may result in heavy shipments of petroleum products, lumber, cotton, raw rubber, and other bulk materials to

[87] Grain destined for Buffalo usually travels 150 miles by rail from Minneapolis to Duluth; shipments to Pittsburgh could move the entire distance from primary market by water.

Pittsburgh and in the expansion of industries based on these materials.

The Decentralization of Industry

In the past few years business men and economists have given much attention to the possibilities of decentralizing industry. Some of the social disadvantages of having large industrial plants concentrated in a comparatively few urban areas were brought out by the severity of unemployment in these areas during the recent depression and by the inability of urban industrial workers to support themselves and their families once the factories were partially or entirely closed down. Decentralization, or rather ruralization, offers the possibility that workers may reside near their work and yet enjoy the benefits of living in a semirural environment, such as being able to provide part of their own food supply. On the other hand, one-factory communities appear to be peculiarly susceptible to wide fluctuations in employment.

Thus far, however, decentralization seems to have been limited mainly to the spread of industry to suburban areas. Among other factors the improvement in transportation and communication and the development of a highly flexible and widely available source of power may furnish the basis for the continued spread of industry to small, nonmetropolitan cities and even to rural areas. On the other hand, cheap, long-distance communication has facilitated the concentration of office work and general management in central cities at considerable distance from production units. The result has been a stimulus, especially since 1920, to the growth of the great metropolitan communities. Marked population gains in Allegheny County from 1920 to 1930 are to be explained in part by this development.

If decentralization of industry takes the form of the extension of a manufacturing industry, already localized in one or two areas, into other large industrial centers for the purpose of avoiding the danger that a single industrial dispute may tie up the operation of an entire industry, it is conceivable that the Pittsburgh district might attract factories of considerable importance. The current widespread unionization in the mass-production industries, however, makes such a movement seem less likely. Reports that the automobile industry might decentralize its manufacturing activities and locate important units outside the general Detroit-Toledo

region at one time aroused the hope of Pittsburghers that factories in some branch of the industry would be located in or near their city. The local district has many advantages to offer automobile producers, such as adequate supplies of steel, aluminum, glass, paints, and fuel and power. In the past decade, however, the Pittsburgh industrial district has lost what little representation it had in this industry.

Actually the tendency toward decentralization of industry may result in the moving of some of the lighter machine industries away from the district to smaller towns affording lower taxes, cheaper sites, lower labor costs,[88] lower power costs, or a combination of these advantages. The transfer or establishment by the Westinghouse Electric and Manufacturing Company of departments making mechanical refrigerators, small motors, domestic appliances, and radio parts to branch factories in smaller centers may be cited as illustrations. With respect to the steel industry, however, there is little, if any, likelihood that a large corporation will shift part of its operations to distant, smaller cities. In this industry the tendency toward centralization is stronger than that toward decentralization, and Pittsburgh is not likely to lose except to another major producing district.

If important new industries are to be developed in the Pittsburgh industrial district they will probably represent industries that are dependent either on low fuel and power costs or on cheap iron and steel or on both—in other words, industries such as the heavy machinery industry, the steel furniture and office equipment industry, the making of steel houses, and the chemical industry, especially the production of bulk coal-tar products. Industries making light machinery and the more highly processed chemicals are much freer to locate over a wide territory because of the relatively low ratio of raw material costs to total production costs. An industry having as its major requirement large amounts of power and fuel should find favorable location factors in the Pittsburgh district. If, on the other hand, the industry is one that requires unusually cheap electric power, it may find production costs,

[88] On differences in wage payments according to size of city, see Charles F. Roos, *NRA Economic Planning* (1937), p. 163. A special tabulation of the United States Bureau of the Census indicates that, with respect to male employes in the boot and shoe industry in the North, 70 per cent of the men received hourly earnings of $0.62 or less in cities of 2,000 or less, whereas in cities of 250,000 or more only 53 per cent received these wages.

even under the most favorable local conditions, lower near a water-power site. Witness, for example, the location of the newer refining plants of the Aluminum Company of America at Massena, New York, and Alcoa, Tennessee, rather than in the Pittsburgh district. Yet in very few industries is electrolysis as important as it is in the aluminum industry. An industry that requires a combination of cheap fuel and power or a combination of cheap power and inexpensive coal to be used as a raw material probably has greater advantages in the Pittsburgh district than at a source of water power where fuel is lacking.

Conclusion

In the Pittsburgh district, retardation of growth in total industrial production in the period since about 1910 has resulted in the main from the fact that the major local industries are old industries which several decades ago reached their phases of most rapid development and from the additional fact that few new, rapidly expanding industries have become established locally. Moreover, none of the moderately important industries in the Pittsburgh district have grown up since the beginning of the century. Even the making of electrical equipment and aluminum products—industries much younger than coal, steel, or glass—were well established in the district by 1900. The absence of new major industries in large part explains the marked retardation about 1910 in industrial growth and indirectly in population growth. Several new important industries have developed in the United States in the past 30 years, but none of them have been of great direct assistance in stimulating industrial expansion in and around Pittsburgh. Several of them, however, have been large consumers of coal, steel, and glass, in part obtained from western Pennsylvania. Perhaps the most significant contributions to economic growth in the area since the war have been the continued expansion of the electrical apparatus industry and the rising output of aluminum products. Although the growth of each of these industries has slowed down considerably in the past two decades, the local rates of increase are still high in comparison with rates for the older industries. In both the younger industries local production approximately doubled from 1919 to 1929, whereas the output of steel and glass increased much less and that of coal declined. Although in local importance the two younger industries are still overshadowed by steel and

coal, the differences in relative importance between the two pairs of industries will probably continue to narrow. A more recent event of considerable bearing on the industrial future of this area is the development of alloy steels. The expansion of this branch of the heavy industry gives some promise of making a real contribution to growth in local production. In the past three decades, however, there has been a marked deceleration of total industrial activity, owing largely to the absence of new industries and to the maturity of the older dominant industries.

If the trend in local productive activity is to rise more rapidly, either the production trends of the present major industries must rise or new industries must be developed in the area. The revival of rapid growth in an old industry usually requires a revolutionary change in the industrial arts: either in the internal organization of the industry itself or in the requirements of a consuming industry.[39] Such changes have occurred in old industries, but very infrequently. In the plate glass industry, for example, an important re-acceleration of the rate of growth occurred only once in many years and that as a result of the increased output of the closed-type automobile. Recent technological changes in the industry together with the adoption of safety (or double plate) glass for automobiles give strong indication of another acceleration of growth. In the iron industry the development of the Bessemer and open-hearth processes of making steel, an alloy of iron and carbon, led to a similar rare increase in the rate of growth. Revolutionary changes may occur again in the coal and steel industries but they are not very likely to appear in the immediate future. Usually, the older the industry, the less rapid the important changes in productive method and in organization. Generally, only in the early stages of development is the introduction of improvements rapid. Technical progress, in other words, proceeds at a declining rate, because the possibilities of important changes are more and more difficult to uncover. Moreover, old industries are often less susceptible to innovations because of the strength of traditional methods and because of unwillingness to scrap old equipment in the face of decelerating output.[40]

[39] It is possible that a change in consuming habits might lead to a rapid growth in the manufacture of consumers' goods without any revolutionary change in the methods employed in making them.

[40] Arthur F. Burns, *Production Trends in the United States since 1870* (1934), pp. 133–45; Harry Jerome, *Mechanization in Industry* (1934), p. 342.

Most instances of a re-acceleration of local industrial growth can be explained in terms of the introduction and expansion of new industries. The fact that few new industries have taken root in the Pittsburgh district during the past 30 years is presumptive evidence that the district has not been a particularly advantageous location for most of the new forms of manufacturing. Possibly a greater variety of industries would have been attracted by lower electric-power rates. If in the future new industries grow up in the district, it is likely that they will be closely related to the present industrial structure. That is, they probably will be dependent in one way or another upon coal, steel, or cheap transportation. The two heavy industries so dominate economic activity in the Pittsburgh district that even the introduction of several related secondary industries is not likely, at least for many years, to exert a major influence on the growth of total industrial production. The numbers employed in coal mining and in iron and steel production in the 16-county area in 1929 each approximated 125,000, whereas total employment in the next three ranking industries combined—electrical equipment, foundry and machine shop products, and glass—amounted to only slightly more than half that figure.[41] Since new industries of considerable size probably will not develop in the Pittsburgh district in the immediate future and since a revival of rapid growth in coal or steel seems unlikely, the probabilities of material rejuvenation of local industrial activity in the next decade or so appear to be small. A continuation of the slow-growth trends established during the past quarter of a century appears more likely.

A realistic consideration of the future industrial trend of the Pittsburgh district must be conceived principally in terms of the prospects for coal and steel and secondarily in terms of the outlook for electrical equipment, foundry and machine shop products, glass, fabricated structural steel, and clay products. These are all capital goods industries; moreover, to a great degree they are tied to building activity. Few other areas in the country would be so

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[41] In 1935 in the 11-county area the value of products in iron and steelworks was more than three times the total for the three medium-sized industries. The totals were: iron and steelworks products, $534 million; electrical machinery, $61 million; foundry and machine shop products, $56 million; and glass, $54 million. From a special tabulation obtained from the United States Bureau of the Census.

stimulated by a long-term revival of construction. For no other area is the continuance of local production trends so heavily dependent on the continued growth of manufacturing and construction in the country at large, for the flattening out of trends in these industries would lead to a sharp reduction in requirements for capital equipment and building materials. Because of that dependence the trend of local industrial activity is closely tied to the stage of development of industry in the country as a whole. Producers' goods industries can grow only in relation to the industries consuming their products. Thus, local industries will continue to grow as long as their markets consist of anything more than replacement demand, assuming no losses to competing areas. But unless re-acceleration of industrial growth occurs nationally the trend of local output will probably remain only slightly upward. Pittsburgh's industries are old and basic; they are dependent on such a great variety of consuming industries that only a general outburst of productive activity is likely to lead to a material increase in their rates of growth.

In summary, the weight of the evidence seems to indicate that the future growth of industrial output in the Pittsburgh district will be the slow growth normally characteristic of industrial maturity.

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