
ARTICLES

International Industrialization Levels from 1750 to 1980

Paul Bairoch
University of Geneva

General Introduction

Very few attempts have been made to estimate levels of industrialization. One must first discard the very incomplete and rough estimates made by the early investigators of national accounting systems, since they rarely paid attention to the problem of the level of industrialization, which did not seem important at the time. The first relatively serious estimate was made by Mulhall (1896), and concentrated mainly on data for the year 1894 (although including partial data from the period 1820 to 1894). Subsequent estimates derived essentially from calculations of the indices of world (or regional) industrial production and are therefore based on national indices of production which inevitably gives rise to problems of weighting. The first of these estimates was apparently made by Dessirier (1928), but this covered only a small group of countries (the criteria on which the weighting was based were not clearly stated). Much more ambitious and carefully elaborated were the estimates of Wagenfuhr (1933) for 1928 and that of the League of Nations (1936) based on the period 1925-28. For more recent years, mention should

be made of the estimates for the OECD countries in 1938 and 1950 made by Paretti and Bloch (1956), and especially those of the Statistical Office of the United Nations (United Nations 1965) for the period 1938 to 1961. Using the data contained in these estimates together with other contemporary sources, particularly production indices, a number of retrospective estimates have also been attempted — notably those by Maizels (1965) which go back to 1899, and by Lewis (1978) which go back to 1913.

Thus, there is as yet very little if anything available on the earlier periods of industrialization. It was for this reason that we made a first attempt in early 1960 to estimate levels of industrialization in the XIXth century (Bairoch 1965), but we did not go beyond proposing a general classification per country for the different periods. In the process of elaborating a European index of industrial production (Bairoch 1976) we have used these and additional data to attempt a more comprehensive estimate for 1860 and 1900. Preparation of an encyclopaedia entry on industrialization (Bairoch 1979) and other intermittent research on the process of industrialization in under-developed countries have led us to take a rather critical attitude towards both our own and other available estimates, since these all tend to pay too little attention (when any is given) to the more traditional industrial sectors with the result that there is an inbuilt bias both in the calculations of relative levels of industrialization and in the scale of the historical expansion of production. For the encyclopaedia entry mentioned above we produced an initial set of calculations which provided a less imperfect picture of the situation. Very probably the numerous additional calculations carried out in the course of preparing the present paper allowed us to reduce the margin of error even further. One of the principal objectives of these data has also been to attempt to establish the level of industrial production in the western nations on the eve of the Industrial Revolution.

Those readers with a particular interest in the key methodo-

logical problems should turn to the Appendix, which describes and explains the methods and the criteria used to obtain the series which are presented and discussed in the main text. This Appendix also provides information on geographical and sectoral distinctions, on definitions adopted, on margins of error in the different series, and on the primary sources. At this point one need only say that the analysis is limited to manufacturing industry that is industry in general with the exception of mining, construction electricity, gas and water (see Appendix, section B). "Manufacturing industry" covers the entire field of production, without differentiating between different levels of technology or organisation structures of firms. The term "modern industry" refers to all those (variable) sectors affected by modern technology (no matter what the form of firm organisation). But in this case, and in the absence of pertinent information, the distinctions are in terms of sectors. Until 1860 "modern industry" comprised the modern textile sector (mainly cotton but including elements of other fibre industries) and the non-traditional iron industries. After 1880, the chemical industry is added to the group and in 1913, cement and aluminium. After 1913 the distinction between those two types of industry becomes increasingly complex and arbitrary, and ultimately reduced to purely technological criteria. Except where otherwise stated, the national data refer to the national geographical boundaries of the period in question.

Since the principal object of this essay is to present the results of our calculations, the analysis has been restricted solely to describing and explaining the salient factors. This means that we have deliberately left aside many important aspects of the subject such as the causes which lay behind different patterns of development; neither have we attempted any discussion of the interactions evident in the process of industrialization. Had we tried to do this we would either have been forced to adopt a distorting and over-simplified style of analysis, or else far outrun the length permitted for an article.

To facilitate the presentation of these series covering three centuries, we decided to adopt the following procedure: *Part A* will be devoted to an analysis of the principal trends in the period 1750-1980; *Part B* will focus on the period 1750 to 1913; *Part C* will cover the period 1913 to 1980. We should also mention that the figures for the period 1800-1938 are based on triennial or quinquennial annual averages (except for 1913). In the same way, we also tried to eliminate the effects of short-term conjunctural fluctuations for 1938 and for 1980.

A. *The principal trends — 1750 to 1980*

Seen on a world scale, the industrial take-off which resulted from the Industrial Revolution was an extremely slow phenomenon. Although things began to speed up rapidly in England, the cradle of the Industrial Revolution (from as early as 1740-60) a century later industrial production had still not even doubled in world terms. Even more important — since this is the really crucial ratio — it had only increased by between 5% to 10% in terms of *per capita* production. This slowness is due above all to the fact that England was a very small part of the world — England's population around 1750 was less than 1% of world population — and also that the changes which had occurred in England's industrial production took over half a century to be imitated and followed elsewhere. The first imitators were most notably Switzerland, Belgium, France and the United States.

Another reason for the slowness of the process can be found in the ways in which manufacturing developed in those countries destined to be included in the Third World. Our data suggest that in the period 1750 to 1800, when the adverse effects of colonization were not as yet being experienced in these countries, their performance was not very positive. In fact, the available data (particularly for China) suggest that this was one of those difficult periods for the traditional societies when production ex-

TABLE 1
PRODUCTION OF WORLD MANUFACTURING INDUSTRIES (1900 = 100)

	Total production		Population (millions)	Per capita production	
	1900 = 100	Annual growth rate		1900 = 100	Annual growth rate
1750	(23.6)		781	(49.4)	
1800	(27.2)	(0.3)	969	(46.0)	(- 0.1)
1830	34.1	(0.8)	1116	50.1	(0.3)
1860	41.8	0.7	1280	53.5	0.2
1880	59.4	1.8	1437	67.7	1.2
1900	100.0	2.6	1638	100.0	2.0
1913	172.4	4.3	1812	155.8	3.5
1928	250.8	2.5	2026	202.8	1.8
1938	311.4	2.2	2216	230.1	1.3
1953	567.7	4.1	2641	352.1	2.9
1963	950.1	5.3	3196	486.9	3.3
1973	1730.6	6.2	3874	731.7	4.2
1980	2041.6	2.4	4410	758.3	0.5

Sources: Author's computations and estimates.

Notes:

The degree of rounding off of the figures does not imply a correspondingly low margin of error. Figures in parentheses have a higher margin of error than other figures for the same periods.

panded more slowly than population. After 1813, however, there is even evidence that the total volume of manufacturing production of the Third World was beginning to fall due to the impact of imports from the metropolitan countries. The date given above is quite precise due to the removal of the British East India Company's trade monopoly, which had hitherto closed the Indian market to imports of European manufactured goods and even tended to favour the export of Indian textile goods. We shall return to this point later on.

Due to the geographical diffusion of the process of industrialization and the rapid progress made by the industrial sector within the United Kingdom, industrial production grew rapidly from the period 1840-1850. By about 1860 the United Kingdom alone was producing manufactured goods equivalent to 35 % of the to-

tal world production in 1750 (see Table 2). At that time, the members of the future developed world, whose inhabitants amounted to 28 % of the world population, had achieved a level of production which had already exceeded the total world industrial output for 1750. It is in the years 1830 to 1860 that this division between the future developed world and the Third World, which was to have such important consequences, began to take clear shape. The industrialization of the former led to the deindustrialization of the latter, and the proportional contribution of each region to the total output of manufacturing production was almost exactly reversed. If we include Japan with the Third World countries of that time, these still held some 63 % of total world manufacturing potential in 1830, as against 37 % for Europe and North America: by 1860 the proportions had become 39 % and 61 % respectively.

After 1860 and up to the First World War, the rate of growth in manufacturing output began to speed up consistently. There were a number of reasons for this acceleration: the deindustrialization of the Third World countries no longer affected world production levels; industrialization had now spread to the majority of European as well as a number of extra-European countries; and after the general depression of 1870-90 there was a lively phase of expansion. Between 1860 and 1913 the total volume of world manufacturing output increased fourfold (or threefold in terms of *per capita* production). Despite the effects of the two wars and the depression of the 1930s, at the end of the period of reconstruction in 1953, the world's industrial potential ¹

¹ We use the term industrial potential to mean the volume of production thereby arbitrarily assimilating the productive capacity and the volume of production. However, except for 1938 and for 1980, it is likely that in the western developed countries the difference between levels of production and practical capacity were not too important and relatively constant in the long term. Information on the gap between actual output and capacity is relatively rare even for the contemporary period. As far as we know the United States is the only country that produces such figures for all branches of manufacturing industry, and here one can follow this pattern from 1925, and more

TABLE 2

DEVELOPMENT OF MANUFACTURING PRODUCTION
BY MAJOR REGIONS (U.K. IN 1900 = 100)

	Developed countries			Third World	World
	United Kingdom (a)	United States	Total		
<i>Absolute volumes</i>					
1750 (b)	2	—	34	93	127
1800 (b)	6	1	47	99	147
1830	18	5	73	112	184
1860	45	16	143	83	226
1880	73	47	253	67	320
1900	100	128	481	60	541
1913	127	298	863	70	933
1928	135	533	1258	98	1356
1938	181	528	1562	122	1684
1953	262	1373	2870	200	3070
1963	334	1804	4699	439	5138
1973	471	3089	8432	927	9359
1980	454	3475	9718	1323	11040
<i>Percentages of the world total</i>					
1750 (b)	1.9	0.1	27.0	73.0	100.0
1800 (b)	4.3	0.8	32.3	67.7	100.0
1830	9.5	2.4	39.5	60.5	100.0
1860	19.9	7.2	63.4	36.6	100.0
1880	22.9	14.7	79.1	20.9	100.0
1900	18.5	23.6	89.0	11.0	100.0
1913	13.6	32.0	92.5	7.5	100.0
1928	9.9	39.3	92.8	7.2	100.0
1938	10.7	31.4	92.8	7.2	100.0
1953	8.6	44.8	93.5	6.5	100.0
1963	6.5	35.1	91.5	8.5	100.0
1973	5.0	32.6	90.1	9.9	100.0
1980	4.1	31.2	88.0	12.0	100.0

(a) 1913 boundaries.

(b) Very approximative figures.

Sources: Author's computations and estimates.

Note: The degree of rounding off of the figures does not imply a correspondingly low margin of error.

reliably since 1947. In the market economies, adjustments between levels of production and practical capacities for production are generally quite rapid, whereas the situation may be quite different in the Third World and in the planned economies.

was three times greater than in 1913, and 20 times greater than in 1750. The growth effected in this period was not only due to the expansion that had occurred in the developed countries, but was also a result of the fact that the process of de-industrialization had halted in the Third World, although at this time the Third World still could claim only 5% of the increase of total output.

Since the end of the Second World War, by virtue of the combination of an extremely rapid process of expansion in both the developed and the Third World countries, there has been a totally unprecedented rate of growth in world industrial output, which grew by 6.0% per annum (4% *per capita*) between 1953 and 1973. In this same period the Third World already contributed a much larger share to this expansion, and accounted for 11% of the total growth in industrial output. The accumulated world industrial output between 1953 and 1973 was comparable in volume to that of the entire century and a half which separated 1953 from 1800. It is therefore easy to understand why the problems of pollution and those of the risk of exhaustion of natural resources reached critical levels in this phase of rapid growth. Between 1973 and 1980, despite the oil crisis and the depression of 1974/5, world industrial production continued to grow at the rate of 2.4% per annum. By 1980 the level of world industrial production was 80/95 times that of 1750. However, since in the meantime the world population increased sixfold, *per capita* production has risen only by a factor of 15. But this 15 is considerable in its own right since it is worth pointing out for comparative purposes that it is highly unlikely that in the same period the production of agricultural goods *per capita* has multiplied by more than 3². In terms of the rate of expansion of pro-

² On the basis of average consumption figures in calories, and after translating animal calories into vegetable calories, one can estimate that the *per capita* agricultural production in the Third World for this period increased at best by 20% (and at worst fallen by 20%), whereas in the developed countries it has increased by a minimum

ductivity, the difference is much less (if at all) but this another question that will not be approached in this study.

As we have already indicated the pattern of development was very different in the major economic regions of the world. While the XIXth century saw the industrialization of the Western World, it also saw the de-industrialization of the Third World. There cannot be any question but that the cause of the de-industrialization in the Third World lay in the massive influx of European manufactured products, especially textiles, on the markets of these countries. These products by virtue of the huge progress in productivity that had been achieved could be sold much more cheaply than the local artisanal and craft products. In England from as early as 1830/40, the mechanisation of spinning had increased productivity in this sector by a factor of 300 to 400. The difference in wages was a very moderate one. A spinning worker in England probably earned a wage that was only 50 to 70 % higher than that of an Indian textile craftsman. Given the generally low levels of English wages at this time the gap may well have been even less, perhaps in the order of 20-50 %. Low wage costs meant that even allowing for transport costs and the profits of the intermediaries who were indispensable for such operations, exports to these distant markets remained profitable. Access to those markets were in addition guaranteed by the fact that the metropolitan countries imposed a strictly one-way form of commercial liberalism in nearly all their colonies. In India, a typical example of the process of de-industrialization, the massive imports of British manufactured goods date from 1813. By 1814 the imports of cotton fabrics had risen to 1 million yards, and were to reach 51 millions in 1830, 995 millions in 1870 and 2050 millions by about 1890 (Desai, 1971) (equivalent to about 7.2 yards [6.5 metres] per inhabitant).

of 160% and a maximum of 250% (depending on the assumed starting point for consumption. That means a range of *per capita* world increase of agricultural production varying from 110 to 190% during those 230 years (from 1750 to 1980).

The volume of the Third World's manufacturing output fell until the beginning of the XXth century. We estimate (although this is a rather rough calculation — see the Appendix) that by that time the *per capita* output was a little less than a third of what it had been in the mid-XVIIIth century. In view of this low restarting point and of the process of re-industrialization which was also beginning to make itself felt in the Third World from the 1880s onwards, it seems likely that industrial production expanded by over 130% between 1900 and 1953. However, since production was expanding even more rapidly at this time in the developed countries, in 1953 the Third World countries occupied the lowest relative position ever, with only 6-7% of the world's industrial production.

While there is no doubt that the de-industrialization of the Third World was either entirely or in very large part due to the industrialization of the West, the question may still be asked to what extent the industrialization of the West was assisted by, or dependent on, the markets provided by the Third World? Data which we collected for the present study provide various indications on this subject, which can be used to complement information drawn from other sources and approaches. By accumulating annual production we calculated the total volumes of production in these two regions of the world, and also estimated the total domestic volume of the consumption of manufactured products in the Third World on the basis of various hypotheses for the growth of *per capita* consumption. It can then be assumed that difference between the estimated volume of consumption and the estimated volume of indigenous production must have been met by imports from the advanced countries. In view of the declining living standards of the populations of the Third World, it seemed unduly optimistic to assume that the *per capita* consumption of manufactured products would have remained stable, an extremely pessimistic hypothesis allows for a fall of 30%.

Table 3 presents calculations for six different estimates based on varying consumption patterns within these two extremes.

TABLE 3

PERCENTAGE OF THE MANUFACTURING OUTPUT OF THE DEVELOPED COUNTRIES EXPORTED TO THE THIRD WORLD DEPENDING ON THE DIFFERENT HYPOTHESES OF THIRD WORLD CONSUMPTION

Hypothesis on the consumption per capita of manufactured goods in the Third World	1800 to 1860	1860 to 1913	1800 to 1913
Consumption:			
Stable throughout the period	10.9	14.9	14.5
With a (total) decline of 10% between 1800 and 1913	9.2	12.3	11.7
With a (total) decline of 10% between 1800 and 1860 and a recovery to earlier levels by 1913	5.3	13.0	11.5
With a (total) decline of 10% between 1800 and 1860 and statu quo after	5.3	11.1	9.9
With a (total) decline of 20% between 1800 and 1913	4.4	8.8	7.9
With a (total) decline of 30% between 1800 and 1913	0.5	5.9	4.9

Sources: Author's computations and estimates. See the text.

Leaving aside the two extreme hypotheses and allowing for a margin of error in the data, the present approach would suggest that 6-14 %, with a mean average around 10 % of the manufactures produced in the developed countries were exported to the Third World during the XIXth century. Using foreign trade statistics, we also estimated (Bairoch 1980) that between 1800 and 1938 the percentage was between 5 and 8 %. Allowing for the fact that a smaller percentage of manufactured goods was exported to Third World countries between 1913 and 1928 than during the last part of the preceding century, the two sets of estimates match fairly well. This would seem to suggest that the damage caused to Third World industries did not in fact have a correspondingly massive positive effect in the developed countries. Taken as a whole, the access to the markets of the Third World was no more than a subordinate stimulus to the industries of the developed

countries. Although this appears true in general terms, one must also examine national particularities. Certainly, in the case of the United Kingdom the relative contribution of the markets of the Third World countries was at least two times greater than for the average of the industrial countries. But even in this case, the contribution of the markets of the Third World came only after some five and six decades of modern industrial development had already taken place. On the other hand it is obvious that even a marginal additional outlet may have a sizeable influence on the profitability of an industrial sector. However one should also remember that these outlets might also imply certain negative features: for example since they were easy markets they did not encourage innovation and were therefore unlikely to become a factor in encouraging technological changes. Although the United Kingdom might seem to illustrate this particular thesis very well, such an explanation would clearly not be sufficient on its own to explain the loss of vitality in British industry which became evident already in the years 1880-1890.

Hitherto, and in the pages which follow, we talk of levels of industrialization in terms of volume of manufacturing output *per capita*. It must be said that this is a rather approximative approach, even though it is a method still widely used today. It remains imprecise, because it means ignoring totally the whole question of productivity. For example let us take as a theoretical case two countries of similar size and in terms of population, the first of which having an industrial output 50% greater than that of the second, yet achieving that output with levels of productivity twice as low as those of the second country; which of the two should we consider the more industrialised? The best solution would be to devise a formula which takes account of the two features and introduces an adequate (but of necessity, arbitrary) system of weighting. Such an approach is extremely difficult to apply even for contemporary data, and it becomes virtually useless when applied to historical data. That is why we shall

use the term "level of industrialisation" in its traditional sense — the *per capita* volume of industrial production. We also wanted to try to estimate the variations in labour productivity by means of the ratio between the total volume of production and the numbers employed in the industrial sector, but due to the immense task involved in homogenizing data on the active working population we have been forced for the time being to leave this question aside.

TABLE 4

PER CAPITA LEVELS OF INDUSTRIALIZATION
(U.K. in 1900 = 100; 1913 boundaries. See notes below)

	1750	1800	1860	1913	1928	1953	1980
DEVELOPED COUNTRIES	8	8	16	55	71	135	344
Europe	8	8	17	45	52	90	267
Austria-Hungary (a)	7	7	11	32	32	104	342
Belgium	9	10	28	88	116	117	316
France (b)	9	9	20	59	78	90	265
Germany (c)	8	8	15	85	101	138	393
Italy	8	8	10	26	39	61	231
Russia (d)	6	6	8	20	20	73	252
Spain	7	7	11	22	28	31	159
Sweden	7	8	15	67	84	163	409
Switzerland	7	10	26	87	90	167	354
United Kingdom	10	16	64	115	122	210	325
Outside Europe							
Canada	—	5	7	46	82	185	379
United States	4	9	21	126	182	354	629
Japan	7	7	7	20	30	40	353
THIRD WORLD	7	6	4	2	3	5	17
China	8	6	4	3	4	5	24
India (e)	7	6	3	2	3	5	16
Brazil	—	—	4	7	10	13	55
Mexico	—	—	5	7	9	12	41
WORLD	7	6	7	21	28	48	103

(a) After 1913, the weighted average of Austria, Hungary and Czechoslovakia.

(b) In order to take into account territorial changes we have subtracted 5% from the levels between 1928 and 1970.

(c) After 1928 East and West Germany.

(d) USSR, after 1913.

(e) India and Pakistan after 1928.

Sources: Author's computations and estimates.

Note: The degree of rounding off of the figures does not imply a correspondingly low margin of error.

The differing patterns of rates of industrial growth in the two segments of the world led to an everwidening gap between their respective levels of industrialization. In 1800 the gap was still quite moderate, and the average level for the future developed world was only some 30-40% higher than that for the future Third World, while the latter was still very close to the situation of the less developed European countries like Russia (See Table 4). Altogether in term of inequality in levels of industrialization, the situation at this time was still very similar to the traditional pre-industrial world. On the basis of our calculations, which are obviously very rough and may well be challenged (we shall be delighted to replace them with something more reliable), we would suggest that in the pre-industrial world the differences in levels of industrialization were very small (see Section 2 of the methodological Appendix). Leaving aside primitive societies, one can estimate that the gap between the least and the most "industrialized" of the pre-industrial countries was of the order of 1.0 to 2.1. This is the case for medium-sized economies (with 3-5 million inhabitants). Between the larger countries the gaps tended to be smaller, and for the smaller countries rather greater. In order of magnitude, while the gaps between the larger countries ranged between 1.0 and 1.5, for the smaller countries they varied between the extremes of 1.0 and 4.0. If we also include primitive societies, the gaps become much greater since certain of these societies living in favourable climatic areas consumed virtually no manufactured goods other than arms, jewellery and toys but hardly any clothing. However since our anthropological knowledge is very limited we have preferred not to risk making any estimate for primitive societies.

Already around 1860 the average gap separating the Third World from the developed world had reached the extreme upper limits of the traditional gaps found between the countries of the pre-industrial world. At that time, the gap between individual countries had reached 1 to 21 and great disparities are found amongst

the developed countries. In fact as we shall see, the disparities in levels of industrialization within the developed world continued to increase until the 1880's. On the other hand, the gap, or rather the abyss, separating the Third World from the developed countries continued to get wider until 1953, at which time it reached the order of 1 to 27; between the most developed and the least developed country, the gap was in the order of 1 to 400 or more.

Before moving on to describe and analyse in greater detail the type of evolution that occurred during the XIXth and XXth centuries, let us first look at the long-term upheavals in the relative positions of the leading industrial powers. *Table 5* classifies, on the basis of total output, the 20 leading industrial countries. The most striking feature is the great lack of uniformity in patterns of growth, so that each half century sees a reordering of the relative positions held by at least four-fifths of the countries. In 1860 the traditional industries still held a very important place, which explains why some heavily populated countries such as China and India were still the second and third most important industrial powers in the world, "Great Russia" occupied the third position in Europe. Naturally, as can be seen by glancing at *Table 6* below, the rankings in terms of *per capita* industrial output are completely different. But let us stay for the moment with the ranking by total industrial potential. In 1913 China still held seventh place with only 4% of world industrial potential, even though its population was over a quarter that of the entire world. The combination of a high level of industrialisation and a large population now placed the United States in the leading position (the USA overtook the United Kingdom during the period 1888-1895). By 1913 a small country like Belgium, with less than 8 million inhabitants had attained a gross industrial output which exceeded that of India, whose population was over 310 millions.

For the period 1913-1980 three particularly striking developments can be noted. The first is the rapid industrialization of

TABLE 5

THE TWENTY LEADING WORLD POWERS IN TERMS OF TOTAL MANUFACTURING OUTPUT
(the figures following the country's name represent levels of industrialization relative to the U.K. in 1900 = 100)

1860		1913		1953		1980	
1	United Kingdom 45	United States 298		United States 1373		United States 3475	
2	China 44	Germany 138		Russia 328		Russia 1630	
3	India 19	United Kingdom 127		United Kingdom 258		Japan 1001	
4	France 18	Russia 77		Germany West 180		Germany West 590	
5	United States 16	France 57		France 98		(China) 553	
6	Russia 16	Austria-Hungary 41		Japan 88		United Kingdom 441	
7	Germany 11	China 33		(China) 71		France 362	
8	Austria-Hungary 10	Japan 25		Italy 71		Italy 319	
9	Japan 6	Italy 23		Canada 66		India 254	
10	Italy 6	Belgium 16		India 52		Canada 220	
11	Spain 4	India 13		(Germany East) 44		(Poland) 169	
12	Belgium 3	Sweden 9		(Czechoslovakia) 36		Brazil 159	
13	Switzerland 2	Canada 9		(Poland) 31		(Germany East) 157	
14	Sweden 1	Switzerland 8		Australia 31		Spain 156	
15	Brazil 1	Brazil 4		Sweden 28		(Czechoslovakia) 129	
16	Mexico 1	Netherlands 4		Belgium 25		Korea 125	
17	Netherlands 1	Mexico 3		Netherlands 24		(Roumania) 118	
18	Portugal 1	Denmark 2		Spain 22		Jugoslavia 103	
19	Roumania 1	Roumania 2		(Hungary) 21		Australia 88	
20	Canada 1	Portugal 2		Switzerland 20		Netherlands 84	

Source: Author's computations and estimates.

Note: The ranking order of the countries in parentheses is more approximative.

Japan and the USSR, which ensured them second place in the world total production, ranking behind the USA, even though the gap separating them from the USA remained important. The second is the declining position of the United Kingdom and Germany, although in the latter case this is mainly due to the political division of the country after the Second World War. The decline of economic vitality is certainly the most important factor in accounting for the fall of UK by 1980 to 6th place in the world ranking. The third striking development is the appearance amongst the ranks of the industrialised nations of a number of countries which formerly had only very low levels of industrialization. Amongst these are Spain, Poland, South Korea and Taiwan (the last two being placed respectively between the 15th-17th place and the 22nd-24th place). For this reason, the three small but highly industrialised countries (Belgium, Sweden and Switzerland) which always ranked among the 20 (or in fact 15) leading industrial powers, disappear from this leading group.

The changes in the levels of industrialization in *per capita* terms (see Table 6) have been much less dramatic than the changes in industrial potential, this being mainly because these do not take account of the different rates of population growth, which are far from negligible even within specific economic regions.³ Since 1860 no non-Western country except Japan has figured among the 18-22 most industrialized countries. Notice should be taken of the fact that the smaller countries have tended to hold a very high position (both the European countries and also Canada). This tendency had become even more pronounced by about 1913. On the eve of the First World War, seven of the twelve most industrialised nations were small countries.

³ For example, between 1800 and 1928 the population of Germany increased from 92% to 158% that of France; that of the United States from 34% to 264% that of the United Kingdom. In addition, the *per capita* level eliminates at least in part the effects of changes in frontiers.

TABLE 6

THE TWENTY LEADING INDUSTRIALISED COUNTRIES IN TERMS OF PER CAPITA MANUFACTURING OUTPUT
(the figures following the country's name represent levels of industrialization relative to the U.K. in 1900 = 100)

1860			1913		1953		1980 (a)	
1	United Kingdom	64	United States	126	United States	354	United States	629
2	Belgium	28	United Kingdom	115	United Kingdom	210	Sweden	409
3	Switzerland	26	Belgium	88	Canada	185	Germany West	395
4	United States	21	Switzerland	87	Switzerland	167	(Germany East)	393
5	France	20	Germany	85	Sweden	163	Canada	379
6	Germany	15	Sweden	67	Denmark	149	Finland	371
7	Sweden	15	France	59	Australia	146	Denmark	356
8	Austria-Hungary	11	Canada	46	Germany West	144	Switzerland	354
9	Finland	11	Denmark	33	Norway	129	Japan	353
10	Norway	11	Austria-Hungary	32	Belgium	117	(Czechoslovakia)	344
11	Netherlands	11	Norway	31	New Zealand	117	(Hungary)	333
12	Spain	11	Netherlands	28	(Czechoslovakia)	117	United Kingdom	325
13	Denmark	10	Italy	26	(Germany East)	100	Austria	325
14	Italy	10	Spain	22	Netherlands	96	Belgium	316
15	Russia	8	Finland	21	France	95	France	277
16	Portugal	8	Japan	20	(Hungary)	92	(Russia)	252
17	Canada	7	Russia	20	Austria	90	Australia	249
18	Japan	7	Australia	19	(Russia)	73	New Zealand	248
19	Greece	6	Portugal	14	Italy	61	Norway	246
20	Roumania	6	Roumania	13	Finland	53	Netherlands	245

(a) The very small differences between the countries (excepting the USA) mean that the first 6-8 placings have little real significance.

Sources: Author's computations and estimates.

Note: The ranking order of the countries in parentheses is more approximative.

However, at the same time, not all the smaller countries were highly industrialized by any means — and, as in the case of the larger countries, the dividing line tends to fall in the middle of Europe: to the north and west we find the more industrialised countries, to the South and East the less industrialised.

Although by 1953 almost every country had regained and surpassed its prewar levels of per capita production, the effects of the war can still be detected easily in the rankings. Japan, for example, is no longer to be found amongst the 20 leading industrial nations (its place was now between 24th-28th), whereas those countries that had not been engaged in the conflict (or only partially) had moved up the scale. The classifications for 1980 need to be treated with reservation for two reasons: the margin of error in the data for 1980 is probably greater than that for 1973 and 1963 (since the figures rely in both cases on the changes which occurred since 1963); secondly, and this is even more important, because of the very slight range of dispersal, which means that for the thirty countries ranked after the United States a variation of only 5% one way or the other can result in a move of 4 to 6 places. In addition, and this is a feature which we shall return to later, one of the main characteristics of economic development during the period 1953 to 1980 was an equalization of levels of per capita production among the industrialised nations. This process is clearly evident from *Table 6*: the gap between the 1st and the 20th country in 1953 was of the order of 1 to 6 — by 1980 it was less than 1 to 3. Another major reservation concerns the ranking of the Eastern European countries, where it must be remembered that the figures very likely contain a high margin of error. Finally, one should also point out that even by 1980 there is still no Third World country ranking among the 20 most industrialized nations. In fact, the leading Third World country (Taiwan) holds the 24th-28th place on the world ranking, while North Korea is between 28th-32nd and Brazil and Mexico only 31st-37th.

B. 1750-1913 - The period of upheavals and a break with the past

The very slow growth of *per capita* production of manufactured goods has already led us to emphasize the limited nature of the changes brought about, by industrialization before the 1830s. Another indicator of this same situation is provided by the relative contribution during the 1750-1913 period made by "new technology" industries to total production (see Table 7).

TABLE 7

THE SHARES OF "NEW TECHNOLOGY" INDUSTRIES
IN THE TOTAL MANUFACTURING OUTPUT BY REGIONS
(in percentage)

	Developed countries (excluding Japan)			Third World	
	United Kingdom	Other countries	Total	(excluding Japan)	World (Japan included)
1750	0-1	0	(a)	0	(a)
1800	6-10	1-3	2-4	(a)	1-2
1830	32-40	6-10	12-17	0-1	4-6
1860	60-70	18-24	29-36	0-1	17-23
1880	62-74	30-38	40-48	1-3	30-38
1900	68-78	49-57	52-61	4-9	49-56
1913	72-80	55-65	60-65	10-19	54-62

(a) Less than 0.5%.

Sources: Author's computations and estimates. See the text.

Obviously the definition of 'new technology industries' has to be rather rough yet this is still an extremely important general indicator of predominant tendencies.⁴ By about 1830 probably rather less than 6% of world industrial production was the result of new technology industries. At the same time, more

⁴ Our estimate of the importance in each region and in each period of the relative contribution of the "new technology" industries is based not only on distinctions made between sectors, but also within sectors. In the case of cotton, for example, we have

than half of the total new technology industries were concentrated in the UK (or more accurately, in Great Britain given the very low level of industrialization in Ireland). By 1860, that is more than a century after the start of the industrial revolution, new technology industries accounted for barely one-fifth of world industrial production.

Even in the future developed countries, the new technology industries were only contributing about one-third of manufacturing output in 1860. True, in the UK this percentage was much higher and probably reached about two-thirds, but over a century had passed since the first great upheaval in this "first industrial nation". In the case of the other developed countries around 1860, the share of the new technology industries was still only about one-fifth.

These proportions, as we have pointed out, concern the relative shares of production. But in terms of employment, the relative share of the new technology industries in total employment was at this time lower, since in general the value added per employee was higher than in the traditional sectors. One can make the following estimates for the percentage of the industrial workforce employed in the new technology industries by about 1860⁵: United Kingdom 50-58%; other developed countries 10-18%; the developed countries collectively (excluding Japan) 23-31%; the world 14-21%. On the other hand, if we retain the price structures existing before the Industrial Revolution the role of the new technology industries in production becomes quite large — something like 40-50% in terms of production for the developed countries and 25-35% for the

used a different "new technology" weighting factor for each region and in each period for spinning and for the rest of the operations of the sector. Although these percentages have been derived from a huge mass of direct and indirect information, they are of course only approximations.

⁵ Estimating arbitrarily the value added per employee in the "new technology" industries to be 40% higher than in the traditional industries in the UK (30% higher elsewhere).

world. These are of course highly approximative figures, but they indicate orders of magnitude. Even taking these last percentages into account however, it is clear that by 1860 we are still far from a situation in which the new industries held a massive lead. The industrial world of the XIXth century was then one that had been subject to major changes but which still bore for a long period the clear imprint of the past.

Finally things did not begin to speed up until around 1880-1890, and this was then due to the acceleration in the rate of industrial growth and to the appearance of new sectors of industry, two developments which were inter-related. It was probably sometime between 1890 and 1895 that the contribution of the new technology sectors reached the 50% level for the first time in the developed countries. In the UK, this level had already been achieved around 1850, whereas the less industrialised countries of the developed world were not to achieve it until after the First World War. In terms of average even for the whole of the world by 1900 the new technology sectors represented about half the total industrial production, which was in part due to the decline in relative importance of the Third World.

At the outbreak of the First World War, nearly two-thirds of world manufacturing industry had been affected by new technologies, and even their effect on employment was now approaching 50%. One should also remember that this 50% was related to a world labour force which had itself grown considerably. Actually, one can estimate that between 1800 and 1913, the total employment in manufacturing in Europe (excluding Russia) had grown from about 6 to some 38 millions, with the rate of growth being much greater in North America and Russia.

Let us now turn to the regional components of these changes. Between 1750 and 1830, the industrialization of Europe mainly concerned the United Kingdom where manufacturing output rose in the period by a factor of 7. Elsewhere, and only with

the exceptions of Switzerland, Belgium and, to a much lesser degree, France, the growth rate of industrial output did no more than parallel population growth. It is important to remember that between 1750 and 1830 Europe's population — excluding the UK but including Russia — rose from some 145/155 millions to about 218 millions. If we eliminate population expansion, then the United Kingdom alone becomes responsible for two-thirds of Europe's industrial growth of output during these 80 years.

Outside Europe, the most important changes in the period 1750 to 1830 were the emergence of the United States and the stagnation of the Third World. In the United States, as a result both of the rapid population expansion (1.2 millions in 1750 to 12.9 millions by 1830) and the spread of industrialization, manufacturing output increased by a factor of nearly 50 so that by 1830 the country had become the 6th industrial power of the developed world.

Despite a stagnation of production between 1750 and 1830 the Third World still contributed in 1830 some 50-70% of world industrial output, almost entirely (98-99%) due to the traditional industrial sectors. The appearance of more modern forms of industry were extremely rare and were non-existent in the whole vast area of Asia and black Africa. With regard to North Africa mention should be made of Mehmet Ali's attempts at industrialization, and around 1830 Egyptian industry reached its XIXth century peak. The main industrial centres of Latin America (especially Brazil, Mexico and Columbia) were each probably less important in terms of their industrial productive capacities.⁶

The lead taken by the United Kingdom and the rapid expansion of its industrial production in the years 1830-1860 enabled that country to obtain an ever increasing share of European and

⁶ We use the term "productive capacities" in order to avoid the controversy over the extent to which industrial plants were effectively utilised in Egypt.

TABLE 8

TOTAL INDUSTRIAL POTENTIAL (U.K. IN 1900 = 100;
TRIENNIAL ANNUAL AVERAGES, EXCEPT FOR 1913)

	1750	1800	1830	1860	1880	1900	1913
DEVELOPED COUNTRIES	34.4	47.4	72.9	143.2	253.1	481.2	863.0
Europe	29.6	41.2	63.0	120.3	196.2	335.4	527.8
Austria-Hungary	3.7	4.8	5.8	9.5	14.0	25.6	40.7
Belgium	0.4	0.7	1.3	3.1	5.7	9.2	16.3
France	5.0	6.2	9.5	17.9	25.1	36.8	57.3
Germany	3.7	5.2	6.5	11.1	27.4	71.2	137.7
Italy	3.1	3.7	4.2	5.7	8.1	13.6	22.5
Russia	6.4	8.3	10.3	15.8	24.5	47.5	76.6
Spain	1.6	2.1	2.7	4.0	5.8	8.5	11.0
Sweden	0.3	0.5	0.6	1.4	2.6	5.0	9.0
Switzerland	0.2	0.4	0.8	1.6	2.6	5.4	8.0
United Kingdom	2.4	6.2	17.5	45.0	73.3	100.0	127.2
Outside Europe	4.9	6.2	9.9	22.9	56.9	145.8	335.2
Canada	—	—	0.1	0.6	1.4	3.2	8.7
United States	0.1	1.1	4.6	16.2	46.9	127.8	298.1
Japan	4.8	5.1	5.2	5.8	7.6	13.0	25.1
THIRD WORLD	92.9	99.4	111.5	82.7	67.0	59.6	69.5
China	41.7	48.8	54.9	44.1	39.9	33.5	33.3
India	31.2	29.0	32.5	19.4	8.8	9.3	13.1
Brazil	—	—	—	0.9	0.9	2.1	4.3
Mexico	—	—	—	0.9	0.8	1.7	2.7
WORLD	127.3	146.9	184.4	225.9	320.1	540.8	932.5

Sources: Author's computations and estimates.

Notes:

The degree of rounding off of the figures does not imply a correspondingly low margin of error. For the countries: geographical boundaries at the dates given. For the economic regions: actual boundaries.

world output despite the spread of industrialization to other countries, and by about 1860 the UK was supplying some 37% of total European industrial production equivalent to about 20% of world production. In terms of the new technology industries, the UK's lead was even greater since between 75 and 85% of the industries of this type in Europe were located in the UK. But

after 1860, although Britain remained predominant, and was not to have its lead effectively reduced until 1870-1880, the industrial world became less uni-polar. The new rising industrial powers (France, Germany and above all the United States) had by 1860 together developed a modern industrial potential equivalent to 73% that of the UK — and by 1880 this rose to 108%.

In the 1880's modern industry began to expand quickly in some Third World countries, and between 1880 and 1913 the total volume of output increased by factors between 10 and 14. In view of the very low starting point, even by 1913 the size of these modern sectors was still very small. On the eve of the First World War less than 2-3% of the world's modern technology industries were located in the Third World and the *per capita* output still averaged only 0.1-0.2% that of the developed countries. Because of the very minor importance of this modern sector, the growth of the entire manufacturing sectors of the Third World was not much affected. While the population increased by between 15-20% from 1880 to 1913, the overall volume of production remained more or less static.

In terms of levels of industrialization (see *Table 9*), the spatial confinement of the world's modern industrial development up to the 1830s is even more evident than for total production figures. With the exception only of Switzerland, the United States and of course the United Kingdom, no other country had succeeded in doubling its industrialization level between 1750 and 1830. The variations in the levels of industrialization were indeed greater than they had been in 1750, but they were still small in comparison with later periods. The coefficient of variation between the levels of industrialization achieved by the 19 European countries was 33% in 1800, and rose to 51% in 1830 after which it shot up to 92% in 1860 and to 94% by 1880. After 1880 one sees a process of levelling out both within Europe and throughout the developed world. It was then that a number of countries which had been bypassed earlier were now to become in-

TABLE 9

PER CAPITA LEVELS OF INDUSTRIALIZATION (U.K. IN 1900 = 100;
TRIENNIAL ANNUAL AVERAGES, EXCEPT FOR 1913)

	1750	1800	1830	1860	1880	1900	1913
DEVELOPED COUNTRIES	8	8	11	16	24	35	55
<i>Europe</i>	8	8	11	17	23	33	45
Austria-Hungary	7	7	8	11	15	23	32
Belgium	9	10	14	28	43	56	88
France	9	9	12	20	28	39	59
Germany	8	8	9	15	25	52	85
Italy	8	8	8	10	12	17	26
Russia	6	6	7	8	10	15	20
Spain	7	7	8	11	14	19	22
Sweden	7	8	9	15	24	41	67
Switzerland	7	10	16	26	39	67	87
United Kingdom	10	16	25	64	87	100	115
<i>Outside Europe</i>							
Canada	—	5	6	7	10	24	46
United States	4	9	14	21	38	69	126
Japan	7	7	7	7	9	12	20
THIRD WORLD	7	6	6	4	3	2	2
China	8	6	6	4	4	3	3
India	7	6	6	3	2	1	2
Brazil	—	—	—	4	4	5	7
Mexico	—	—	—	5	4	5	7
WORLD	7	6	7	7	9	14	21

Sources: Author's computations and estimates.

Notes:

The degree of rounding off of the figures does not imply a correspondingly low margin of error.
For the countries: geographical boundaries at the dates given. For the economic regions: actual boundaries.

involved in industrialization — not only the well-known examples of Russia, Austria-Hungary, Italy, Spain, and Japan, but also Denmark, Netherlands and, albeit to much a lesser degree, Portugal and some Balkan states. By 1900 the coefficient of variation between the levels of industrial development achieved among the European countries had dropped back to 83% and by 1913 had levelled off at a little below 80%.

On the eve of the First World War despite this rapid expansion of their industries, the industrial new-comers were still relatively unindustrialized. The level of industrialization achieved by Russia in 1913 was pretty much that of the United Kingdom in 1810 or that of France in 1860. The same was also true for Spain, Japan and Italy, which was the most industrialised of this trio. But the situation was quite different in those countries which were the first to follow in the path opened up by the United Kingdom. For example if the United States was alone in overtaking the UK's level of industrialization by 1913, Germany, Switzerland and Belgium had drawn very close (24-26% lower), France was about 40% behind Germany in 1913. Mainly due to the loss in 1871 of what were her most developed industrial provinces, her industrialization ranking had fallen from 4th/5th place in 1860 to 8th in 1913. By the eve of the First World War even the least developed of the European countries had attained a degree of industrialization which was 20-50% greater than that of the average traditional Western societies on the eve of the Industrial Revolution.

And this average had also increased greatly since 1860. Between 1800 and 1860 the average level of industrialization in the advanced countries rose by 1.2% per annum: between 1860 and 1913 the rate increased to 2.3% per annum. On the eve of the First World War the level of industrialization was seven times greater than it had been on the eve of the Industrial Revolution. If we exclude both Japan and the huge but only slightly industrialized Russia, the average level for the developed countries is increased by 31% and was therefore nine times greater than that of the traditional societies.

Outside the white world, the XIXth century was above all else the age of colonization. And the effect of this colonization reached its greatest intensity in the years between 1840 and 1900. For the Third World countries as a whole, the per capita level of industrialization by about 1900 was probably only a third

TABLE 10

RELATIVE SHARES OF DIFFERENT COUNTRIES AND REGIONS
IN TOTAL WORLD MANUFACTURING OUTPUT (IN PERCENTAGES;
TRIENNIAL ANNUAL AVERAGES, EXCEPT FOR 1913)

	1750	1800	1830	1860	1880	1900	1913
DEVELOPED COUNTRIES	27.0	32.3	39.5	63.4	79.1	89.0	92.5
Europe	23.2	28.1	34.2	53.2	61.3	62.0	56.6
Austria-Hungary	2.9	3.2	3.2	4.2	4.4	4.7	4.4
Belgium	0.3	0.5	0.7	1.4	1.8	1.7	1.8
France	4.0	4.2	5.2	7.9	7.8	6.8	6.1
Germany	2.9	3.5	3.5	4.9	8.5	13.2	14.8
Italy	2.4	2.5	2.3	2.5	2.5	2.5	2.4
Russia	5.0	5.6	5.6	7.0	7.6	8.8	8.2
Spain	1.2	1.5	1.5	1.8	1.8	1.6	1.2
Sweden	0.3	0.3	0.4	0.6	0.8	0.9	1.0
Switzerland	0.1	0.3	0.4	0.7	0.8	1.0	0.9
United Kingdom	1.9	4.3	9.5	19.9	22.9	18.5	13.6
Outside Europe	3.9	4.2	5.3	10.2	17.8	26.9	35.9
Canada	—	—	0.1	0.3	0.4	0.6	0.9
United States	0.1	0.8	2.4	7.2	14.7	23.6	32.0
Japan	3.8	3.5	2.8	2.6	2.4	2.4	2.7
THIRD WORLD	73.0	67.7	60.5	36.6	20.9	11.0	7.5
China	32.8	33.3	29.8	19.7	12.5	6.2	3.6
India-Pakistan	24.5	19.7	17.6	8.6	2.8	1.7	1.4
Brazil	—	—	—	0.4	0.3	0.4	0.5
Mexico	—	—	—	0.4	0.3	0.3	0.3
WORLD	100.0	100.0	100.0	100.0	100.0	100.0	100.0
WORLD: absolute volume (a)	127.3	146.9	184.4	225.9	320.1	540.8	932.5

(a) On the basis: U.K. in 1900 = 100.

Sources: Author's computations and estimates.

Notes:

The degree of rounding off of the figures does not imply a correspondingly low margin of error.

For the countries: geographical boundaries at the dates given. For the economic regions: actual boundaries.

that of 1750. One says "probably" because there is reason to be very careful here particularly since the figures on this point are very crude. But even allowing for inaccuracy (for margins of error see the methodological Appendix) the fall in levels of industrialization certainly exceeded 50%. The decade 1880-1890 saw the beginnings of a process of re-industrialization which made itself felt even within the Third World area as a whole despite the fact that only a few of the countries were involved, since these include many of the very largest: such as China, India, Brazil and Mexico. It is interesting to compare this with the forward surge of the Third World countries between 1953 and 1980, because during this period it was generally the smaller countries that played the main role (see below).

Let us go back for a moment to the case of the United States, which had by 1913 established a clear lead as the greatest industrial power, attaining a degree of industrialization 10% higher than that of the UK and also overtaking the latter's overall industrial potential by 135%. Around 32% of the total world industrial output now came from the United States alone. This overwhelming lead was not fully perceived at the time, and there were two main reasons for this. The first was the very speed of the American expansion, since in 1880 the United States produced only some 15% of world industrial production. Even more important, however, was the fact that the United States, because of its size and other geo-economic factors (its distant position, and huge natural resources of raw and agricultural material), only played a very marginal role in the international trade in manufactured goods. Even in 1913 the United States' share in the world trade in manufactured goods was still around 2.3 times less than its share in the world production of these goods.

C. *The XXth century — a period of very rapid growth and major shifts in the centres of gravity of industrialization*

Even if we start the XXth century in 1913, that is on the eve of a war which was to cause a decline in production for many of the industrialised countries, and even if we end it in 1980 — a date which comes at the end of a six-year period of slowing down — the main feature of the XXth century still remains the very rapid expansion of industrial production. Whereas between 1800 and 1913 world manufacturing production increased 1.5-1.7% per annum, between 1913 and 1980 the annual growth rate was 3.8%. The difference is partly related to a more rapid demographic growth rate (rising from 0.5/0.6% in the XIXth century to 1.3% in the XXth century). But this accounts only in part for the change. In terms of industrial growth *per capita* the increase is still from 1.0/1.2% to 2.4% respectively; the rhythm of growth was therefore twice as rapid.

At a simplistic, and indeed tautological level of explanation this acceleration of industrial growth results from the coincidence of three factors. The first of these is far and away the most important and would deserve to be studied much more closely; it is the general acceleration of economic growth in the three decades that followed the Second World War. The second factor is the success of centralised planning in establishing basic industries in the less industrialized European countries, most notably in the USSR.⁷ The third factor is the re-industrializa-

⁷ The margin of error in the data on the planned economies and especially the USSR cannot affect the undisputed success achieved in the first phase of industrialization. This success was a good deal more modest than the official figures would have us believe, but it was still quite remarkable until the decade 1960-70. Despite the enormous damage resulting from the war, manufacturing production in the USSR grew (according to our estimates) by 6.8-7.2% per annum between 1928 and 1963 (according to the official figures the annual rate would be about 14%). But once a certain level of industrialization had been achieved, centralised planning proved to be a rather less effective instrument. Again from our own estimates, between 1973 and 1980 production grew by only about 2.8% per annum (the official figure is 5.4%).

tion of the Third World, especially after the period of de-colonization when special priorities were given to this sector.

TABLE 11

TOTAL INDUSTRIAL POTENTIAL (U.K. IN 1900 = 100; ANNUAL FIGURES, EXCEPT 1928 AND 1938 = TRIENNIAL ANNUAL AVERAGES)

	1913	1928	1938	1953	1963	1973	1980
DEVELOPED COUNTRIES	863	1259	1562	2870	4699	8432	9718
MARKET ECONOMIES	715	1089	1288	2380	3624	6547	7388
<i>Europe</i>	380	480	629	801	1361	2290	2529
Belgium	16	22	18	25	41	69	76
France	57	82	74	98	194	328	362
Germany	138	158	214	180	330	550	590
Italy	23	37	46	71	150	258	319
Spain	11	16	14	22	43	122	156
Sweden	9	12	21	28	48	80	83
Switzerland	8	9	9	20	37	57	54
United Kingdom	127	135	181	258	330	462	441
<i>Outside Europe</i>	335	609	659	1579	2263	4257	4859
Canada	9	20	23	66	109	199	220
United States	298	533	528	1373	1804	3089	3475
Japan	25	45	88	88	264	819	1001
PLANNED ECONOMIES	148	169	274	490	1075	1885	2330
U.S.S.R.	77	72	152	328	760	1345	1630
THIRD WORLD	70	98	122	200	439	927	1323
MARKET ECONOMIES	35	51	69	126	255	545	750
India	13	26	40	52	91	194	254
Brazil	4	8	10	18	42	102	159
Mexico	3	3	4	9	21	47	68
PLANNED ECONOMIES	34	47	53	74	184	382	573
China	33	46	52	71	178	369	553
WORLD	933	1356	1684	3070	5138	9359	11041

Notes:

The degree of rounding off of the figures does not imply a correspondingly low margin of error.

For the countries: geographical boundaries at the dates given. For the economic regions: actual boundaries.

The First World War acted as a catalyst in shifting the geographical centres of gravity. Around 1913, Europe's industrial capacity represented about 61 % of that of the developed countries, and consequently the capacity of the non-European developed countries represented 39 %: by 1928 the positions were respectively 52 % and 48 %. Alongside the United States, which by 1928 was producing 42 % of world manufacturing output, Canada, Australia and above all Japan had also emerged as far from marginal industrial powers. After 1930-35 the industrial capacity of the Empire of the Rising Sun certainly overtook that of the ancient Celestial Empire, even though the former was still eight times more populated.

Within Europe itself, the 1914-18 war does not seem to have caused any major industrial upheaval other than the collapse of the Austro-Hungarian Empire which because of the size of its population had hitherto been the fourth industrial power on the European Continent. But it should be noticed that although in the decade after the war the industrial development of both Austria, and to a lesser degree Hungary, was very moderate, the situation of Czechoslovakia was quite different. This country had always been the most industrialised province of the old Austro-Hungarian Empire, and in the 1920s it experienced very rapid industrial expansion. By 1928 Czechoslovakia had attained 6/7th place on the Continent in terms of *per capita* industrialization, which put it on much the same level as the Netherlands and only one place behind France.

The traditional impression which still survives of the depression in the 1930s needs to be revised, at least in part. Although there was indeed a slowing down in the growth of industrial production during the 1930's, the overall volume of output for the developed countries by 1938 ^{*} was 25 % higher than in 1928. In fact, many more countries had come out of the depression

^{*} The figure is not for 1938 but for the triennial yearly average around that year.

than is often assumed and these included (in addition to Germany and Italy) the United Kingdom, the four Scandinavian states, the majority of the Balkan states, Australia, New Zealand and South Africa. Although the causes of such an evolution were quite varied, industrial production increased very rapidly in Japan and in the USSR. In fact, between 1928 and 1938 both of these countries overtook France in terms of total industrial capacity, although in both the level of industrialization still remained relatively low (see *Table 12*). By 1938 Japan had reached the position which had been held by France in 1910 and by the UK in the mid-XIXth century; by 1938 the USSR had reached about the same level as France in 1900.

Although its dominant world position had been eroded, the United Kingdom was still the leading industrial power in Europe and retained this primacy until the beginning of the 1950s when the USSR was able to overtake it by virtue of its much greater size. However in terms of the level of industrialization, the United Kingdom did not lose its lead until the early 1960s when it was overtaken by Switzerland, Sweden and Germany. Furthermore since the population of West Germany is much the same as that of the United Kingdom, this also meant that it was slipped back in terms of total industrial capacity as well.

The effects of the Second World War on the geographical distribution of industry were similar to those of the First World War. In both cases the country which was already the leading industrial power was involved in the conflict without its industrial structures being in any way damaged. One can estimate that by 1946 about 49% of world manufacturing production came from the United States alone. Even by 1953, when the other countries were regaining their pre-war levels of production or in many cases had already begun to exceed them, the United States still accounted for 45% of world manufacturing output.

Despite the fact that the manufacturing output of the Third World had expanded between 1938 and 1953 more rapidly (3.4%

TABLE 12

PER CAPITA LEVELS OF INDUSTRIALIZATION
(U.K. IN 1900 = 100; ANNUAL FIGURES,
EXCEPT 1928 AND 1938 - TRIENNIAL ANNUAL AVERAGES)

	1913	1928	1938	1953	1963	1973	1980
DEVELOPED COUNTRIES	55	71	81	135	194	315	344
MARKET ECONOMIES		96	105	167	222	362	387
Europe		76	94	107	166	260	280
Belgium	88	116	89	117	183	291	316
France	59	82	73	95	167	259	277
Germany	85	101	128	144	244	366	395
Italy	26	39	44	61	121	194	231
Spain	22	28	23	31	56	144	159
Sweden	67	84	135	163	262	405	409
Switzerland	87	90	88	167	259	366	354
United Kingdom	115	122	157	210	253	341	325
Outside Europe							
Canada	46	82	84	185	237	370	379
United States	126	182	167	354	393	604	629
Japan	20	30	51	40	113	310	353
PLANNED ECONOMIES	25	27	39	71	129	196	243
U.S.S.R.	20	20	38	73	139	222	252
THIRD WORLD	2	3	4	5	8	14	17
MARKET ECONOMIES	2	3	3	4	7	12	14
India	2	3	4	6	8	14	16
Brazil	7	10	10	13	23	42	55
Mexico	7	9	8	12	22	36	41
PLANNED ECONOMIES	3	4	4	5	10	18	24
China	3	4	4	5	10	18	24
WORLD	21	28	31	48	66	100	103

Notes:

The degree of rounding off of the figures does not imply a correspondingly low margin of error.

For the countries: geographical boundaries at the dates given. For the economic regions: actual boundaries.

per annum) than in any other previous period, by 1953 this region as a whole had reached its all-time lowest position in relative terms, provided only 6-7% of world industrial capacity (see *Table 13*). In fact, 1953 must have marked the nadir exactly because since then and up to the present (1981) manufacturing production has expanded more rapidly in the Third World than in the developed market economies. As a result the situation in 1953 was that on one hand, 67% of the world population produced only 6-7% of the manufactured goods, while the other 23% produced 93/94% of the total. At the same time (1953) only 9% of the world population (USA, UK, Canada, Switzerland, and Sweden) were responsible for 57% of world output. At the beginning of the 1950s the geographical concentration of industrial production in the world reached its peak. The Gini coefficient was 0.72 in 1953, whereas in 1913 it had been 0.70 and in 1860 0.44.

The period of very rapid industrial expansion from 1953 to the present is characterised by a marked levelling out of degrees of industrialization, without the gap which divides the Third World from the developed countries being significantly reduced. The Third World has in fact moved from 6-7% of the world total to about 11-13% in 1980, while by the same time the share of the 9% most industrialized population now only accounts for 36% of total world industrial output (the Gini coefficient has settled out at 0.69). If we restrict ourselves to the developed countries the Gini coefficient is reduced from 0.43 in 1953 to 0.29 in 1980.

Within the developed world, the most striking changes are related to events which took place on two islands: the emergence of the industrial might of Japan and the acceleration of the industrial decline of the Great Britain. In Japan the effects of the war had been extremely grave and took a long time to repair, so that it was not until 1963-5 that the country regained its pre-war share in world manufacturing output. But the rapid expan-

TABLE 13

RELATIVE SHARES OF DIFFERENT COUNTRIES AND REGIONS
IN WORLD MANUFACTURING PRODUCTION (IN PERCENTAGES;
ANNUAL FIGURES, EXCEPT FOR 1928 AND 1938:
TRIENNIAL ANNUAL AVERAGES)

	1913	1928	1938	1953	1963	1973	1980
DEVELOPED COUNTRIES	92.5	92.8	92.8	93.5	91.5	90.1	88.0
MARKET ECONOMIES	76.7	80.3	76.5	77.5	70.5	70.0	66.9
Europe	40.8	35.4	37.3	26.1	26.5	24.5	22.9
Belgium	1.8	1.7	1.1	0.8	0.8	0.7	0.7
France	6.1	6.0	4.4	3.2	3.8	3.5	3.3
Germany	14.8	11.6	12.7	5.9	6.4	5.9	5.3
Italy	2.4	2.7	2.8	2.3	2.9	2.9	2.9
Spain	1.2	1.1	0.8	0.7	0.8	1.3	1.4
Sweden	1.0	0.9	1.2	0.9	0.9	0.9	0.8
Switzerland	0.9	0.7	0.5	0.7	0.7	0.6	0.5
United Kingdom	13.6	9.9	10.7	8.4	6.4	4.9	4.0
Outside Europe	35.9	44.9	39.2	51.5	44.0	45.5	44.0
Canada	0.9	1.5	1.4	2.2	2.1	2.1	2.0
United States	32.0	39.3	31.4	44.7	35.1	33.0	31.5
Japan	2.7	3.3	5.2	2.9	5.1	8.8	9.1
PLANNED ECONOMIES	15.8	12.5	16.3	16.0	20.9	20.1	21.1
U.S.S.R.	8.2	5.3	9.0	10.7	14.2	14.4	14.8
THIRD WORLD	7.5	7.2	7.2	6.5	8.5	9.9	12.0
MARKET ECONOMIES	3.8	3.7	4.1	4.1	5.0	5.8	6.8
India	1.4	1.9	2.4	1.7	1.8	2.1	2.3
Brazil	0.5	0.6	0.6	0.6	0.8	1.1	1.4
Mexico	0.3	0.2	0.2	0.3	0.4	0.5	0.6
PLANNED ECONOMIES	3.6	3.5	3.1	2.4	3.6	4.1	5.2
China	3.6	3.4	3.1	2.3	3.5	3.9	5.0
WORLD	100.0	100.0	100.0	100.0	100.0	100.0	100.0
WORLD, absolute volume (a)	933	1356	1684	3070	5138	9359	11041

(a) On the basis: U.K. in 1900 = 100.

Notes:

The degree of rounding off of the figures does not imply a correspondingly low margin of error. For the countries: geographical boundaries at the dates given. For the economic regions: actual boundaries.

sion of Japanese industry did not stop there: between 1963 and 1973 production grew at the rate of 12% per annum, and although this rate fell back to 2.9% in the years 1973 to 1980 it still remained twice as rapid as that of the other advanced market economies. Between 1963 and 1980 Japan accounted for 23% of the global expansion in manufacturing production in the Western countries, even though Japan's output in 1963 amounted to only about 7% of the total of the group. Japan has now become not only the third world power in terms of total industrial production, but also now holds 5th/14th place in terms of *per capita* industrial production; in 1963 her position on both counts had been, respectively, 6th and 18th-20th.⁹

The country that had been the third industrial power in the world in both 1938 and 1953, the United Kingdom, had slipped by 1980 to 6th place, while her share in world industrial production had fallen from 11% of in 1938 to only 4%. In terms of *per capita* output the UK fell from second place in 1938 to 9th-14th place by 1980. In fact the highest level of *per capita* industrial output (achieved just before 1980) was 5% lower than the 1973 figure. The United Kingdom, therefore, presents a clear case of de-industrialization. A similar process can also be detected (although to a very much slighter degree) in the case of Switzerland, another country which had been early to industrialize, as well as Australia and Norway (already a result of the perverse effect of oil resources?). If we move to a regional analysis we can see similar tendencies at work — especially in the Belgian Walloonian provinces and in the northern and eastern regions of France, all of which are again regions that had been industrialised at a very early stage. And just as it occurred in the Third World countries during the XIXth century, one of

⁹ The reader should bear in mind that the very low degree of dispersion amongst the dozen countries immediately behind the USA means that any precise ranking becomes arbitrary. But allowing for this, if present trends are maintained, by 1985-7 Japan should become the second world power in terms of *per capita* production.

the main causes of this de-industrialization of the contemporary developed world lies in the massive substitution of imports for national production. It is clearly much too early, however, to hazard any opinion on the likely duration of such tendencies since they are also heavily affected by short-term factors as well.

This phenomenon of de-industrialization, in combination with a more generalised tendency for the more industrialized countries to expand relatively slowly while the less industrialised attain more rapid growth rates, is responsible for a greater equality in the levels of industrialization both in the case of the main regions and of individual countries. Thus while for the developed countries in 1953 the gap was of the magnitude of 1 to 25, by 1980 it had shrunk to only 1 to 5; the coefficient of variation in the levels of industrialization of the 23 developed Western countries fell from 71% in 1953 to 45% by 1980 (and if we exclude South Africa the figures would be 70% and 41%). In the last thirty years a large number of relatively little industrialized countries have experienced a very rapid expansion in manufacturing industry, Spain and Italy being the foremost examples. Both countries were placed in terms of industrialization respectively at below 30% and 60% of the western European average in 1953, and yet by 1980 had climbed to 60% and 80%. And similar changes have occurred in the cases of Greece, Ireland, Finland and Yugoslavia (see *Table 16* in the Appendix).

There has also been a levelling off of differences between the developed Western countries and those of the East. In 1953 the Western nations had a level of industrialization 2.2 times greater but by 1980 it had fallen to 1.6. Most of the catching up occurred in the 1950s and early 1960s. However, our figures may well be slightly biased in favour of the East in that they do not give sufficient weight to consumer goods and new technologies, although it is unlikely that this bias is greater than 10% (on this see sections A4 & A5 of the Appendix).

The levelling off of the levels of industrialization also means,

ipso facto, that the dominant position long held by the United States has eroded. Between 1953 and 1963 the United States' share in world manufacturing production fell from 45% to 35%, the lowest percentage recorded since the end of the First World War (except for the Depression years of the 1930s). In 1953 Europe as a whole (including the USSR) had a smaller industrial capacity than the United States (respectively 42% and 45% of world production), where in 1963, the reverse is true (respectively 48% and 35%). Since 1963 the situation has stabilised, since European industry has lost ground in world terms in a manner similar to American industry — both have fallen by 11% in the period 1963-1980. But it would appear that the Eastern European countries have fared better. Quite apart from the possibility of a statistical bias in our figures (despite our adjustments), such a development can also be explained by the very low level of industrialization in these countries even by 1963, since their development thereafter has not been greater than that of the less developed countries in the West. But the most important question is to foresee which regions in the developed world will benefit most (or which will suffer most) from the far-reaching technological changes which have begun to displace traditional production processes (especially the micro-chip revolution, the use of robots, the advent of bio-chemical industries and new energy sources).

The very low starting-points of Third World manufacturing mean that despite the rapid progress registered, the gap which divides them from the developed world is still enormous. Around 1953 the gap was of the order of 1 to 27 in terms of per capita output; by 1973 it had become 1 to 23; by 1980 1 to 20. Yet one can estimate that around 1963 these countries exceeded the level of industrialization corresponding to the traditional pre-industrial societies, and that the present *per capita* levels are already about two times higher. Taking account of all the distortions inherent in long-term comparison, this suggests that the

present level of industrialization in the Third World is equivalent to that reached in Europe around 1860. That would also imply (again with the same reservations) that in the last 17 years the Third World despite massive demographic pressure has made as much progress as had Europe in the 60 years following 1800. However the progress already achieved is not a guarantee of future success. The rapid expansion of Third World industrialization has been largely due to two factors: import substitution in many sectors, and at the same time the growth of exports to the Western countries. However, since import substitution has now probably approached its limits in most of these countries, future development will have to rely much more than in the past on the expansion of the domestic markets, which in turn implies a rise in rural demand, since this is far and away the most important sector. Exports of manufactures to the developed world have in the past only benefited a relatively small number of Third World countries and this is responsible, as we shall see below, for the unequal nature of industrial development of the Third World. As far as the future is concerned, it is by no means certain that such exports will continue to expand, since the relatively liberal import policies of the developed countries may well be changed under pressures from growing domestic structural unemployment.

Within the group of Third World countries a distinction must also be made between the planned economies (notably China) and the rest. Industrial expansion in China seems to have been faster than the average for the rest of the Third World, although it is possible that our figures may conceal an element of overvaluation. One would have to wait for the publication of more complete retrospective statistics and for serious studies based on them to obtain more reliable orders of magnitude. But whatever the case, taken as a whole, the progress in China has been extremely rapid and Mao's dream of catching up with the United Kingdom, which was the symbol of industrial power, was pro-

bably achieved already between 1975 and 1980, in part, because the United Kingdom had been experiencing de-industrialization. Also, China's population is 16 to 18 times greater than that of the UK. But one should bear in mind, on the other hand that in 1950 the UK's industrial capacity was 5 times China's, while the figure in terms of modern industry alone was closer to 10.

As far as the market economies of the Third World are concerned, our Tables can give only a rather incomplete picture of their development. In addition to Brazil and Mexico, which have begun to contribute an increasingly important share to total Third World production, one must also add the cases of Taiwan, South Korea and Hong Kong. According to our calculations and estimates these five countries provided about 25-29% of the manufacturing production of the Third World in 1953, and by 1980 were contributing 59-65%. These five countries, have a total population which is only 11% of that of the Third World market economies.

There are two other points which can be raised in passing: the growing multi-nationalization of manufacturing industry in the Third World, and the specialization in the traditional sectors. From our own estimates (Bairoch 1979), whereas the proportion of the total manufacturing output of the developed countries which was produced abroad in factories owned by multi-national companies was about 11% in 1973, in the market economies of the Third World the proportion was between 28-31%. On the point of specialization in the traditional sectors — in 1973 the Third World provided 10% of world manufacturing production, but the proportion was nearly 50% in the case of cotton yarn, as against 1-2% for artificial fibres. In the same way, the share of the Third World in the world chemical industry, in advanced electronics or in aero-space industries was less than 3%.

By way of conclusion it should be reiterated that in the present analysis we have deliberately not attempted to examine the huge and extremely important issues which might help explain

why the patterns of industrialization have differed so widely, nor the interactions between industrialization and other aspects of social and economic life. The main purpose of this paper has been to describe and present the statistical series that we calculated for the long-term development of these manufacturing industries which played a primary role in the history of mankind since the start of the Industrial Revolution.

METHODOLOGICAL APPENDIX, COMPLEMENTARY TABLES AND SOURCES

GENERAL CONSIDERATIONS:

THE TWO MAIN POSSIBLE ALTERNATIVE APPROACHES

There are principally two different approaches in use for estimating the volumes of industrial production for periods for which we lack complete sets of statistical series. One method involves working backwards from contemporary figures by applying to them indices of industrial production. The other method is to use physical production figures for the period in question and then to weight them according to the relative contribution of each sector. Clearly both methods imply the risk of introducing elements of bias.

In the first approach there is a double risk of bias. First of all the production of each country must be translated into a common currency, but even more important is the lack of standardization in the methods used for calculating indices of industrial production. Unlike calculations of GNP which involve reasonably standard procedures, the methods used to obtain indices of production are much more varied. Our own analysis of the indices available for Europe (Bairoch 1976) made it clear that the lack of uniformity in the methods used led to a very considerable variation in the results. Depending on the weights, the method of weighting and the spread of sectors selected, the average growth rate for a country's industry may vary by as much as 100%. Such a bias does not rule out the use of indices for a particular country when estimating figures for a larger geographical area — since the errors will probably cancel one another out — but it does mean that the indices of individual countries become a highly unreliable base from which to estimate retrospectively the relative importance of the industrial production of different countries in any given group. This is particularly true over long periods. Another drawback of the method lies in the fact that for a large number of countries we do not have any indices at all¹ and it is for this reason especially that we did not use this method in the present study.

¹ In fact, out of the 25 countries that made up the developed world in the XIXth century, the available indices (more or less comprehensive) enable us to go back to 1913 for about 15 countries — for 1880 the number is reduced to about a dozen, and for 1850 we are left with only 4 countries. For the Third World the data are even more incomplete. In fact, out of a total of over a hundred administrative units that

The second method also involves some non-negligible risks of distortion, and above all means research of a much wider scope than the other approach. Here, too, we are faced with the problem of weighting, but the application of a standard solution will reduce the risk of distortions in opposite directions. A more particular distortion arises from the great diversity of industrial structures which it is difficult to make adequate allowance for. Taken as a whole, there cannot be any doubt that the distortions inherent in the second method are much less serious than those which accompany the former. In addition, for the great majority of the countries in question, it is the only method feasible for the period before 1913, in view of the nature of statistical data now available. This is why we have used this method throughout the present study, despite the great amount of research which it entails.²

The following pages provide an explanation of the methodology employed, organised under the following headings (in which we have also provided a brief general survey of various other problems encountered in the course of the research):

- A. General approach
- B. 'Manufacturing industry', 'Industrialization': definitions and justifications
- C. Definitions of economic regions
- D. Estimation of the importance of manufacturing industries in the traditional economies on the eve of the Industrial Revolution
- E. Primary sources
- F. Margins of error in the data
- G. Tables concerning countries not presented individually in the tables of the text
- H. Choice of the base units
- I. List of secondary sources cited in the text

made up this region in the XIXth century, we can only trace statistics back to 1913 in about five cases — and there are no estimates for even a single one before 1860.

² See our general introduction above for a list of previous attempts to estimate levels of industrialization.

A. GENERAL APPROACH

The first objective was to estimate the importance of the different sectors of manufacturing in traditional Western societies on the eve of the Industrial Revolution. This was done mainly on the basis of data on *per capita* consumption of manufactured goods and from estimates of the sectoral distribution of labour (see section C below). Starting from this base, the method used in the estimates varied with the chronological periods in question. For the data of the period 1928-1980 we were able to rely partly on earlier calculations, whereas for the period 1800-1913 all the estimates result from our own calculations. The same is true for the 1750 estimates, but these should be seen more as hypotheses based on data on traditional societies, rather than true calculations (see A.2 below).

A.1 1800-1913 — the developed countries

We should begin by pointing out that except for 1913 the figures used in all our calculations are based on triennial or quinquennial annual averages, in order to reduce the effects of short-term fluctuations. Our calculations are based on two aggregate series and were carried out in two separate stages. The two aggregates consist, on one hand of what we have termed modern manufacturing industries and, on the other of the rest of manufacturing industry³ or traditional industry. In the first stage we calculated all the data for the United Kingdom, and then secondly we calculated the relative importance (compared to the UK), sector by sector, of all the other countries of the world.

The most complex calculations were those connected with the modern industries which even by 1830 already amounted to nearly half of the UK's output. Between 1800 and 1860, 'modern industry' means the whole of the cotton textile industry together with a fraction (that varies over time) of other textile sectors, as well as the iron and steel industry. The base data for calculating the contribution of the UK textile industry comes from figures on the consumption of raw cotton and the data regarding the mechanization of labour in other sectors. And, as Table 14 il-

³ We should draw a distinction between this "modern" industry and what was referred in the text as "new technology industries". In the case of "modern" industry the criterion for inclusion is based purely on the general character of the sector, whereas in the case of the "new technology" industries the criteria are purely technological (see the text above).

illustrates, cotton quickly became the predominant fibre in Europe's overall consumption of textiles, and even more so in the world, given the preponderant position of cotton in non European societies.

TABLE 14

PRODUCTION OF TEXTILE YARN IN THE DEVELOPED COUNTRIES, JAPAN NOT INCLUDED (THOUSAND OF TONS, EXCEPT CUMULATIVE TOTALS: QUINQUENNIAL ANNUAL AVERAGES, EXCEPT FOR 1913)

	Cotton	Wool	Linen and hemp	Silk	Jute	Total	Per capita kg
1800	50	120	330	6	—	500	2.4
1830	160	150	430	10	—	740	2.9
1860	840	250	550	12	70	1730	5.2
1880	1410	440	630	16	260	2760	6.8
1900	2630	570	620	26	560	4420	8.7
1910	3580	670	630	30	670	5590	9.7
1913	4110	700	630	33	720	6190	10.3
Cumulative total in millions of tons (a)	115.5	34.6	58.2	1.6	18.6	228.5	—

(a) Assuming a uniform linear growth between each of the six periods above (except for cotton, where we have made certain corrections to take account of the "cotton famine" of the years 1861-1865).

Sources: Author's computations and estimates. See the text.

For the iron industries, the base data are the figures on the production of cast iron and pig iron and on the domestic consumption of raw iron and steel. Naturally, due weighting was given to the greater value-added inherent in the second set of figures. Besides, the expansion of industrialization saw the growing importance of iron and steel, like cotton, although always to a lesser degree, as an item of industrial consumption. In terms of weight iron goods represented a little under 90% of the metal consumed in the developed world in 1800 and about 95% by 1913. But in this case even more than for textiles, it is important to bear in mind price differentials; in the mid-XIXth century unworked copper cost about twenty times more than pig-iron (although the differences were less pronounced when it came to value-added).

From 1880 onwards we added the chemical industry to the 'modern industry sector', and we have also taken into account the data on steel production within the metal industries. We included the cement and aluminium industries beginning with 1913.

Still with regard to the UK, we calculated the evolution of the traditional industrial sectors for the following four sub-sectors which collectively represented about four-fifths of the total traditional sector: textiles, clothing, foodstuffs, timber and furniture. The estimates for the output of non-traditional textiles are based on volumes of fibres consumed. The development of the clothing industry was calculated on the basis of the overall development of the textile industries bearing in mind that the clothing industry tended to expand more rapidly than the textile industry as a whole. The estimates for the foodstuff industries are based essentially on consumption data. For timber and furniture, on the other hand, the estimates are based on employment statistics which we adapted on the rather arbitrary assumption that productivity doubled between 1800 and 1913. For the remainder of the 'traditional' sectors, for which we have not been able to obtain data, we have assumed that the growth rate was similar to the averages revealed by the clothing and timber/furniture industries.

To estimate the importance of modern industries in the other countries, we compared the output of these countries sector by sector with the UK. We also introduced a number of corrective factors in order to take into account national specializations and these have tended to accentuate the importance of the modern industries.

Estimating the relative importance of the different industrial sectors in each country in comparison with those of the UK has not presented any major methodological problems, since the data are generally given in physical quantities. We leave of course aside here the question of collecting the different series of data (see section E below). In order to eliminate possible bias, we adopted certain procedures: for textiles, for example, we used a weighted average of the consumption of cotton and the number of spindles, while also taking into account the relative importance of other textile fibres. In the sector of the transformation of iron, we took into account the degree of sophistication evident in the dominant forms of production in the different countries.⁴ For the chemical industry, on the other hand,

⁴ In order to account for the differences in the degree of elaboration of the finished products of each country, the net domestic consumption figures for primary metal products have been affected by a coefficient (in relation to the value of cast-iron) ranging from 3 to 5. On the other hand, in calculating the data for 1800-1860 (and only in the cases of certain countries) we have excluded from the "modern" iron industry the traditional iron industries. The degree of modernization in this sector has been estimated on the basis of the amount of cast iron produced by coke smelting and the

the data used are only in part the result of our own computations. For 1913 we used Syennilson's estimates (1954), which we extended by calculating the output for the countries not included from data on the production of the principal chemical products. In the same way we also extrapolated retrospectively for 1880 and 1900.

The choice of the countries where we extended the scope of 'modern industries' was made largely on the basis of an analysis of the employment structures in manufacturing industry. There are many cases where specialization was important and seriously affected the overall level of industrialization. The most classical example is the Swiss watchmaking industry, which by 1900 was employing 50% more people than the cotton industry. In addition to the case of the Swiss watchmaking industry (and also of its silk industry), one could mention the main cases of timber industry in Norway, Sweden and Finland; the foodstuffs industry in Denmark; luxury industries in France; the Austrian flax industry. The importance of these sectors was calculated with regard to the relative importance of the value added and also the labour employed by each sector (in relation to the normal position of such industries in other countries).

The importance and development of the traditional sectors in the different countries (other than the UK) was estimated simply by comparison with the UK. In each case we took account of the level of modern industrialization and we assumed that a given level of modern industrialization does not necessarily imply a similar level achieved on the basis of traditional forms of industrialization. The difference was estimated from the general information available on the levels of development in the different countries and also from the timing of the take-off of their modern industries: we assumed as a general rule that those countries which industrialized late experienced more rapid growth in their modern than in their traditional sectors. This manner of establishing the relative importance of the traditional sector does not carry any major risk of distortion in the case of the developed countries, but the same is not true when it comes to the Third World. We shall take up this point in the following section.

average capacities of the blast furnaces. But here as elsewhere we have avoided any "mechanical" application of these criteria, since there are a whole range of intermediary situations. One good example of this is the United States, where the wide availability of timber meant that no shift to coke took place until the industry had already reached a more advanced level of modernization.

A. 2: Data for the developed countries in 1750 and data for the Third World countries between 1750 and 1913

The starting point is the estimate of the importance of manufacturing in the traditional Western societies on the eve of the Industrial Revolution (see section D). While that provides a reasonable average, it is obvious that the determination of individual countries levels around 1750 will remain arbitrary for a long time. Given the lack of reliable information, there is unfortunately no alternative to falling back on more subjective calculations, and one cannot go any further until our colleagues working on the economic history of traditional societies are able to provide us with more extensive and detailed data than those available today (but will it be possible?).

The first stage involved estimating a minimum and a maximum level, working from the basis of figures available sector by sector, on the spread in Europe of *per capita* consumption rates for different manufactured goods in the first stages of the Industrial Revolution — and for Third World countries throughout the XIXth century. These estimates suggest that the minimum level was about 35-40% below average, the maximum about 25-30% above average. This implies that the gap between the most and the least industrialized countries was of the order of 1 to 2. It must be stressed that this ratio applies only to Europe and to economic units (countries) of medium size (3-5 million inhabitants around 1750). The gaps were much less for the very large countries and much greater for smaller ones. But since the latter represented only a very small share of total European population, the final margin of error is correspondingly reduced. Working from these parameters, we assigned each European country a specific level of industrialization, drawing on the figures available for the early XIXth century and also on more general types of information (which include, of course, an important subjective element).

The estimates made for levels of industrialization for the non-European societies around 1750 are equally, or, at least as, arbitrary. We estimated that the level of industrialization of China was similar to that of pre-industrial Europe. This would imply a level about 10% less than Europe if we exclude Russia, whereas for India we retained a level similar to that of Europe including Russia. For the rest of Asia, we assumed a level about 10% below that of India. For Latin America, given the prevalence (with varying degrees of severity) of colonial regimes, we have assumed a level about 40% below the European average. For Africa and the Pacific the prevalence of primitive societies and the predominant climate

led us to assume a level about 35% below the average. These percentages are also partly drawn from industrial levels that we have estimated for the non-European societies in the XIXth century (see above).

For the XIXth century, the level of development of the traditional industries of the Third World was estimated from these starting points, and also by taking into account in the case of the more important countries, the volume of their imports of manufactured goods. In this case we attempted to synthesize the findings of the different studies available. On that basis we divided all the non-modern industrial activities into three groups (textiles, metals and the rest), and then we attempted to gauge the relative share of each group. This clearly implies a considerable margin of error (see section F below), and therefore the figures should be read as probable orders of magnitude. In the case of the modern industrial sectors, the data become very much more reliable and we adopted exactly the same technique as was used for the advanced countries other than the UK (see above A. 1).

A. 3: 1928 — all the countries

For 1928 (or rather the period 1925-28) there are three different estimates of levels of industrialization in the principal countries of the world. These are by Wagenfuhr (1933), the United Nations (1945)⁵ and Maizels (1965), although the latter is an extrapolation from data for 1955.

As a general rule, we used the average of these three series for the developed countries (excepting Japan), together with our own calculations for 1928 (based on the data for 1913 to which we applied the appropriate rates for the growth in the volume of manufactured products). For the majority of these countries, the information from the three different series is very compatible. However, there are a number of cases where the results show greater disparity, and in these cases we have attempted to rectify the averages by re-analysing the data on industrial production.

For the total volume of manufacturing output in the developed countries, the estimate for 1928 is based on the data for 1913 and on a

⁵ In fact the League of Nations published two estimates: the one mentioned above and published in the study "Industrialization and Foreign Trade", and an earlier one published in the 1935-6 issue of the annual report on "World production and prices". The figures which appeared in the later publication were corrected versions from the earlier one.

manufacturing production index that we calculated on basis of individual countries indices.

In the case of the Third World countries we decided not to use any of the three estimates already referred to. As the authors in each case were perfectly well aware, none of them pays sufficient attention to either traditional industries or to artisan production. For the Third World as a whole, we calculated the level of industrialization in 1928 on the basis of the level achieved in 1913, by applying the growth rates suggested by our own study of the development of manufacturing industry (Bairoch 1979), and at the same time applying to the data for 1928 the same procedures used for earlier periods (see above). We used this same double approach to calculate the data for the four leading industrial powers of the Third World and for Japan.

A. 4: 1938, 1953 and 1963 — all the countries.

The basic data for each of these three dates are taken from the figures compiled by the United Nations (1965, 1971) on the amount of value-added by country and by region of the world (excluding the planned economies of the Third World, principally China). However, we have not used these figures either for Eastern Europe (and the USSR) or for the Third World countries. A analysis of the results convinced us that they contained major distortions.⁶ Furthermore even in the case of the Western developed economies we had to apply certain tests to remove some probable distortions.

For the Eastern European countries we used our own estimates. These are based on comparisons for some twenty main manufactured products of levels of production in Eastern Europe and in the USSR both with those of the USA and also with the western European countries. For both comparisons we used a weighted average (the weighting in this case being very approximative), and this has resulted in two very close sets of figures, even though they are not, in view of the different structures of the two entities, identical. The figures we retained result from a weighting that is more heavily based on the comparison of eastern countries versus western Europe than on that Eastern countries versus USA (3 to 1). The final results of our estimates show that in 1963 the manufacturing

⁶ This distortion has also been tacitly "acknowledged" by one United Nations organisation — UNIDO (United Nations Industrial Development Organization) — whose estimates for the period after 1960 differ noticeably from earlier studies.

production of the developed countries of Eastern Europe was 29.7% of that of the developed Western countries. There is still a probability that the figures conceal a certain bias in favour of the Eastern countries. According to the estimates made by the Statistical Office of the United Nations (1971) the share of the Eastern countries was 44.3%, whereas the most recent calculations of the UNIDO (1981) put it at 20.1%. We shall come back shortly to this UNIDO estimate, which almost certainly relies on much too high a growth rate for the period 1963 to 1980, and therefore leads to an unrealistically low figure for 1963.

The evolution of overall volumes of manufacturing production for the developed Western countries between 1928 and 1963 was calculated in the same way as for the period 1913-28 (see above).

For the Third World countries we used the same methodology as for 1928 (see above).

A. 5: 1973 to 1980: all the countries

For the market economies, the incomplete nature of the statistics available from the relevant international organizations led us to calculate our own data for the years 1973 to 1980, working from the position in 1963. We have already pointed to the important risks of distortion when this method is used for retrospective estimates, but for contemporary calculations it can be accepted: the dangers of bias are less great, even though this method is by no means perfect. Although the standardization of methods of calculation is much better than in the older historical series, while the range of cover is much more complete than in the case of historical indices, this does not rule out elements of distortion. For this reason it is probable that the margins of error in the figures for 1973 and 1980 are greater than in those for 1963 (see section F). Also, in view of the rather jerky pattern of the recent short-run economic development we applied a number of correctors to the data for 1980, in an attempt to make the data for that year more comparable (in some cases, for example, rather than use the 1980 figure we took instead the highest output figure recorded just before that date – either in 1979 or 1978).

In the case of the planned economies we adopted the same procedure employed for the period 1938 to 1963. It is interesting to note that for the Eastern developed countries our figures for 1973 and 1980 are much closer to the UNIDO estimates (see above) than those of 1963. The following figures show the relative importance of the manufacturing outputs

of the East European countries (including the USSR) estimated as a percentage of the output of the developed Western countries.

	<i>UNIDO</i>	<i>Our estimates</i>
1963	20.1 ⁰ / ₀	29.7 ⁰ / ₀
1973	27.6 ⁰ / ₀	28.8 ⁰ / ₀
1980	36.4 ⁰ / ₀	31.5 ⁰ / ₀

The *UNIDO* estimates would imply that there had been an annual rate of growth in the industrial output of the Eastern countries of 8.0% between 1963 and 1980, a figure which is almost certainly a gross over-estimation.

B. 'MANUFACTURING INDUSTRY', 'INDUSTRIALIZATION': DEFINITIONS AND EXPLANATIONS

Before defining the term manufacturing industry we should start with the terms 'industry' and 'industrialization' and underline in particular their contrasting meanings. To define 'industry' in the sense that we used the word is not easy since it covers a wide range of different activities. That is why we propose the following definition: industry is the totality of those activities whose object is to produce, or to transform, material goods, excluding all those activities properly described as agricultural (including everything up to the harvest). Whereas the term 'industry' may accurately be applied to all such activities whatever the period or the level of technology employed, the term 'industrialization' cannot be employed before the onset of the multiple changes that accompanied the Industrial Revolution. In fact, 'industrialization' may be defined as a process which arose from the Industrial Revolution (of which it was a major component), and which consists in the profound changes affecting economic and social structures that result from the rapid expansion of industry due to the introduction of new techniques (not only of production, but also of management and property rights).

The definition of 'manufacturing industries' used here covers division 2 and 3 (headed 'manufacturing industries') of the 'international standard industrial classification of all economic activities' drawn up by the United Nations. In the revised classification branches 2 and 3 have been put into a single group (branch 2). In other words, the term 'ma-

manufacturing industry' embraces all forms of industry except mining, construction, as well as electricity, gas, water and sanitary services.

The exclusion of mining certainly involves making some rather arbitrary distinctions, since if the process of transformation is to be one of the criteria of the manufacturing industries, at what point does that transformation begin? Why not at the moment of the sorting of the ores, or at the moment when they are raised from the mine-shafts? But if we include the mines, then we must also include a section of agriculture since for long periods this was one of the main sources of raw materials for industry. Does a shepherd work in industry? No — like the cotton picker, the coal miner and the woodcutter, he is outside manufacturing even if his own work may be destined to serve the former. But there is an additional, and much more important factor, which justifies the exclusion of these sectors and which also makes manufacturing a much better indicator of the levels of industrialization attained than would be industry in its broadest sense. One of the features of under-development has been precisely the expansion of the mining industry in the Third World (as well as in certain European countries), while what is produced was and still is destined almost entirely to go to the manufacturing industries of the developed countries.

The exclusion of the building industry raises rather fewer problems and for our purposes certainly facilitates identifying and measuring the process of industrialization proper. The problem is more complex when we come to electrical power which is after all one of the great example of 'modernization'. But to have included it would have meant either dissociating the sector of energy production, or otherwise adding coal mining, forestry etc.

C. DEFINITION OF THE ECONOMIC REGIONS.

The choice of economic criteria for very long-term statistical series involves necessarily a number of highly arbitrary decisions. For example, the distinction between developed and non-developed countries will involve quite different groups of countries in 1860, in 1900 or in 1980. But if one sets out from the assumption that one of the main functions of long-term statistical series is to provide retrospective statistical series for present day economic regions then the arbitrary element is greatly reduced and the problems of definition greatly simplified. This is the perspective that we have used both in the present study and in other

closely related analyses that we have carried out. In short, we have adopted the United Nations definitions.

The developed countries include the following countries and regions: the whole of Europe (excluding European Turkey), the USSR (including the Asiatic regions), Canada, United States, Japan, South Africa, Australia and New Zealand.⁷ Within this bloc, the 'planned economies' are: the USSR, Albania, East Germany, Bulgaria, Hungary, Poland, Roumania, Czechoslovakia (the market economies comprise the remainder of the developed countries).

The Third World, or the developing countries, include all the remainder once the developed countries are excluded (see above). Within the bloc, the following developing countries are defined as planned economies: China;⁸ North Korea, Mongolia and North Vietnam.⁹ The rest of the Third World countries are defined as market economies.

D. ESTIMATE OF THE IMPORTANCE OF MANUFACTURING INDUSTRY IN TRADITIONAL WESTERN SOCIETIES ON THE EVE OF THE INDUSTRIAL REVOLUTION.

After examining the different alternatives available, we decided that the least arbitrary way of assessing levels of manufacturing industry output in traditional societies was to estimate the *per capita* consumption of the principal manufactured goods and especially (although not exclusively) textile products (including clothing) and metal products which, taken together, have represented about 65-75% of the total consumption of manufactured goods. In fact, this is not only the least arbitrary approach but it is also the only feasible one.

⁷ Since 1972 the United Nations has included Israel among the developed countries. As certain of the calculations used in the present analysis were carried out before that time, they place that country with the Third World. But in any case the effect on the overall aggregates is very small since in 1953 Israel was responsible for less than 0.1% of total world industrial output.

⁸ Very recently the United Nations has started to aggregate certain series for Taiwan with those of China. But since this Chinese province has not, in economic terms at least, formed part of China since 1895 we have kept them separate. Putting the two together would seriously distort the values of the data, since this region, which represents only 2% of China's population, has an industrial output which is nearly 14% of that of China.

⁹ The reunification of Vietnam took place in 1976 and for statistical reasons we have not made any adjustment for this.

The figures we have elaborated refer to an average situation of Western Europe on the eve of the Industrial Revolution, and therefore represent something that would be the average of the situations in countries like France, Germany, Italy between 1740 and 1780, and the United Kingdom in about 1700.

To build up these estimates we assembled three sets of data. The first and the most important are the estimates pertaining to the period in question — and these relate predominantly to France, to Great Britain and partially to Germany.¹⁰ We have compared these data with the statistics of total production for most of those products for Europe as a whole between the XVIth and the XVIIIth centuries. We have made a second comparison with the same aggregates for the early XIXth century, especially concentrating on Europe without the UK. The results were confronted also with figures that we calculated for the consumption of manufactured products in the XIXth century by the Third World countries. In the case of textile products, we even used an additional fourth type of calculation. Although this last type of calculation entails some rough estimates, it did enable us to assess upper and lower limits and thereby provided a test of the accuracy of the results obtained from the other types of calculation. This approach involved estimating the average number of hours devoted to spinning and then applying to these figures the probable technical yields.

We shall now provide the *per capita* consumption figures for textile products. In yarn equivalent the average was 2.5 kgs.¹¹ This figure can then be broken down as follows: woollen textiles 0.55 kgs, linen and hemp 1.8 kgs, cotton and silk 0.15 kgs. It goes without saying that independently from international differences in total consumption the relative importance of each fibre varied from one country to another due to regional peculiarities which resulted as much from climate as from history.

For the metal industries, we have concentrated on iron production.

¹⁰ The reference is essentially to the works of Marcovitch (1965-6), Deane and Cole (1967) and Hoffmann (1965).

¹¹ In terms of raw fibres that would be about 3.7-3.9 kgs, whereas in cloth it would be 2.3-2.4 kgs. The yield of raw fibres into yarn vary both with the type of fibre and its quality. For cotton the "yield" is high and fairly constant (about 91%). On the other hand for unwashed wool this varies greatly, especially since the cleaning operation can, depending on the breed of sheep produce from 45% to 85% of the raw washed wool. We have tried wherever possible to base our calculations on quantities of raw washed wool. Finally the coefficient for converting unwashed wool into yarn used here was 52%. For linen and hemp the coefficient is 65%.

since this was the dominant metal and in terms of volume represented nearly 90% of total metal production in traditional European societies in the XVIIIth century. The average annual consumption *per capita* was 2.8 kgs of cast-iron. The margin of error for the other metals is probably very much greater. The second place was held by lead (0.2 kgs) then copper (0.06 kgs) and tin (0.01 kgs). The consumption of all other metals used in the period (mercury, antimony, zinc, gold and silver) did not exceed 0.02 kgs.

On the same basis we have also estimated the average *per capita* consumption of certain other important industrial products: leather (0.5 kgs), paper (0.4 kgs), glass (0.4 kgs) and soap (1.4 kgs).

The weighting used for the aggregation was based on the price of the finished products — for example in the case of wool, the value of the final wool product (before transformation into clothing) per kg of yarn. The data are taken mainly from the studies by Marcovitch (1965-6) and Deane and Cole (1967). We used an average for the two countries (France and England) and for the beginning, the middle and the end of the XIXth century.

The contribution of those sectors which could not be estimated by the methods described above has been calculated either from the very rare estimates of the respective employment figures¹² and/or by means of the value of production, comparing employment figures and output in each section with the situation in the textile industries. We arrived at the following figures (expressed as percentages of the textile sector): clothing 20%, food industry 18%, furniture 12.5%, lime and cement 4%, chemical industry other than soap 0.8%.

E. PRIMARY SOURCES

Collecting the basic statistics used in the present study has been an extremely lengthy business, since we have now been systematically gathering material for over twenty years. First we used the material for an article (Bairoch 1965) on levels of development in the XIXth century. Since then we have tried whenever the opportunity has arisen to increase or improve our 'data bank'. It goes without saying that this labour of

¹² Notably Marcovitch for France at the end of the XVIIIth century, and data collected in the study edited by P. Bairoch (1968).

gathering the material together has never by any means been a full-time occupation. What we have done is to explore progressively and systematically the following five types of documentary sources:

1. The general statistical yearbooks published by individual countries
2. The retrospective statistical yearbooks published by individual countries.
3. The compilations of national and international statistics.
4. National economic history monographs.
5. Sectoral economic history monographs.

For obvious reasons we cannot provide here a full list of all these publications since the full number reaches several hundreds. Nor should the list of references that appears as *section I* of the present Appendix be seen as a selected list of references, since it provides only references to the publications cited in the present text and contains very few of the basic sources mentioned above.

The greater part of the statistical series which was used in our own calculations are not provided as such in the primary sources. This is often the case, for example, for national consumption of textile yarns and metal products. Where such figures were lacking we calculated them from other series covering domestic production and foreign trade. It is obvious that we have not been able to take account of stock variations but since in the majority of cases we have calculated triennial and quinquennial averages the effects of stock variations was virtually eliminated.

F. MARGINS OF ERROR IN THE DATA

We can only attempt a very crude estimate here of the margins of error contained in the series that we have estimated. Ultimately the outcome results from the judgements that we have exercised on the value of the individual basic statistics used and to the additional errors arising from the statistical procedures to which we subjected the data. Therefore the margin of error in our own estimate of the margins of error may well be high — but we would still argue that an author is the person best placed to attempt such an estimate, and that it is very important for subsequent users of the series to have some idea of what the margins may be.

Before giving our estimates of the respective margins of error for the

different periods, we should mention that these refer to the average of all the countries, and that therefore the margins of error are much greater in the case of the smaller rather than the larger countries. This is due to the much greater degree of specialization in the smaller countries, which creates additional risks of statistical distortion. On the other hand the margins of error are generally greater in relation to the 'traditional' than for the 'modern' industrial sectors.

Let us start with the average level of industrialization attained by the Western countries on the eve of the Industrial Revolution. Paradoxical as it may seem, the margin of error in this case is relatively small — at most 25/30%. This is due to the fact that the differences of the levels of industrialization in the different countries was very small. As far as the figures for 1750 of the individual European countries are concerned, they are to be used mainly to express orders of magnitude and they have a margin of error of about 40%, and the margin is probably less in the direction of under-estimation (that is, the range of error would probably be from -30% to +60%). For the Third World as a whole, we would again be fairly confident that given the overall size of the aggregate the margin of error of the relative level of industrialization (in comparison with the West) is only about 20/25%.¹³ Given the size and the advanced levels of the civilizations of China and India, the margins of error for these two countries must be comparable with those given above.

The margins of error in the data for 1800 are smaller than in those for 1750 only for the larger European countries, like the United Kingdom, France, and Germany. However, by 1830 since the quality of the primary statistics for all the European countries had improved, and since the growing importance of the 'modern' industries became more marked the margin of error is therefore reduced. For Europe as a whole the average margin is in the order of 20/30%; for the relative levels achieved by the individual countries, about 20% for those already in the process of industrialising and about 30% for the rest. For the Third World there is no significant change — and the same is true in this case for the three successive periods (1860, 1880, 1900). For the developed countries the margins of error at these dates are of the order of 20-25%, and in the case of the relative positions of the individual countries it is about 15%.

¹³ This does not exclude the possibility of a cumulative margin of error which could lead to a total margin of error of the order of 40-50% in the case of absolute levels of industrialization.

In 1913 the margins of error for the average levels of industrialization are about 20%; for the relative positions of the individual countries about 15%. There is no reason to think that there has been any significant reduction in this percentage in the period 1913 to 1980, since any improvement in the quality of the statistics is offset by the increasing complexity of currency conversions and by the fact that the statistics of the socialist countries are organised on different bases. For the market economies the margin of error is probably about 8-10%, although, because the data for 1973 and 1980 are based largely on the 1963 figures (through the use of production indices, the margin of error must have risen to 10-12%). For the planned economies of the developed region the margins of error are noticeable higher even though we have corrected the United Nations figures, and must be between 15% and 25%. For the Third World, the margin of error for the estimates of average levels will be between 20-30%, and for relative levels about 20%.

Despite that margin of error which may still seem sufficiently large for those who have not first-hand experience of this type of research, we believe that our calculations have attained limits of accuracy beyond which it will be very difficult to progress further. This is particularly true of pre-1928 data and with the assumption of an individual research effort. It would, on the other hand, be possible to reduce the margins of error if one thought in terms of a large-scale team research effort. This would mean that a number of teams (or even individual researchers) could undertake to collect the material on each individual sector and try to establish with more precision the contribution of each country to the total output of the sector. For each sector the time required to carry out the research would vary considerably, running from 2 to 3 research months for 'straightforward' sectors, to 15 and 20 months for more 'difficult' ones. To obtain a sufficiently wide coverage of manufacturing industry it would be necessary to study about 30 sectors. In all this would require something of the order of 300-500 research/months.

G. CHOICE OF THE BASE UNIT

We decided to give the results of our calculations using the situation of the United Kingdom in 1900 (more accurately, in 1899-1901) as 100. There are a number of reasons for using this procedure. First of all, the preponderant position held by the UK which was the cradle of the Industrial Revolution and which held the position of the most industrialised

country in the world for very much longer than its successor, the United States. Also 1900 is an easy date to remember and falls very nearly in the middle of the period of rapid industrialization experienced down to the present. Finally, the total volume of the United Kingdom's manufacturing output in 1900 was by pure chance probably roughly equal to that of the entire world in about 1700, that is before the Industrial Revolution had begun to make itself felt.

H. TABLES RELATING TO COUNTRIES NOT PRESENTED INDIVIDUALLY IN THE TEXT

TABLE 15

LEVELS OF INDUSTRIALIZATION (1800-1913) FOR THE DEVELOPED COUNTRIES NOT LISTED SEPARATELY IN THE TABLES IN THE TEXT (U.K. IN 1900 = 100)

	1800	1830	1860	1880	1900	1913
TOTAL LEVELS						
<i>Europe</i>						
Bulgaria	0.3	0.3	0.3	0.4	0.7	1.1
Denmark	0.2	0.2	0.4	0.6	1.2	2.3
Finland	0.2	0.2	0.5	0.7	1.2	1.7
Greece	0.1	0.1	0.2	0.3	0.5	1.2
Netherlands	0.6	0.6	0.9	1.4	2.7	4.1
Norway	0.2	0.2	0.4	0.7	1.1	1.9
Portugal	0.6	0.6	0.8	1.1	1.6	2.1
Roumania	0.5	0.5	0.6	0.9	1.4	2.3
Serbia	0.2	0.2	0.2	0.3	0.5	0.8
<i>Outside Europe</i>						
South Africa	—	—	0.1	0.2	0.6	0.8
Australia	—	—	0.2	0.5	1.0	2.3
New Zealand	—	—	—	0.1	0.2	0.4
PER CAPITA LEVELS						
<i>Europe</i>						
Bulgaria	5	5	5	6	8	10
Denmark	8	8	10	12	20	33
Finland	8	8	11	15	18	21
Greece	5	5	6	7	9	10
Netherlands	9	9	11	14	22	28
Norway	9	9	11	16	21	31
Portugal	7	7	8	10	12	14
Roumania	5	5	6	7	9	13
Serbia	5	5	6	7	9	12
<i>Outside Europe</i>						
South Africa	—	—	4	5	5	6
Australia	—	—	6	8	11	19
New Zealand	—	—	4	5	8	13

Notes:

The degree of rounding off of the figures does not imply a correspondingly low margin of error.

For the countries: geographical boundaries at the dates given.

TABLE 16

LEVELS OF INDUSTRIALIZATION (1913-1980) FOR THE DEVELOPED COUNTRIES NOT LISTED SEPARATELY IN THE TABLES IN THE TEXT (U.K. IN 1900 = 100)

	1913	1928	1938	1953	1963	1973	1980
<i>TOTAL LEVELS - Europe</i>							
Austria	—	9	10	15	26	49	59
Bulgaria	1	2	3	6	11	21	28
Czechoslovakia	—	22	23	36	65	103	129
Denmark	2	5	7	16	24	42	44
Finland	2	4	5	5	17	34	43
Germany East	—	—	—	44	86	125	157
Greece	1	3	4	3	7	20	26
Hungary	—	6	9	21	42	69	86
Ireland	—	2	3	4	5	9	12
Jugoslavia	1	5	7	11	32	70	103
Netherlands	4	11	13	24	42	75	84
Norway	2	3	5	11	15	24	24
Poland	—	16	19	31	66	129	169
Portugal	2	3	4	5	10	23	31
Roumania	2	4	5	15	37	85	118
<i>Outside Europe</i>							
South Africa	1	3	6	15	23	45	56
Australia	2	8	14	31	53	87	88
New Zealand	—	1	3	6	10	17	19
<i>PER CAPITA LEVELS - Europe</i>							
Austria	—	56	64	90	148	266	325
Bulgaria	10	11	19	32	54	102	139
Czechoslovakia	—	66	60	117	193	292	344
Denmark	33	58	76	150	212	345	356
Finland	21	43	59	53	151	299	371
Germany East	—	—	—	100	207	303	393
Greece	10	19	24	17	36	93	114
Hungary	—	30	34	92	172	274	333
Ireland	—	23	40	47	72	170	147
Jugoslavia	12	15	18	28	69	137	174
Netherlands	28	61	61	96	145	231	245
Norway	31	48	76	129	171	252	246
Poland	—	22	23	49	88	160	196
Portugal	14	18	19	26	45	105	130
Roumania	13	11	11	36	81	169	218
<i>Outside Europe</i>							
South Africa	6	14	22	46	55	76	79
Australia	19	58	86	146	201	267	249
New Zealand	13	37	77	117	158	241	248

Notes:

The degree of rounding off of the figures does not imply a correspondingly low margin of error. For the countries: geographical boundaries at the dates given.

I. REFERENCES TO SOURCES CITED IN THE TEXT

NB: this is not a summary of the statistical sources from which our data and calculations have been drawn, but simply a list of the specific studies mentioned in the text. For the statistical sources, see above Section E.

BAIROCH, P.

- "Niveaux de développement de 1810 à 1910", *Annales, E.S.C.*, 20e année, N. 6, November-December 1965 (p. 1091-1117).
- *Commerce extérieur et développement économique de l'Europe au XIXe siècle*, Paris 1976.
- *Industria*, in: *Enciclopedia Einaudi*, vol. 7, Torino 1979 (p. 313-352).
- "Le volume des productions et du produit national dans le Tiers-Monde, 1900-1977", *Revue Tiers-Monde*, Tome XX, No. 80, October-December 1979 (p. 669-691).
- "Le bilan économique du colonialisme: mythes et réalités", *Itinerario*, 1980, vol. 1 (p. 29-41).

BAIROCH, P. (under the supervision of), DELDYCKE, T., GELDERS, H. et LIMBOR, J.-M.

- *The Working Population and its Structure*, vol. 1, *International Historical Statistics*, Brussels and New York 1968.

DEANE, P. et COLE, W.A.

- *British Economic Growth, 1688-1959*, Cambridge 1967.

DESAI, M.

- "Demand for Cotton Textiles in Nineteenth Century India", *The Indian Economic and Social History Review*, vol. 8, No. 4, December 1971 (p. 337-361).

DESSIERIER, J.

- "Indices comparés de la production industrielle et de la production agricole en divers pays de 1870 à 1928", *Bulletin de statistiques générales de la France*, T. XVIII, October-December 1928 (p. 65-110).

HOFFMANN, W.G. (with the collaboration of GRUMBACH, F. et HESSE, H.)

- *Das Wachstum des Deutschen Wirtschaft Seit der Mitte des 19. Jahrhunderts*, Berlin 1965.

LEAGUE OF NATIONS

- *World Production and Prices, 1935-36*, Geneva 1936.
- *Industrialization and Foreign Trade*, Geneva 1945.

LEWIS, W.A.

- *Growth and Fluctuations, 1870-1913*, London 1978.

MAIZELS, A.

- *Industrial Growth and World Trade*, Cambridge 1965.

MARCOVITCH, T.J.

- "L'industrie française de 1789 à 1964" in: *Cahiers de l'ISEA* (Histoire quantitative de l'économie française). Série AF 4, No. 163, July 1965. Série AF 5, No. 173, May 1966. Série AF 6, No. 174, June 1966. Série AF 7, No. 179, November 1966.

MULHALL, M.G.

- *Industries and Wealth of Nations*, London 1896.

PARETTI, V. et BLOCH, G.

- "Industrial Production in Western Europe and the United States, 1901 to 1955" *Quarterly Review*, No. 39, December 1956 (p. 186-234).

SVENNILSON, I.

- *Growth and Stagnation in the European Economy*, United Nations, Geneva 1954.

UNIDO

- *A Statistical Review of the World Industrial Situation, 1980*, Vienna 1981.

UNITED NATIONS

- *The Growth of World Industry, 1938-1961*, New York 1965.
— *The Growth of World Industry, 1969 Edition*, New York 1971.

WAGENFUHR, R.

- "Die Industriewirtschaft. Entwicklungstendenzen der Deutschen und Internationalen Industrieproduktion 1860 bis 1932", *Vierteljahreshefte zur Konjunkturforschung*, vol. 31, Berlin 1933.

