## LONG-RUN DEVELOPMENTS

In THE descriptive part of this book we shall, on the whole, follow the conventional decomposition of time series into their components, referred to in chapter i. We start, therefore, with a description of the broad outlines of the development, that is, with the trend movement, and in this chapter describe the long-run economic development since the beginning of the nineteenth century.

### POPULATION

The rapid economic growth during the nineteenth century may be shown first by reference to population figures. In the

TABLE 3

GROWTH OF POPULATION IN FOUR INDUSTRIAL
COUNTRIES, 1800–1930

	Around 1800	1930
France (1930 territory)	28	42
Germany (1930 territory)	22	66
England and Wales	9	40
United States*	5	123

<sup>\*</sup> The rapid increase was due partly to immigration.

course of the nineteenth century the population of the world increased very rapidly, mainly as a consequence of reduced mortality rates. The figures in millions in Table 3 give a clear indication of this movement.

Toward the latter part of the nineteenth century the rate of increase slowed down as a consequence of birth control. Al-

<sup>1.</sup> Cf. p. 9, supra.

though the curve of a population, calculated on the basis of its marriage rate, fertility rate, and mortality rate for different ages and changing with time, is by no means a simple curve, it can for most countries be represented with a very high degree of approximation by a growth curve and for the early part of the period by an exponential curve. For certain countries, such as Germany, however, this approximation does not yield satisfactory results. In Germany the rate of increase of the population has shown a notable upward change after 1870 and after 1933.

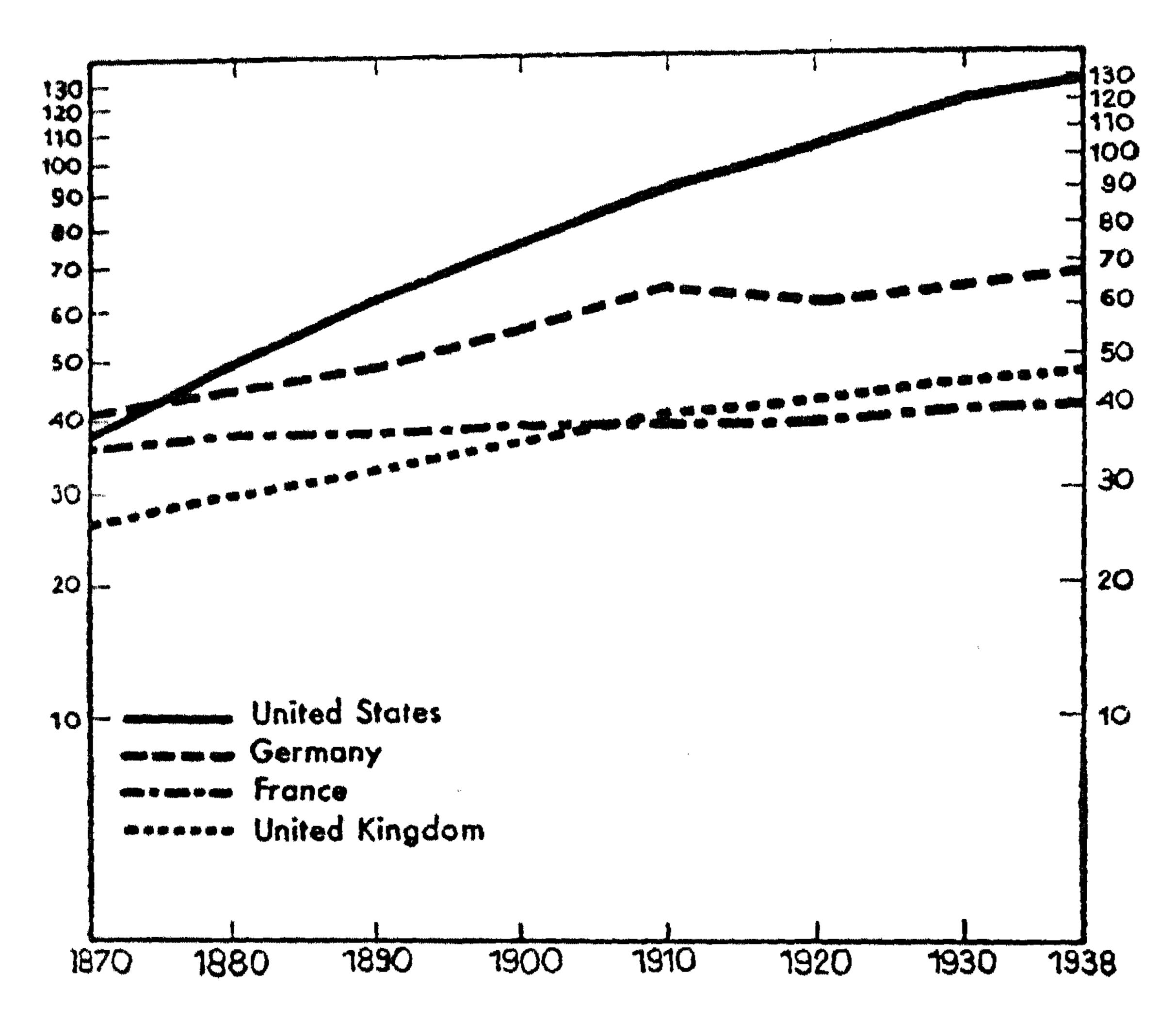


Fig. 10.—Population growth in the four largest industrial countries since 1870 (in millions).

Generally, however, the curves that indicate the growth of population are very smooth, as will be seen from Figure 10.

# LAND

The availability of natural resources also increased in the nineteenth and, though in lesser degree, in the twentieth centuries. Most important in this respect was the opening-up of the natural riches of the United States. But in Europe, too, the area under cultivation, the capacity of mines, etc., increased. The same is true for other continents. A few of the available figures are shown in Figure 11.

### PRODUCTIVITY

Running parallel with the increase of this factor of production, nature, and not always easily distinguishable from it, is the great increase in technical knowledge. This increase in technical knowledge showed itself not only qualitatively in the production of many new products. It also made itself felt quantitatively in that the same quantity of output was obtained by the use of smaller quantities of the factors of production. The fact of technical progress can easily be established if there is a reduction in the use of each of the factors of production;

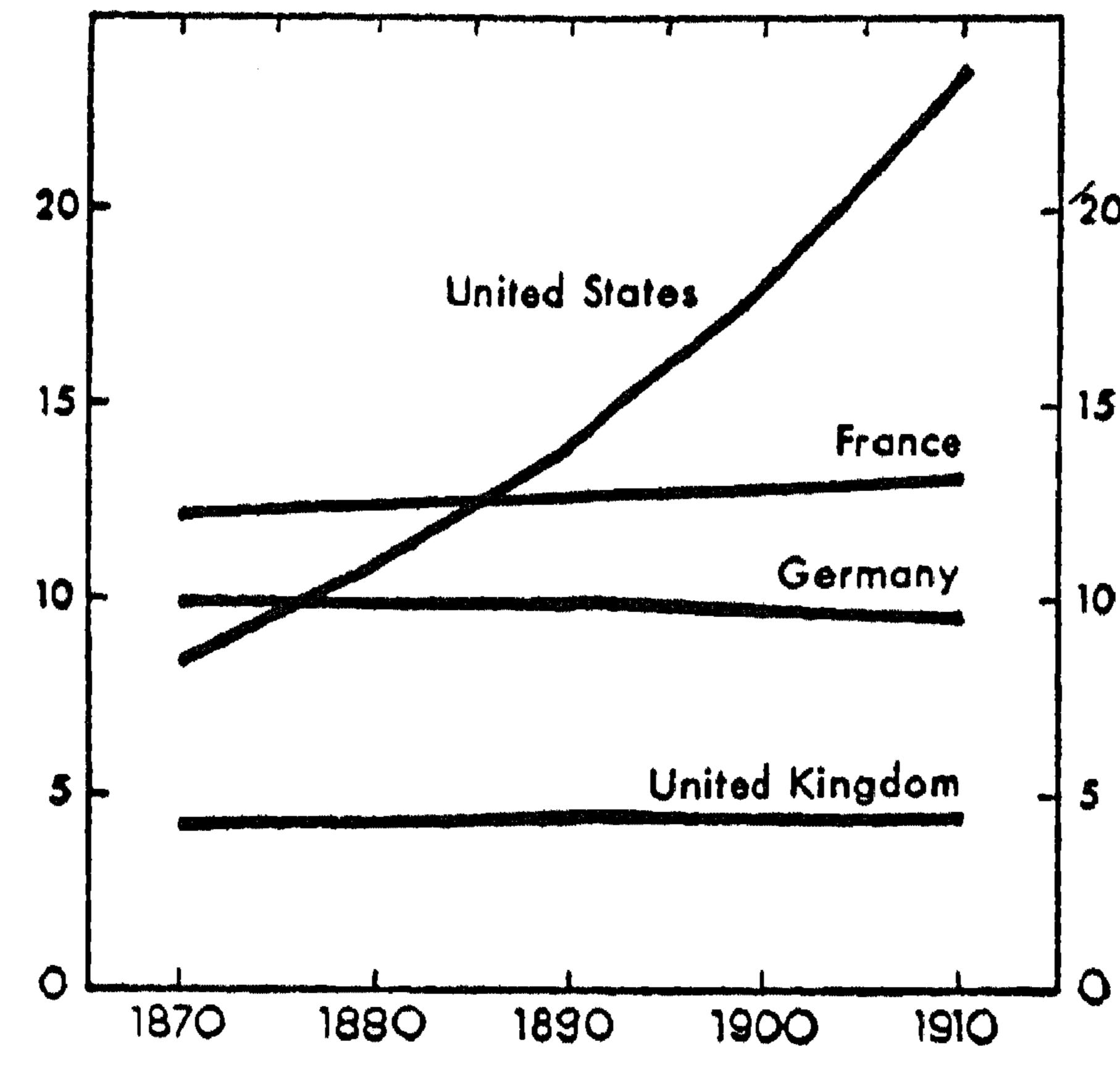


Fig. 11.—Growth of the quantity of arable land in the four largest industrial countries. (Value at prices of 1890 in billions of dollars.)

sometimes, however, a decrease in the quantity of labor may be accompanied by an increase in the quantity of capital used. If the increase in capital represents less sacrifice as measured by current prices than the decrease in the quantity of labor, there is a net reduction in sacrifice. It must be realized, nevertheless, that at a given state of technical knowledge, different production processes are always possible—different combinations of the factors of production which, at a given level of prices for the various factors of production, involve different costs. In the simplest case in which there are only two factors of production, labor and capital, all these combinations may be represented by points on a curve; the co-ordinates of each point indicate the quantities of labor and capital used per unit of product. All

these points lie on one and the same "curve of technical possibilities." A switch from one of these possibilities to another may mean a reduction in total cost; yet it does not indicate technical progress. An exact definition of technical progress can therefore be given only as follows: Technical progress occurs when new combinations become possible that are cheaper than the cheapest combination possible before, at the given level of prices. One might also say that technical progress represents a change in the curve of technical possibilities, as a result of which a smaller quantity of one factor of production is necessary for any given quantities of the other factors of production.

There is no doubt that the quantity of labor per unit of product has on the whole gradually declined. In other words, the volume of output per unit of labor, or the statistical labor productivity, has increased. Between 1870 and 1914 this increase amounted roughly to the following percentages per annum: for Germany 1.8, for England 0.5, for France 1.1, and for the United States 1.1.

Very few figures, and on the whole rather defective ones, are available with respect to the quantity of capital and of natural resources used per unit of product and with respect to the development of these quantities over time. It would seem probable that the quantity of natural resources per unit of product, like the quantity of labor, has decreased and that the quantity of capital per unit of product has increased. It is possible, therefore, as Professor Douglas<sup>2</sup> believes, that there has been no real technical progress in the theoretical sense of the word. According to him the changes we observe are simply the forms in which labor and nature are replaced by capital; these are the previously unknown parts of the same "curve of technical possibilities." The mechanization of production (replacement of labor and nature by capital) would, according to Douglas, have taken place as a result of changes in relative prices: capital has become more abundant and thereby cheaper in relation to the other factors of production. Although this explanation is possible, it would seem to us more probable that actual technical progress has taken place.

<sup>2.</sup> Paul H. Douglas, The Theory of Wages (New York, 1924), pp. 209 ff.

The presence of capital in the form of capital goods with a long life-span leads to fixed costs that are practically independent of the volume of output. It is generally believed that the share of fixed costs in total costs has gradually increased. It is not easy, however, to find a statistical verification of this belief for production as a whole, and a recent study would rather tend to indicate that the reverse is true.<sup>3</sup>

### THE STOCK OF CAPITAL

Population, natural resources of a country, and technical knowledge can generally be considered as data; but, for the quantity of capital goods available, this treatment is proper only in the short run. In the somewhat longer run the quantity of capital goods is dependent on economic activity itself and is therefore a variable to be explained by economic science. In the period under consideration the increase in the quantity of capital has been quite rapid. Before we give figures on this subject, we will have to dwell for a moment on the difficulties involved in the concept of "the quantity of capital goods." We consider as capital goods all commodities that have been produced and are to be used in further production. The stock of capital goods may be measured in different ways. A somewhat primitive way would consist in the counting of numbers and the weighing of physical quantities, for instance, counting the number of locomotives, ships, houses, and weighing the quantities of iron, stone, and timber incorporated in them. Such methods have great disadvantages. Some houses may be much larger than others. In weighing the quantities of raw materials used in their production, some allowance is made for this, but no account is taken of the fact that "one ton of iron" may represent commodities of quite different quality, such as iron bars or machines.

A less primitive method consists in measuring some aspect of

<sup>3.</sup> P. J. Verdoorn, De Verstarring der Productiekosten ("Increasing Rigidity of Cost of Production") (Rotterdam: Netherlands Economic Institute, 1943). Roughly speaking, this finding would be due to the fact that, although the quantity of capital per unit has increased and the quantity of labor (constituting chiefly variable-cost items) has decreased, their money values have moved proportionally because of the divergent price movements of the two factors.

the productive capacity of capital goods. Thus, one can measure the horsepower of a locomotive, the capacity of a ship, the number of rooms of a house. Obviously, this form of measuring is also not quite satisfactory. An old house and a new house with the same number of rooms do not have the same value. Moreover, this yardstick indicates only one aspect of the capital goods, whereas in reality more than one characteristic determines the importance of the capital goods for productive purposes. These measures fail in particular to reflect the depreciation which each capital good undergoes in the course of time.

All the various aspects of the significance of capital goods are reflected in their money value, as indicated either by the market price (for capital goods that have a current market) or by the book value. This measure also has its disadvantages, however. The value of money is not constant, and book values are often subject to peculiar considerations. The ideal method would be to distinguish a very large number of capital goods (one-year-old locomotives of type A, two-year-old locomotives A, three-year-old A's, etc.; locomotives B of all ages, etc.), evaluating them at the prices they have at some moment t and changing these valuations by means of the chain-index method. So far, however, insufficient data are available to apply this method.

The series in Table 4, computed by the Netherlands Central Bureau of Statistics, have therefore been based on a combination of the first and second methods of measurement, that is, measurement by number, size, or capacity.

The stock of capital goods of the categories indicated increased by more than 2.5 per cent per year for each of the countries shown, considerably faster than the increase in the population. This rapid increase was made possible by intensive saving. It may be assumed that in these countries over the period under consideration approximately 15 per cent of the national income was saved.

# THE VOLUME OF OUTPUT

We shall now give some indication of the growth of some characteristic economic variables, starting with those of a phys-

ical nature. Within this group a distinction may be made between "flow" magnitudes and "stock" magnitude. Among the former we count such variables as production per year and consumption per year; among the latter, the stocks available at a certain moment of time. The most important general flow variable which would indicate the position of the economy as a whole is the total volume of production. A second very important variable is the total volume of labor performed, sometimes roughly indicated by the term "employment." Both variables have increased rapidly during the nineteenth century, the

TABLE 4\*

AVERAGE INCREASE PER YEAR (IN PER CENT) OF CERTAIN CATEGORIES

OF CAPITAL GOODS AND OF THE POPULATION, IN SIX COUNTRIES

1870–1910

	Germany	France	United Kingdom	Nether- lands	United States	Sweden
1. Livestock	1.0	0.4	0.4	0.8	1.6	1.0
2. Industry	6.2	6.2	4.5	5.0	5.8	9.7
3 Railroads	2.9	2.5	1.5	1.9	3.2	5.3
4. Commercial fleet		2.0	3.5	3.5	2.5	3.7
5. Houses		0.4	1.5	1.2	2.5	0.9
6. Weighted average†	3.7	3.1	2.8	2.6	3.8	4.6
7. Population	1,1	0.1	0.9	1.2	2.1	0.7

<sup>\*</sup> Netherlands Central Bureau of Statistics, Maandschrift, 1942, p. 113.

former more rapidly than the latter on account of the increase in labor productivity. Employment would show a greater rate of increase if it were expressed in the number of days worked rather than in the number of hours worked, as the average working day has been considerably reduced. Even the number of hours worked has increased considerably. It should be noted that neither of the two measurements takes into account any possible changes in the intensity of labor. This magnitude, however, would be very difficult to define and even more difficult to measure, and opinions differ greatly as to its changes over time.

In the four main industrial countries the annual rate of increase of production between 1870 and 1914 was as shown in Table 5.

<sup>†</sup> Weighted in accordance with the importance of the five series in the national wealth around 1910 of the countries concerned.

The rate of increase has not been constant. Thus, for British industrial production (excluding building) the average rate of increase over different periods has been estimated to have been as shown in Table 6. The development of a few index numbers of activity is shown graphically in Figure 12.

An important distinction in the series for total production is that between consumers' goods and investment goods. As shown by the figures in Table 7 for the United Kingdom over the last

### TABLE 5

# ANNUAL RATE OF INCREASE OF PRODUCTION IN FOUR INDUSTRIAL COUNTRIES, 1870-1914

	Per Cent
United States	4.1
Germany	
England	1.6
France	1.5

### TABLE 6\*

# ANNUAL RATE OF INCREASE OF INDUSTRIAL PRODUCTION IN THE UNITED KINGDOM, BY PERIODS

1700-17	80			•		•	*	• •	•	•	•	•	•		•	•	•	•	-	er Annun 0.9
1781-19	13			•	* •	•	•	* 4		*	•	•	•	•	•		•	•		2.8
1819-19	13	• • •	<b>.</b>	•		•	•	• •		•	*	•	•	•	•	•	•	•		2.6
1855-19	13		• •	•		•	•	• 4	•	•	•	•	•	-	•	•	•			2.0
1923-35				•		٠	•			•	•	•	•	•	•		•	•	•	1.9

1940), p. 28.

two centuries, the latter series has increased at a faster rate than the former. These figures reflect the fact that capital per unit of product has increased. Since the production of investment goods is not of direct consequence for the satisfaction of human needs, the series of the production of consumers' goods is a better indicator of the development of human well-being than is the series of total production. A simple and useful indicator of the movement in the physical basis of human well-being is found in the volume of production of consumers' goods per capita per year. All available figures indicate that this series

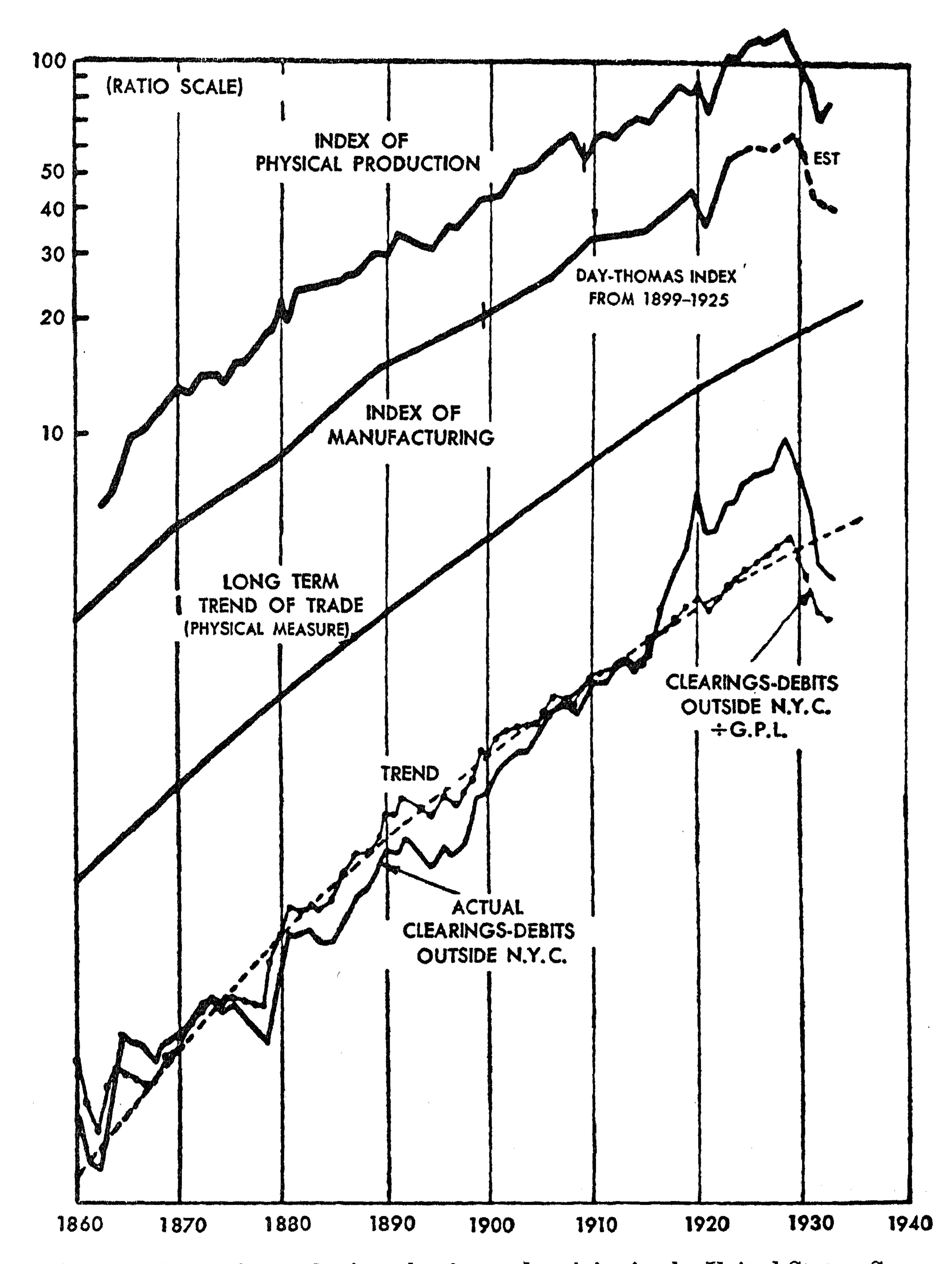


Fig. 12.—Rate of growth of production and activity in the United States. Source: Carl Snyder, "Commodity Prices versus the General Price Level," American Economic Review, XXIV (September, 1934), 394. (The three lower curves show [a] the dollar value of bank clearings and, for later years, bank debits outside New York City; [b] the same series deflated by an index of the general price level; and [c] a trend fitted to the deflated series.)

has also increased, although obviously at a slower rate than has the total production of consumers' goods.

Side by side with the series of production, those of the foreign trade of the various countries deserve attention. Until the first World War the development of international trade was somewhat more rapid than the development of production. This would reflect a tendency toward increasing international division of labor. Since World War I there has been a reaction to this development.

On the whole, less is known concerning the stock variables than concerning the variables indicating flows. We have already given some indications concerning the development of the

### TABLE 7\*

NET VALUE OF PRODUCTION OF INVESTMENT-GOODS INDUSTRIES IN PER CENT OF THAT OF TOTAL INDUSTRY IN THE UNITED KINGDOM, 1740-1924

1740	16	1881	. 47
1783	29	1907	. 58
1812	31	1924	. 53†
1851	40		

\*W. Hoffmann, Wachstum und Wachstumsformen der englischen Industriewirtschaft von 1700 bis zur Gegenwart (Jena, 1940).

†On the basis of later data it can be ascertained that this reduction was only temporary.

stock of capital goods. Some information is available further, concerning the stocks of raw materials. Generally speaking, these stocks have increased less rapidly than the corresponding figures on production; this would indicate a certain rationalization in the use of inventories, made possible in part by more rapid means of communication and in part by improvements in the technique of production.

# PRICES

After the physical magnitudes, we consider prices. Over the last century and a half, nominal or money prices do not show any pronounced general trend, but their movement shows very characteristically the so-called "long waves." If one considers prices over much longer periods than those we study here, a pronounced upward movement can be clearly observed from available fragmentary data on prices in past centuries.

In the nineteenth and twentieth centuries, however, no such tendency can be spotted; in fact, there are some indications of a falling long-run trend for prices of finished industrial products; but the validity of any price comparison of industrial goods over long periods of time is greatly affected by the qualitative improvement of many commodities. Long waves in prices are shown clearly by the fact that most price series show

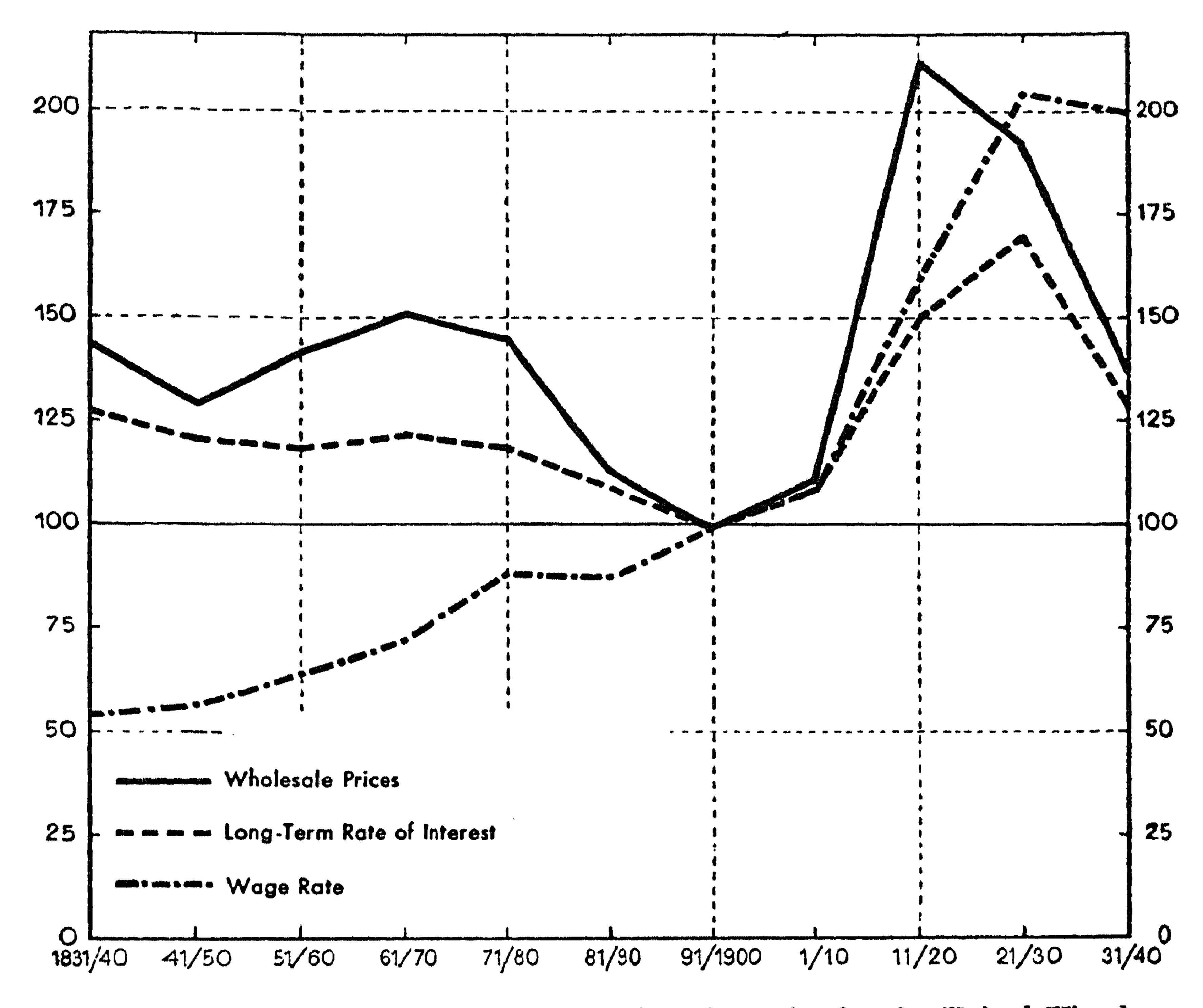


Fig. 13.—Long-run development of certain price series for the United Kingdom (1891-1900 = 100).

a peak around 1810, another one around 1873, and one around 1920; and troughs in 1850, 1896, and 1933 (see Fig. 13). The first peak comes shortly after the period of the Napoleonic Wars, the second one after the Franco-German War and the American Civil War, and the third one after the first World War. The first and the last one of these peaks were no doubt in part caused by the inflation associated with these war periods; for the peak of 1873 this is not so certain.

If, however, no definite trend can be discerned in the movement of nominal prices, a pronounced trend can be seen in relative prices. In particular, the ratio of the wage rate to the general price level has increased almost without interruption, if one abstracts from cyclical fluctuations. The real wage rate, in other words, has increased considerably. There is no pronounced tendency in the ratio between the rate of interest and the general price level. The long waves also show up in the movements of the rate of interest, in particular in the long-term rate.

# FINANCIAL DEVELOPMENT

We may refer, further, to the developments of certain money amounts which are characteristic of the economy. We start with money flows and deal subsequently with money stocks. Important flow series are the value of national income and the shares of it accruing to the various factors of production. For practically all countries both total national income and its various components—income from labor, from capital, and from land—show a very pronounced tendency to increase. Even after allowance is made for changes in the general level of prices and for the increase of population, the series still show an ascending tendency, indicating a tendency for real income per head to increase. It is remarkable that the proportion of income going to the various factors of production has changed very little. The figures given for these proportions depend to some extent on the definitions and the methods of calculation chosen, and these are not the same for all countries; for the two countries, however, for which the most impressive amount of information is available—the United Kingdom and the United States—the percentage of income that goes to labor is remarkably similar and, at least in the United Kingdom, appears to have remained at nearly the same level for over a century (Table 8).

Among the stock variables in terms of money, national wealth and money and banking figures may be mentioned in particular. Here again all figures indicate a very pronounced upward trend. The figures shown in Table 9 refer to the period 1870–1910 which, although representing only a fraction of the

total period from 1800 to the present, is in many respects the most characteristic period of an undisturbed process of growth. More statistical data are available for this period than for earlier years, and certain comparisons are therefore possible which cannot be given for longer periods.

During this period national wealth apparently increased at approximately the same rate as national income, but for both

TABLE 8

NATIONAL INCOME AND ITS DISTRIBUTION

UN	ITED KIN (Billions of			
1. Total national income 2. Labor income 3. (2) as per cent of (1)	1843 0.52 0.33 63	1913 2.17 1.36 62.5	1938 4.67 2 92 62.5	1946 7.97 5.22 65.5
U	NITED ST (Billions of	•		
4. Total national income 5. Labor income 6. (5) as per cent of (4)		1910 30.5 22.5 74	1938 67.4 44.7 66.5	178.2 116.8 65.5

TABLE 9

FINANCIAL DATA CONCERNING THE FOUR LARGEST INDUSTRIAL

COUNTRIES IN 1910

(Index Numbers, 1870=100)

	Germany	France	United Kingdom	United States
National income	* * * * * * * * *	182	194	454
National wealth	* * * * * * * * * * * *	154	183	572
Gold stock of central bank	235	378	177	
Total gold stock in country.			160	1185
Note circulation		257	121	386
Total money supply			190	865
Foreign investments	·	306	271	*
· · · · · · · · · · · · · · · · · · ·	<del></del> ,			

<sup>\*</sup> No figure shown, as in 1870 the United States was still a debtor country.

series the differences between countries were pronounced, the rate of increase being fastest in the United States and slowest in France. The development of the various components of national wealth was also quite divergent. The value of land in the national wealth of England decreased, whereas in Germany and France it remained approximately the same. On the other hand, the value of foreign investments increased greatly, well in excess of the increase in total wealth; but wealth in the form of domestic capital goods also showed a considerable increase during the period.

TABLE 10

DEVELOPMENT AND COMPOSITION OF MONEY SUPPLY IN THE UNITED STATES, 1860-1940\*

	In Bil	LIONS OF D	OLLARS	INP	CENT OF J	OTAL
	1860	1900	1940	1860	1900	1940
Gold coin	0.21	0.61 1.47	0.00 7.85	31	8 21	0 14
Total currency Demand deposits Time deposits	0.44	2.08 5.11	7.85 $33.17$ $15.80$	64 36	29	14 58 28
Total	0.69	7.19	56.82	100	100	100

<sup>\*</sup> Currency in circulation outside Treasury and Federal Reserve banks; deposits of all banks, excluding mutual savings banks. Deposit figures do not include interbank and U.S. government deposits.

The figures relating to monetary and banking statistics also show great increases. They show, further, important shifts among the various components with differences among countries which are much more pronounced than those in the field of production.

Most complete data are available for the United Kingdom. In this country the gold stock at the central bank increased much more rapidly than that of the country as a whole, indicating a concentration of gold in the central bank. The note circulation increased less than either of the two gold series and also less than total money supply, clearly indicating a substitution of deposit money for currency. This same tendency is also clearly shown by the figures for the United States in Table 10.

Whereas in the United Kingdom the money supply increased at approximately the same rate as the national income, it increased much faster than the national income in the United States, indicating apparently a relative extension of the money economy during the period.

In France, as in the United Kingdom, the note circulation decreased relative to the gold stock, whereas in Germany it increased.

In addition to banking statistics, it would be of great interest to have figures concerning the entire money and capital markets, including, for instance, the total value of bonds outstanding at various periods. With the exception of public debt data, however, this information is not available for most countries.

TABLE 11

TOTAL PUBLIC DEBT IN BILLIONS OF NATIONAL CURRENCY

	1870	1910	1930
Germany	0.4	5.0	10.4
France	12.3	32.8	480
United Kingdom	0.80	0.76	7.6
United States	2.44	1.15	16.2

Public debt figures show very clear differences between periods of peace and periods of war. As shown by the figures in Table 11, the total public debt was much larger in Germany and France in 1910 than it had been in 1870, whereas it declined during that period in the United Kingdom and the United States. From 1910 to 1930, however, the figures show an increase for all four countries.

### CHANGES IN TREND AFTER WORLD WAR I

Public debt figures are not the only ones that show a different development since the first World War. In many other respects there was a change in trends. But the many disturbances to which the economies of most countries were subjected in the postwar years make it particularly difficult exactly to discern the new trends. It would seem that the previous tendencies to grow continued but became less regular and less intensive, in

any case with respect to the older industrial countries. On the other hand, in the U.S.S.R., in Latin America, in Japan, and in a number of other countries the development was rapid. The links between the various countries became on the whole somewhat looser, and as a consequence the general picture became less homogeneous. Economic nationalism put many obstacles in the way of increasing world trade, and tendencies in this direction were reinforced by the great depression. International trade declined somewhat in proportion to world production. Similarly, the significance of foreign investments declined. As a consequence of the many disturbances in the economies of various countries, the cyclical and incidental movements tended to dominate the long-run tendencies of growth which were so clearly visible in the period from 1870 to 1910. In a description of the interwar period, cyclical and incidental movements are of much more significance than the long-run trend; it is for this reason that we have confined ourselves in this chapter mainly to the period before World War I.