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Abstract

This paper documents industrial output growth around the poor periphery (Latin America, the European periphery, the Middle East and North Africa, Asia, and sub-Saharan Africa) between 1870 and 2007. We provide answers to the following questions: When and where did rapid industrial growth begin in the periphery? When and where did peripheral growth rates exceed those in the industrial core? When was the high-point of peripheral industrial growth? When and where did it become widespread? When was the high-point of peripheral convergence on the core? How variable was the growth experience between countries? And how persistent was peripheral industrial growth?

JEL codes: F1,N7,O2

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1. Introduction

To a large extent, world economic history since 1800 has been the history of how the international economic system adjusted to the dramatic asymmetric shock that was the Industrial Revolution. The transition to modern economic growth, based on new energy-intensive manufacturing technologies, created an international economic system that was lop-sided in the extreme. The new technologies originated in Britain, and spread with a short lag to western continental Europe and North America. The result was that the relatively modest pre-industrial economic divergence between the Western European leaders and the rest gave way to the Great Divergence of the nineteenth and twentieth centuries. The richest region in the world -- Western Europe -- had a per capita GDP only 81 per cent higher than the world average in 1820, while the poorest – Africa – had per capita incomes about two thirds of the world average. Western European incomes were thus about 2.7 times those in Africa. By 1913, they were more than five times higher than African incomes, while "British offshoots" in North America and Oceania had incomes more than eight times higher (Maddison 2010).

The Industrial Revolution also gave rise to a "Great Specialization", with stark North-South patterns of specialization characterizing international trade flows (Robertson 1938; Lewis 1978). The new technologies gave Britain, France, Germany, the United States (US) and eventually other countries in Western Europe and North America a powerful potential comparative advantage in manufacturing relative to the economies of the European periphery, Africa, Latin America, the Middle East, and even Asia, which in the middle of the eighteenth century accounted for the lion's share of world industrial output (Bairoch 1982). This potential comparative advantage was increasingly realized across the nineteenth century, as ocean freight rates declined, as railroads linked port to interior, and as trade boomed. The result was large volumes of manufactured goods exported from what we will call the industrial core and, in exchange, large volumes of primary commodities imported from what we will call the poor periphery. This exchange posed both challenges and opportunities for countries in the periphery. On the one hand, falling transportation costs and rising core

incomes allowed them to expand greatly their primary exports, and to enjoy the benefits of improving terms of trade. On the other hand, the same forces led to deindustrialization, at least in those countries which had the industry to lose in the first place. If modern industry provided the route to modern growth, then the static benefits of trade were potentially offset, or even outweighed, by the dynamic consequences of deindustrialization (Williamson 2011a).

Although some countries such as Argentina and Uruguay became rich from primary commodity exports, the key question for periphery countries would eventually be how to join the faster-growing industrial club. Falling transport costs cut both ways. On the one hand, their domestic industries were increasingly exposed to European competition. On the other hand, transport costs eventually fell to the point where the gravitational attraction of thick coal seams, large iron ore deposits, extensive oil fields, and land suitable for producing fibres weakened: increasingly, poorly-endowed industrial laggards could purchase these inputs on world markets at competitive prices, and well-endowed leaders lost that edge (Wright 1990). Trade policy also mattered. In the years following 1870, poor industrial followers interacted with a world economic system that went through several radically different phases: the globalization of the late nineteenth century; its disintegration during the interwar period; the reintegration of the Atlantic economy following World War 2, which coincided with the spread of communism, decolonization, and state-led import substitution (ISI) policies in much of the developing world; and the second wave of globalization which embraced more and more of the world from the 1980s onwards.

Which international trade regimes favoured the spread of modern industry to the developing world – the liberal epochs of the late nineteenth and twentieth centuries, or the intervening periods of disintegration? Theory is ambiguous: trade facilitated the spread of technologies, as did the rise of modern multinational enterprise, and trade allowed developing countries to import cheap energy and other raw materials, and to find export markets for their labour-intensive manufactures. But trade may also have made it difficult for those industries to get off the ground in the first place, faced as they were with the competition of the industrial core.

This paper explores these successive phases of the world economy, and asks: when did modern industry begin to develop in the poor regions of the world? Which were the leading industrial nations in the poor European periphery, the Middle East, Asia, Africa and Latin America, and when did they begin the transition to rapid industrial growth? How typical were these leading countries of their regions more generally? Which periods were those of most rapid industrial growth in the periphery, and of the most rapid convergence of the periphery on the industrial core? And how variable was peripheral industrial growth, over both space and time?

2. The Industrial Output Data

We have collected manufacturing and industrial output data for as many countries between 1870 and 2007 as the historical records permit. We have preferred manufacturing to industrial output whenever possible. We have also preferred value added to gross output whenever possible. The latter choice was driven entirely by the need for consistency: in recent years, many scholars across the world have been building historical national accounts that have pushed back our quantitative knowledge of periphery-country GDP into the interwar or even pre-1914 period. Where these national accounts have been reconstructed using the output approach, the result has yielded data on value added in constant prices for the manufacturing (or industrial) sector. For this reason, we start with the manufacturing value added data provided by the World Bank's World Development Indicators, supplemented with information taken from the United Nation's Industrial Statistics Database.[1] Other frequently used sources include Smits, Woltjer and Ma (2009), the Montevideo-Oxford Latin American Economic History Database, and the United Nation's historical trade statistics database.[2] As we went further back in time, we relied increasingly on individual country

[1] Available on CD from the United Nations.
[2] Available at http://www.rug.nl/feb/onderzoek/onderzoekscentra/ggdc/data/hna, http://oxlad.qeh.ox.ac.uk/ and http://unstats.un.org/unsd/trade/imts/historical_data.htm respectively.

sources, and on recent and ongoing work by many generous colleagues.[3] A data appendix details the sources used for each country and time period.

We focus on six periods. The years before World War I are divided into two sub-periods, before and after 1890. There is then the interwar period from 1920 to 1938; the post-war reconstruction years from 1950 to 1972; the period following the oil crises from 1973 to 1989; and the years of rapid globalization between 1990 and 2007. There are 175 countries in the 1990-2007 sample. Naturally, the farther back into the past we go, the fewer are the countries whose manufacturing growth we can document, and the smaller are the samples. Thus, our sample falls to 141 countries in 1973-1989, and to 93 in 1950-1972.[4] We have information for 55 countries in the interwar period, 41 in 1890-1913, and 31 in 1870-1889. The empirical analysis that follows will make an effort to deal with the issue of changing sample sizes over time, by using both constant and variable samples.

Appendix Table A.1 lists those countries for which we have the data for each of the three periods prior to World War 2. As can be seen, the countries are largely European for the earliest period (including many poor countries in the European periphery), but even here we also have data for Japan, British India (including present-day Pakistan and Bangladesh), Dutch Indonesia, Siam (Thailand), Argentina, Brazil, Chile, Uruguay and Ottoman Turkey. After 1890, we can add China, Korea, Burma, the Philippines, Taiwan, Colombia, Mexico and Peru to this list. And by the interwar period, we have information for six additional Latin American countries, as well as for Egypt, what was then known as the Belgian Congo, and South Africa. By and large, it seems reasonable to surmise that the data tend to become available only when countries start to industrialize. At least in the days before uniform statistical reporting standards, it is hard to see why a poor country would have computed industrial output indices prior to the onset of modern industrialization. The data allow us to track the spread of industrialization across the periphery in a fairly robust manner.

[3] These are listed in the acknowledgments. For some countries and time periods we relied on the same sources as Williamson (2010, 2011b), but the present dataset is sufficiently different that the data appendix here is self-contained.

[4] We exclude countries with only two or three data points in a period, since we could not meaningfully estimate growth rates for these. In an earlier draft, we used all available observations, which increased the sample sizes somewhat, but the results were the same.

But to the extent that countries were experiencing modern industrialization shortly before they started to collect industrial statistics, what we are documenting here probably understates the early spread of modern manufacturing.

These countries are divided into nine groups in the tables and figures that follow. First, there are the three traditional industrial leaders: the United Kingdom (UK), Germany and the US. Next, there are other rich industrial countries in the European core: Belgium, France, Luxembourg, the Netherlands and Switzerland. A third, intermediate group lying between the European core and periphery contains the three Scandinavian countries, while the fourth, the European periphery, includes all other European countries in the south and east. The settler economies of Australia, Canada and New Zealand form a fifth group (hereafter Newly Settled). The remaining four groups are the Middle East and North Africa (MENA), Asia, sub-Saharan Africa, and Latin America and the Caribbean (hereafter simply Latin America). We will occasionally refer to these last four regions, plus the European periphery, as "the periphery", or as "followers", contrasting the experience of these five regions with those of the other four, referred to as "the core", or as "leaders".

3. Average regional growth rates: when and where did growth begin?

When did individual countries and entire regions start recording rapid manufacturing output growth? When did peripheral regions begin to experience higher growth than the rich industrial nations, thus catching up? Were there any periods when the catching up stopped? Was catching up due to more rapid periphery growth, or to slower core growth?

Tables 1 through 3 provide some answers to these questions. The growth rates reported there are computed by regressing the log of real manufacturing output during the period in question on a time trend. Appendix Table A.2 supplies the details for each country, but Tables 1-3 summarize this information in a more digestible fashion. Table 1 reports average annual growth rates of industrial output in our nine regions and six time periods between 1870 and 2007. In each case, the regional growth rate is a simple unweighted average of individual country growth rates. Table 2 presents the growth rates in each

region relative to the growth rate in the three industrial leaders, where the core growth is a GDP-weighted average of the three.

Since the country samples change over time, use of Tables 1 and 2 should be limited to growth rate comparisons between regions in any given period. Of course, we can only compute growth rates where output data are available, and, as noted earlier, one can surmise that where output data are missing for the earlier periods, there was probably not much modern manufacturing to measure. For example, according to Table 1, there was an unweighted average manufacturing growth rate of 4.2 per cent per annum in Asia between 1890 and 1913. This figure represents an average of Japan, China, British India, Indonesia, Korea, Burma, the Philippines, Taiwan and Thailand. These nine countries account for a very large share of the late nineteenth century Asian economy, but it might be reasonable to assume that the average Asian industrial growth rate was in fact lower than 4.2 per cent during this period, reflecting lower rates in those countries for which we do not have data. Tables 1 and 2 tell us for each region and each period that there were countries there growing, on average, at the stated rate: in other words, that industrialization was taking place somewhere in that region at this rate during this particular time period. Which countries were involved, and how typical these experiences might have been of the region as a whole, is an issue that we will return to below.

Table 3 focuses instead on comparisons between periods. For each region and pair of contiguous periods, we take the largest sample of countries for which we have data for both periods, and then compute the change in average growth rates between them. For example, we have data for four Asian countries in both 1870-89 and 1890-1913 (Japan, India, Indonesia and Thailand). The average growth rate for those four countries was 1.2 percentage points higher after 1890 than before. These comparisons are based on constant samples between contiguous periods. Since we have data for more countries in later periods, the sample size of the constant-sample pairs used in these comparisons increases over time. Appendix Table A.3 reports comparisons based on sample sizes which remain constant over time. Broadly speaking, the same stylized facts emerge from the appendix table as do from Table 3, which uses as much information as possible.

Table 1. Industrial growth rates

Panel A: Leaders always US, Germany and UK

Groups	1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007
Leaders	3.0	3.4	1.9	5.2	1.0	2.1
European Core	2.5	2.8	2.9	4.0	1.4	2.0
Scandinavia	2.8	4.8	3.9	4.9	1.1	3.1
European Periphery	4.7	5.0	4.7	8.6	3.5	2.8
Newly Settled	4.9	4.6	2.3	5.2	2.0	2.3
Asia	1.5	4.2	4.2	8.1	5.5	4.2
Latin America	6.3	4.4	2.8	5.2	2.9	2.2
MENA	1.2	1.2	4.9	7.6	6.4	4.5
Sub-Saharan Africa			4.6	5.0	3.5	3.8
Countries	31	41	54	93	141	175

Panel B: Leaders are US and Germany, plus UK before 1939, Japan after

Groups	1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007
Leaders	3.0	3.4	1.9	7.9	2.3	2.2
European Core	2.5	2.8	2.9	4.0	1.1	1.8
Scandinavia	2.8	4.8	3.9	4.9	1.1	3.1
European Periphery	4.7	5.0	4.7	8.6	3.5	2.8
Newly Settled	4.9	4.6	2.3	5.2	2.0	2.3
Asia	1.5	4.2	4.2	7.8	5.5	4.3
Latin America	6.3	4.4	2.8	5.2	2.9	2.2
MENA	1.2	1.2	4.9	7.6	6.4	4.5
Sub-Saharan Africa			4.6	5.0	3.5	3.8
	31	41	54	93	141	175

Note: The table reports unweighted average industrial growth rates by region. Individual country growth rates are computed as the β coefficient of the following regression: $Y=\alpha+\beta t$ where Y is the natural logarithm of industrial production and t is a linear time trend. Regressions are performed only where at least four observations are present.

Table 2. Catching Up: Industrial growth rates relative to the leaders

Panel A: Leaders are always US, Germany and UK

Groups	1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007
European Core	-0.4	-0.6	1.1	-1.0	0.0	-1.1
Scandinavia	-0.1	1.3	2.1	0.0	-0.2	0.0
European Periphery	1.8	1.5	3.0	3.6	2.1	-0.3
Newly Settled	2.0	1.1	0.6	0.2	0.7	-0.8
Asia	-1.4	0.8	2.5	3.1	4.1	1.1
Latin America	3.4	0.9	1.1	0.2	1.5	-0.9
MENA	-1.7	-2.3	3.1	2.7	5.0	1.3
Sub-Saharan Africa			2.8	0.0	2.1	0.7

Panel B: Leaders are US and Germany, plus UK before 1939, Japan after

Groups	1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007
European Core	-0.4	-0.6	1.1	-2.4	-1.1	-1.0
Scandinavia	-0.1	1.3	2.1	-1.5	-1.1	0.3
European Periphery	1.8	1.5	3.0	2.1	1.2	0.0
Newly Settled	2.0	1.1	0.6	-1.3	-0.2	-0.5
Asia	-1.4	0.8	2.5	1.3	3.3	1.5
Latin America	3.4	0.9	1.1	-1.3	0.7	-0.6
MENA	-1.7	-2.3	3.1	1.2	4.1	1.6
Sub-Saharan Africa			2.8	-1.5	1.2	1.0

Note: Average industrial growth rates by region relative to the leaders are computed in two steps. First, we compute the average growth rates for each region as in Table 1. Second, we subtract the GDP-weighted average of the three leaders' growth rates. Note that the leader averages in Table 1 are unweighted.

Table 3. Industrial growth accelerations and decelerations

Panel A: Leaders are always US, Germany and UK

Groups	(1890/1913)-(1870/1889)	(1920/1938)-(1890/1913)	(1950/1972)-(1920/1938)	(1973/1989)-(1950/1972)	(1990/2007)-(1973/1989)
Leaders	0.3	-1.5	3.3	-4.3	1.1
European Core	0.3	0.0	2.5	-2.6	0.6
Scandinavia	2.0	-0.9	1.1	-3.8	1.9
European Periphery	-0.4	0.8	3.9	-4.7	-0.6
Newly Settled	-0.3	-2.2	2.9	-3.2	0.3
Asia	1.2	0.0	3.5	-1.7	-1.2
Latin America	-2.2	-0.7	3.2	-3.3	-0.6
MENA	0.0	6.9	2.4	-1.7	-1.7
Sub-Saharan Africa			-3.2	-0.5	-1.0

Panel B: Leaders are US and Germany, plus UK before 1939, Japan after

Groups	(1890/1913)-(1870/1889)	(1920/1938)-(1890/1913)	(1950/1972)-(1920/1938)	(1973/1989)-(1950/1972)	(1990/2007)-(1973/1989)
Leaders	0.3	-1.5	4.3	-5.6	-0.2
European Core	0.3	0.0	2.5	-2.9	0.7
Scandinavia	2.0	-0.9	1.1	-3.8	1.9
European Periphery	-0.4	0.8	3.9	-4.7	-0.6
Newly Settled	-0.3	-2.2	2.9	-3.2	0.3
Asia	1.2	0.0	3.2	-1.3	-1.1
Latin America	-2.2	-0.7	3.2	-3.3	-0.6
MENA	0.0	6.9	2.4	-1.7	-1.7
Sub-Saharan Africa			-3.2	-0.5	-1.0

Note**:** The table reports the average difference in regions' growth rates between successive sub-periods. Note that successive columns provide the comparison for progressively larger samples of countries.

Table 4. Industrial growth in early members of the "modern growth club"

Group	Country	In	1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007
European Periphery	Finland	1880	3.7	5.0	6.7	5.9	3.5	6.4
	Russia	1880	5.3	4.6	15.3	8.3	4.2	-0.5
	Austria	1883	4.9	3.3	2.3	5.8	2.5	2.8
	Hungary	1883	4.9	3.3	4.0	7.3	2.3	5.9
	Spain	1884	3.4	1.3	-0.5	8.8	1.2	2.9
Asia	Japan	1899	3.0	5.3	6.7	12.4	3.9	1.0
	China	1900		7.8	5.3	9.2	8.4	9.8
	Philippines	1913		6.3	3.4	7.0	1.7	3.3
	Taiwan	1914		5.1	4.4	11.5	9.0	4.9
	Korea	1921		8.0	7.1	13.2	11.8	7.4
Latin America and Caribbean	Chile	1881	7.5	3.9	2.6	5.2	2.0	3.5
	Brazil	1884	7.2	0.0	3.2	7.8	2.9	2.1
	Argentina	1886	6.4	8.8	4.2	4.9	-0.9	1.7
	Uruguay	1886	4.2	3.9	3.2	1.4	1.5	0.1
	Mexico	1902		6.0	3.7	7.1	3.1	3.2
MENA	Turkey	1931	1.2	1.2	8.1	7.6	5.0	4.1
	Morocco	1949				4.8	4.2	2.9
	Tunisia	1950				3.5	7.7	4.6
	Algeria	1959				9.7	7.9	0.1
	Egypt	1962			1.6	6.9	7.9	5.6
Sub-Saharan Africa	South Africa	1924			6.7	6.9	2.8	2.6
	Congo, Dem. Rep. of	1940			2.4	-4.2	-0.4	-3.9
	Zimbabwe	1951				-0.3	2.7	-3.7
	Kenya	1964				8.5	5.4	1.7
	Zambia	1966				8.3	2.1	2.8

Note: "In" indicates the first year that a country experienced a 10-year average backward looking growth rate greater than 5 per cent. Sources: Tables A.2 and A.8.

Finally, Tables 1, 2 and 3 are based on growth rates for all countries barring those with fewer than four observations in a period, a liberal inclusion criterion. Tables A.4-A.7 present results based on a sample which includes only countries with observations for more than half the years in the given period, a more conservative inclusion criterion. These appendix tables yield results very similar to those presented in the text. In short, our results seem robust to the country samples used.

Tables 1, 2 and 3 provide two versions of these exercises. Panel A uses the same industrial leaders throughout -- the UK, Germany, and the United States. Panel B, on the other hand, recognizes that the UK was no longer an industrial leader in the post-World War 2 era, while Japan was. The three industrial leaders from 1950 onwards are thus taken to be the US, Germany, and Japan. Of course this means that the composition of various country groups in Panel B changes after 1950. Thus, Japan is now removed from the Asian group after 1950, while the UK is added to the core European group.

What do these data tell us?

Growth among the leaders was fairly steady between 1870 and 1913, averaging 3-3.4 per cent per annum, followed by a decline to 1.9 per cent during the interwar period (Table 1). The table confirms the impressive boom during 1950-72. If we maintain the same three leaders into the postwar era, their growth reached 5.2 per cent per annum during the growth miracle (Panel A); if instead the UK is replaced by Japan, leader growth rates reached 7.9 per cent per annum (Panel B). These were, of course, the years of the German *Wirtschaftswunder* and the Japanese postwar growth miracle, and this postwar recovery set the bar very high for any other region to surpass it, although Asia, the European periphery and MENA all did (Table 2, Panel B). Since 1973, however, growth in the three post-war leaders has only averaged slightly more than 2 per cent per annum. This leaders' slow down must have been due in part to the fact that war reconstruction forces were exhausted and to the poor macroeconomic conditions following the oil crises. But long-term deindustrialization forces were probably playing the bigger role, as suggested by the continued slow industrial growth between 1990 and 2007 (Table 1).

The most striking finding to emerge from these tables is perhaps the strong performance of Latin America since 1870. Latin America was one of the earliest converging regions, with growth rates of 6.3 per cent from 1870 to 1889, and 4.4 per cent from 1890 to World War I. Indeed, Latin America grew faster than the three leading industrial economies during each and every period, with only two exceptions: 1950-1972, when it still clocked an impressive 5.2 per cent per annum growth rate; and the period after 1990, when its manufacturing growth rate was equal to that in the leaders.[5] During this most recent episode, Latin American manufacturing growth of 2.2 per cent resembled that of a rich country that had completed its industrialization phase (among the richer regions, only Scandinavia saw a noticeably higher growth rate, of 3.1 per cent per annum). In contrast, Asia, MENA, and sub-Saharan Africa all saw much higher growth rates after 1990 – around 4 per cent per annum – a more impressive performance, but also one consistent with their being late-comers.

The European periphery was the second-ranked early converger, with per annum growth rates of 4.7-5 per cent before World War I, 4.7 per cent during the interwar period, and as high as 8.6 per cent during the European Golden Age. Indeed, the European periphery growth rate exceeded that of the leaders, and of the European core, during every period in our sample.[6]

The three English-speaking newly settled economies also recorded very rapid manufacturing growth rates from the 1870s onwards. These rates exceeded those of the leaders until World War 2, although they slowed down significantly during the interwar period (Table 3). Since then, however, their growth rates have been similar to those of other rich countries.

While the regions of recent settlement, Latin America, and the European periphery were all converging on the leaders from 1870 onwards, other regions started converging only after 1890. The quarter-century before World War 1 saw the beginning of very rapid industrialization in Asia, whose growth rates

[5] These statements are based on the data in Table 1, Panel B. If we include the UK with the leaders throughout, then Latin America did as well as or better than the leaders during every period (Table 1, Panel A), except if we take a GDP-weighted average of leader growth (Table 2), which places greater weight on the strong US performance during the final period.

[6] Again, the only exception to this statement is the last period, and only if we take a GDP-weighted average of the leaders' growth.

exceeded those of the industrial leaders in all subsequent periods (Table 2).[7] Scandinavia is another region that started to converge after 1890, and continued to do so through the interwar period. The years between 1890 and 1913 emerge as ones of impressive industrialization in the periphery: with the exception of MENA (represented here by Turkey alone), and sub-Saharan Africa (for which we have no data), average growth rates were higher in all periphery regions than in the industrial core. Furthermore, this was not caused by slowdown among the leaders, since their growth rates rose from 3 to 3.4 per cent per annum, but rather by acceleration in much of the periphery.

We need to stress again that these growth rates are only computed for those countries for which we have the data, and one can presume that industrial growth rates were probably lower in countries for which data are lacking. What the data show clearly, however, is that there were countries in all continents bar Africa where industrialization was proceeding rapidly before 1914. Table 4 tells us something about which countries these were. It provides the growth rates for the five original leaders in each peripheral region, by period. For each region, the leaders are ordered according to how early they first achieved a 10 year average growth rate of 5 per cent or higher.[8] Latin America was led by Chile, Brazil, Argentina, Uruguay and Mexico, while the European periphery was led by Finland, Russia, Austria, Hungary, and Spain. With the exception of Spain, these countries first achieved ten years of 5 per cent average growth as early as the 1880s, implying that rapid growth began during the 1870s. Asia was led by Japan and China, with the Philippines, Taiwan and Korea following: all but Korea had joined the "modern industrial growth club", defined in this way, by the time of World War I.

Regional convergence on the industrial leaders became universal during the interwar period: all regions posted higher average manufacturing growth rates than the UK, US and Germany. This is hardly surprising given that the Great

[7] To repeat, Table 2 is based on a GDP-weighted average of leader growth rates. This obviously gives a higher weight to the US than the unweighted averages in Table 1. If we compare unweighted averages, then the statement in the text continues to hold if we maintain the UK as part of the leader group. If Japan is substituted for the UK, and is thus excluded from the Asian group, then Asia posted a 7.8 per cent per annum growth rate during 1950-72, as opposed to a 7.9 per cent per annum growth rate in the leader group.

[8] Details are given in Table A.8.

Depression affected German and US manufacturing so severely. Nonetheless, the growth rates experienced in the periphery were quite impressive during the interwar period: 4.2 per cent in Asia, 4.6 per cent in sub-Saharan Africa (where the data refer to South Africa and the Belgian Congo), 4.7 per cent in the European periphery, and 4.9 per cent in MENA. Indeed, Table 3 shows that growth rates in MENA and the European periphery bucked the interwar downward trend in that they were even higher between the wars than before 1914.[9] While we have found no pre-war data for sub-Saharan Africa, one can presume that the same was true there as well. Only in Latin America did industrial growth rates decline significantly between the wars, to 2.8 per cent per annum. The interwar years were difficult everywhere, but they were most difficult for the leaders. While the periphery was hit by a falling terms of trade, declining exports, and thus declining incomes, the very fact that commodity export prices fell relative to manufacturing import prices implied a stimulus to domestic manufacturing. The net effect was an overall acceleration of industrial growth across the periphery, Asia and Latin America excepted.

Industrial growth was uniformly high in the periphery between 1950 and 1972, and substantially higher than during the interwar period.[10] It was over 8 per cent in the European periphery and Asia (7.8 per cent in the latter if Japan is included with the leaders), 7.6 per cent in MENA, 5.2 per cent in Latin America, and 5 per cent in sub-Saharan Africa. These impressive performances were generally not sufficient to match postwar growth in the US, Germany and Japan (7.9 per cent), but were equivalent to or higher than the average growth rate in the US, UK and Germany (5.2 per cent), and *much* higher than their collective performance between 1870 and 1913 (3-3.4 percent per annum). Table 2 reports that Asia, MENA and the European periphery posted higher growth rates than the three industrial leaders between 1950 and 1972, if we consider a GDP-weighted average growth rate for the latter group. After the oil shock, there was universal convergence of the periphery on the leaders, although this was due to falling core growth, since growth rates fell everywhere (Table 3). The rate of

[9] Of course, the Middle East and North Africa sample is represented by Turkey alone.
[10] The exception is sub-Saharan Africa, but the comparison is based on just two countries. While growth in South Africa increased very slightly, interwar growth in the then Belgian Congo was replaced with rapid contraction after 1950.

periphery catch up slowed down after 1990, due to further slowdown in much of the periphery.

In summary, the regional data show that:

Stylized Fact # 1: Rapid peripheral industrial growth began in Latin America and the European periphery in the 1870s. It spread to Asia after 1890, and to MENA and sub-Saharan Africa in the interwar period.

Stylized Fact # 2: Peripheral industrial growth rates were uniformly higher than those in the three original industrial leaders between 1920 and 1989. The European periphery and Latin America started converging from 1870 onwards, and only stopped after 1990. Asia started converging after 1890, and MENA and sub-Saharan Africa in the interwar period; all three regions were still converging at the end of the period.

Stylized Fact # 3: The high-point of peripheral industrial growth was the 1950-72 period, although the 1870-90 period saw extremely rapid growth in Latin America.

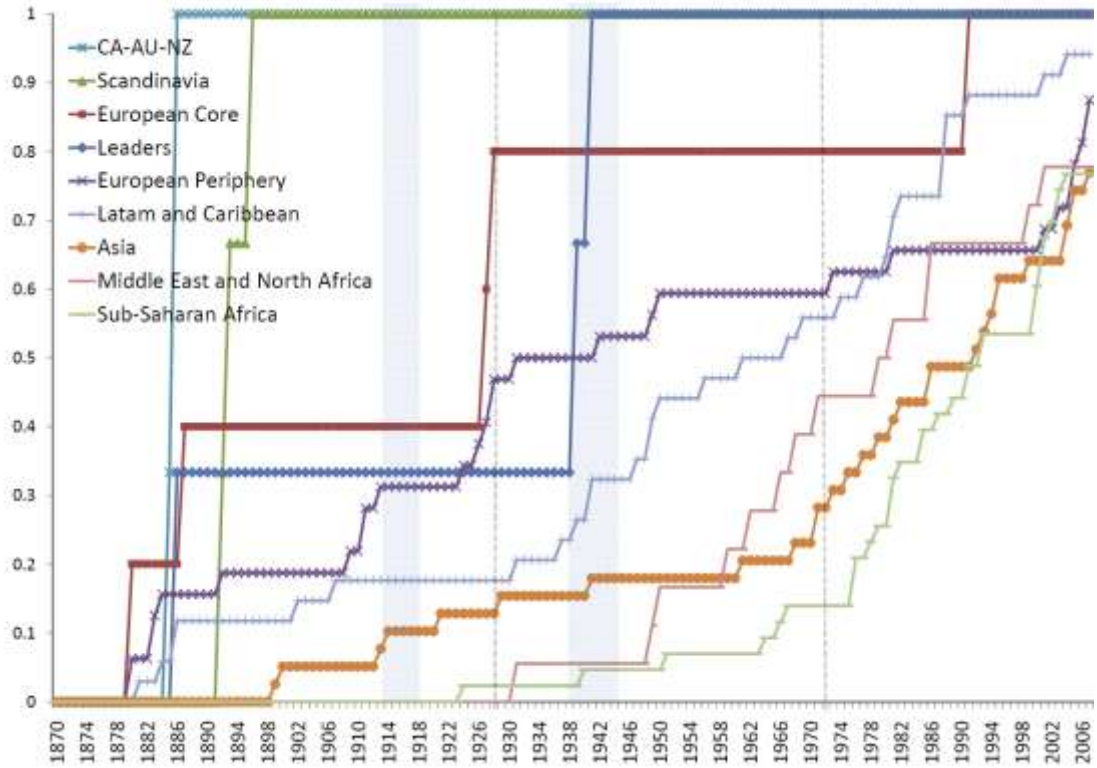
4. When did rapid industrial growth become widespread?

The average regional growth rates presented above have their limitations: they are masking differing country performances within each region, and they are also based on country samples which increase in size over time. We are interested not only in when modern industrial growth began in each region, but on when it began to be widespread. Figure 1 attempts to address this issue. It is based on Appendix Table A.8, which shows for each country the first year in which it posted a cumulative ten-year growth rate superior to 5 per cent per annum. That is, Table A.8 gives the first year for which we can document when each country joined the "modern industrial growth club", where membership is defined as we earlier did in Table 4.

The share of the countries in each region which had joined the "modern industrial growth club" is calculated for each year and then plotted in Figure 1. The shares are monotonically increasing, since we are not concerned with the industrially-mature as they permanently exit from the club late in the postwar period. After all, every successful economy eventually starts to deindustrialize as it moves on to high-tech services: most of the European core and the leaders leave the club in the 1960s and 1970s as Table A.8 documents.

There are two reasons why the regional "modern industrial growth club" shares might increase over time. The first is that data become available for a country already in the growth club. The second is that countries for which data are already available undergo an acceleration in their industrial performance. As suggested earlier, growth accelerations may closely coincide with data becoming available. Table A.8 allows us to gauge how prevalent this was, since it reports not only when countries first joined or finally exited the growth club, but also the year for which data on manufacturing output first become available for the country in question. Since our criterion for club membership is that the country post a cumulative 10-year growth performance superior to 5 per cent per annum, countries can only join the growth club ten years after we have data documenting their performance. In 43.3 per cent of cases, countries join the club precisely ten years after the data begin; in 56.1 per cent of cases they join the club within 15 years of data becoming available; and in 67.8 per cent of cases they join the club within 20 years of data becoming available. In over two-fifths of the cases, therefore, data became available when growth had already attained the required level, while in an additional quarter of the cases, club membership was attained soon after data became available. The estimates in Figure 1 are therefore conservative, in that it is likely that several countries attained the threshold growth level before their industrial output data became available.

Figure 1. Regional diffusion curves: reaching the 5 per cent threshold

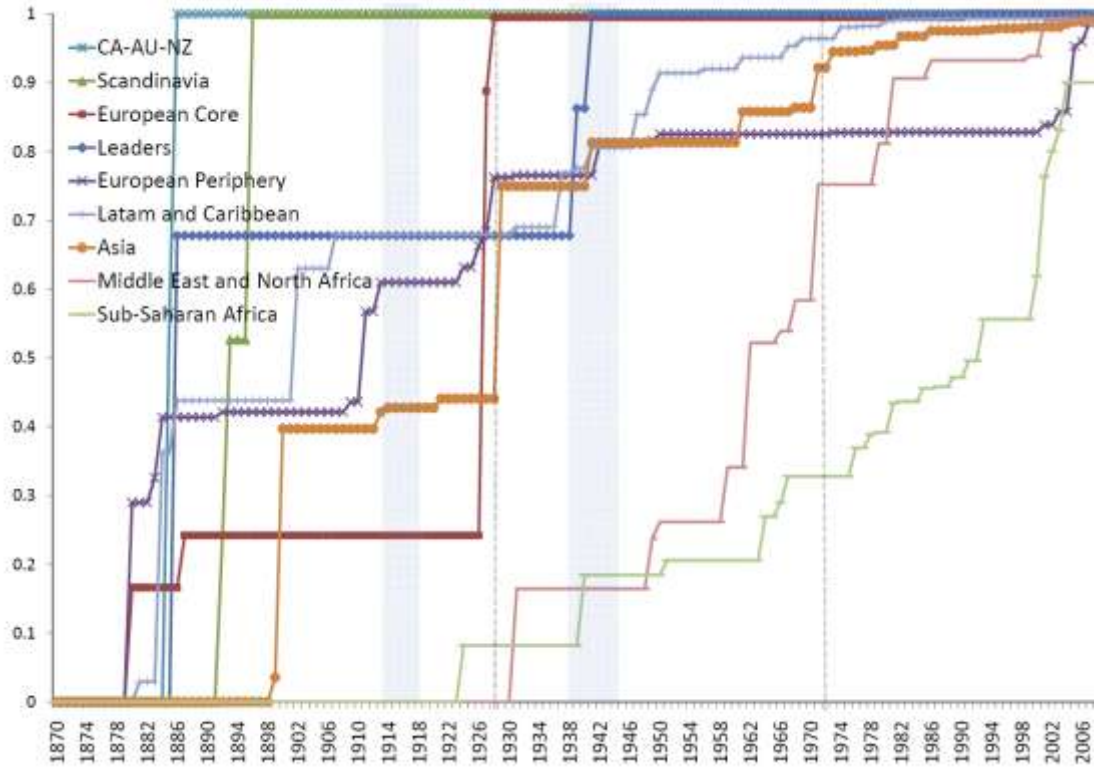


Note**:** The figure shows the proportion of countries for which the 10-year backward looking average industrial growth rate exceeded a 5 per cent threshold. Countries for which data are missing are assumed not to have exceeded this threshold. Source: Table A.8.

Figure 1 shows the successive waves of diffusion of rapid manufacturing growth in various regions of the periphery: first in Scandinavia, then the European periphery, then Latin America, then Asia, then MENA, and finally sub-Saharan Africa. All three Scandinavian countries had joined the modern industrial growth club by 1896. By 1913, the same was true of 31 per cent of the European periphery, 10 per cent of Asia, and 18 per cent of Latin America. Since club membership is based on a retrospective criterion, this implies that these countries had been growing rapidly since well before World War 1. By 1938, club membership had been attained by half of the European periphery, 15 per cent of Asia, and 24 per cent of Latin America, but still only 6 per cent of MENA and 2 per cent of sub-Saharan Africa. By 1973 and the end of the ISI period, the threshold had been attained by 63 per cent of the European periphery, 31 per cent of Asia, 56 per cent of Latin America, 44 per cent of MENA, and 14 per cent of sub-Saharan Africa.

The percentages plotted in Figure 1 are conservative for two reasons. The first, which we have already noted, is that where we cannot document industrial performance, we are forced to exclude the country in question from the club. The second is that these percentages are based on a denominator which includes a large number of modern-day countries, several of which are very small, some of which did not exist in previous periods, and for many of which we do not have data for these earlier periods. Figure 2 provides an alternative perspective which deals at least to some extent with the second of these problems, since it weights the different country experiences by their populations in 2007. More precisely, it asks: what proportion of a region's population in 2007 was living in countries which had attained the 5 per cent growth threshold by any given year?

Figure 2. Regional population-weighted diffusion curves: reaching the 5 per cent threshold



Note: The figure shows the proportion of the region's population in 2007 living in countries for which the 10-year backward looking average industrial growth rate exceeded a 5 per cent threshold. Countries for which data are missing are assumed not to have exceeded this threshold. Source: Table A.8.

By giving more weight to Brazil than to Saint Lucia, or to China than to Bhutan, we increase dramatically the measured diffusion rates in the periphery.

By World War 1, the 5 per cent threshold had been attained in countries accounting for 61 per cent of the European periphery's (2007) population, 42 per cent of Asia's population, and 68 per cent of Latin America's population, already very large numbers. By 1938, the "modern industrial growth club" had been attained by countries accounting for three-quarters of the population in these three poor periphery regions. By 1973, the club had been attained in countries accounting for 83 per cent of the 2007 population of the European periphery, 94 per cent of the Asian population, 96 per cent of the Latin American population, 75 per cent of the MENA population, and even 33 per cent of the population of sub-Saharan Africa. Industrial diffusion was virtually complete, according to this population-weighted criterion. In Asia, Latin America and the European periphery, the 1890-1938 years were the ones that saw the greatest diffusion; in MENA, diffusion occurred largely between World War 2 and the first oil crisis; in sub-Saharan Africa, diffusion proceeded steadily between the interwar years and the 1990s, when it dramatically accelerated. Overall, the decades between 1890 and 1938 were ones of the most rapid diffusion of industrialization to the periphery, at least as measured by output growth. If we define "widespread" to mean "involving countries accounting for more than 50 per cent of a region's 2007 population", then the following is true:

Stylized Fact # 4: Rapid industrial growth became widespread in Latin America and the European periphery before World War I; in Asia during the interwar period; in MENA during the ISI period; and in sub-Saharan Africa in the 1990s.

5. Unconditional Industrial Convergence

There is a vast empirical literature that asks whether poorer countries grow more rapidly than richer ones (Abramovitz 1986, Barro 1997, Bourguignon and Morrisson 2002), and finds that they do not.[11] More recently, Rodrik (2011) has found evidence of unconditional convergence in labour productivity for

[11] Economists have only found evidence of conditional convergence (Durlauf, Johnson and Temple 2005).

individual manufacturing sectors. Since we do not have comparable data on manufacturing employment, we cannot engage with that issue. In this section, we therefore ask a different question: did less industrialized economies experience more rapid industrial growth than more industrialized ones? More precisely, did countries with a lower level of manufacturing output per capita systematically experience more rapid growth in manufacturing output than countries with more manufacturing output per person?

From what has gone before, we know that this was necessarily true in the long run, as modern industry diffused from core to periphery. However, the preceding discussion was based on comparisons between regional averages, ignoring the country-level variation in the data: in principle, it is possible that the highest industrial growth rates in peripheral regions were in the most industrial economies there. When did it become true that manufacturing growth rates were systematically higher in less industrialized countries, and when was this tendency most pronounced?

In order to answer these questions, we need to be able to compare levels of manufacturing output across countries. This is difficult, so we follow two approaches. First, the World Bank's World Development Indicators report comparable manufacturing output levels for 2001, expressed in US dollars. We extrapolate these 2001 output levels back in time using our output indices, and then divide these by population taken from the World Development Indicators and Maddison (2010). This procedure yields estimates of manufacturing output per capita back to 1870, for 179 countries during the most recent 1990-2007 period, 145 for 1973-1989, 101 for 1950-1972, 54 for 1920-1938, 42 for 1890-1913, and 29 for 1870-1889.[12]

There are dangers in extrapolating relative output levels backwards over such long periods, involving as they do compositional shifts, relative price changes, and the like. Furthermore, Maddison's data assume constant boundaries, whereas our growth rates are typically for period-specific boundaries. Therefore, we also adopted a second approach, which was to take Paul Bairoch's (1982) data on cross-country industrial output per capita for two

[12] We can only do this if the country's output indices have no breaks in them. Some do, especially belligerents during the world wars, and so we lose them from the sample.

benchmark years (1913, 1928), and then, where we have the annual output indices, to use these (and population data) to generate comparable absolute levels of per capita output for each year within the periods 1870-1913 and 1920-1938. Similarly, we used UN data for 1967 to generate comparable absolute levels of per capita output for 1950-72, and World Bank data to generate comparable absolute levels for 1973-89 and 1990-2007. While safer, the disadvantage of this procedure is that it involves fewer country observations.

Armed with these two sets of data, we can now ask: when was per capita manufacturing growth faster in less industrialized countries, where the level of industrialization is measured by manufacturing output per capita (Bairoch 1982)? Such convergence, when it took place, must have been due to convergence either in economic structures (i.e. less industrialized countries seeing a shift of labour out of agriculture and into manufacturing), or in manufacturing labour productivity, or both.[13]

Table 5 provides the slope coefficients from regressions of manufacturing output growth rates against initial levels of per capita output. The first column presents our preferred estimates, using the data on output per capita generated from period-specific benchmarks (i.e. the Bairoch data for 1913 and 1928, and the UN data for 1967). One problem with these results is that the number of observations is not constant across time periods, making the coefficients difficult to compare.[14] Subsequent columns address this issue, using the data on levels constructed by extrapolating backward from the 2001 World Bank data. In each column, the sample size is kept constant over time. For example, the estimated coefficient for the interwar period, using the sample of countries for which we have data between 1870 and 1889, is -0.464, with a robust standard error of

[13] Assuming constant labour participation rates. Manufacturing output per capita, Qm/P, is equal to (Qm/Lm)(Lm/L)(L/P), where Qm is manufacturing output, P is population, Lm is employment in manufacturing, and L is total employment. Poor periphery manufacturing typically meant low productivity, small scale and labour-intensive manufacturing compared with the leaders. The onset of modern industrialization should have led to convergence in (Qm/Lm), therefore. Compared with the leaders, the followers were likely to undergo a demographic transition during their industrial take off, thus raising (with a lag) L/P, and thus raising the growth of Qm/P. See Bloom and Williamson 1998; Bloom and Canning 2001; Lee and Mason 2010. Finally, Lm/L rises over time during industrial revolutions (see for example Crafts 1985).

[14] For our six periods, the coefficients are estimated using data for 20, 23, 29, 40, 70 and 134 countries respectively. For the final two periods, this column uses benchmark data from the World Development Indicators.

0.256. In this manner, the coefficients in any given column are comparable with each other, being based as they are on the same country samples.[15]

Table 5. Unconditional industrial convergence

Period	Using period-specific benchmarks	Country sample					
		1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007
1870-1889	-0.384	-0.106					
	(0.493)	(0.275)					
1890-1913	-0.589	-0.049	-0.271				
	(0.388)	(0.118)	(0.225)				
1920-1938	-0.766**	-0.464*	-0.380*	-0.646***			
	(0.329)	(0.256)	(0.189)	(0.207)			
1950-1972	-3.095***	-1.066*	-1.067**	-1.091***	-1.004***		
	(0.387)	(0.516)	(0.395)	(0.287)	(0.222)		
1973-1989	-0.523***	-0.584**	-1.178***	-0.937**	-0.804***	-0.540***	
	(0.168)	(0.233)	(0.397)	(0.386)	(0.282)	(0.169)	
1990-2007	-0.175	-0.363	-0.908**	-0.471	-0.115	-0.106	-0.175
	(0.166)	(0.346)	(0.382)	(0.293)	(0.262)	(0.227)	(0.166)
No. of countries		23	28	44	56	87	134

Note: Coefficients are obtained by regressing average growth rates per annum on the log level at the beginning of the period. The first column reports coefficients using period specific benchmarks; subsequent columns use backward extrapolation from a 2001 benchmark. See text for details. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels respectively.

Table 5 tells a consistent story. While there is evidence of unconditional convergence between 1870 and 1913, it only became statistically significant at conventional levels after World War 1. Clearly, the highpoint of unconditional industrial convergence in the periphery was the ISI period between 1950 and 1972: while strong unconditional convergence persisted after the first oil shock, it was less pronounced than before (compare the coefficients

[15] The diagonal entries are the slope coefficients associated with the scatter plots in Figure 3, with the exception of the coefficient for 1973-89. 92 countries are used in that scatter plot, but since various countries ceased to exist shortly thereafter, there are only 87 countries used for that period in Table 4.

obtained using the 1950-72 country sample). According to Table 5, unconditional convergence in per capita manufacturing output fizzled out after 1990.

Stylized Fact #5: Less industrialized countries saw statistically higher industrial growth rates between 1920 and 1989, with this convergence being greatest during the ISI period.

6. How variable were growth rates?

Figure 3 provides the average growth rate in a sample of 30 countries for which data are available over the entire period, while Figure 4 provides the standard deviation of growth across these same 30 countries. Figure 3 shows clearly the volatility of average growth rates between 1914 and 1950, with slumps associated with the two world wars and the Depression being followed by rapid recoveries. The steadily high growth rates of the 1950-72 period, and the subsequent slowdown, associated with two severe recessions at the start of the 1980s and 1990s, are also clearly visible. Figure 4 shows that for this same sample of countries, the period from 1914-50 was not only one of more volatile growth rates, but of growth rates that were more variable across countries. The greatest variation came in the immediate aftermath of World War II, after which the cross-country variance in growth rates fell to the lowest levels experienced during our period.

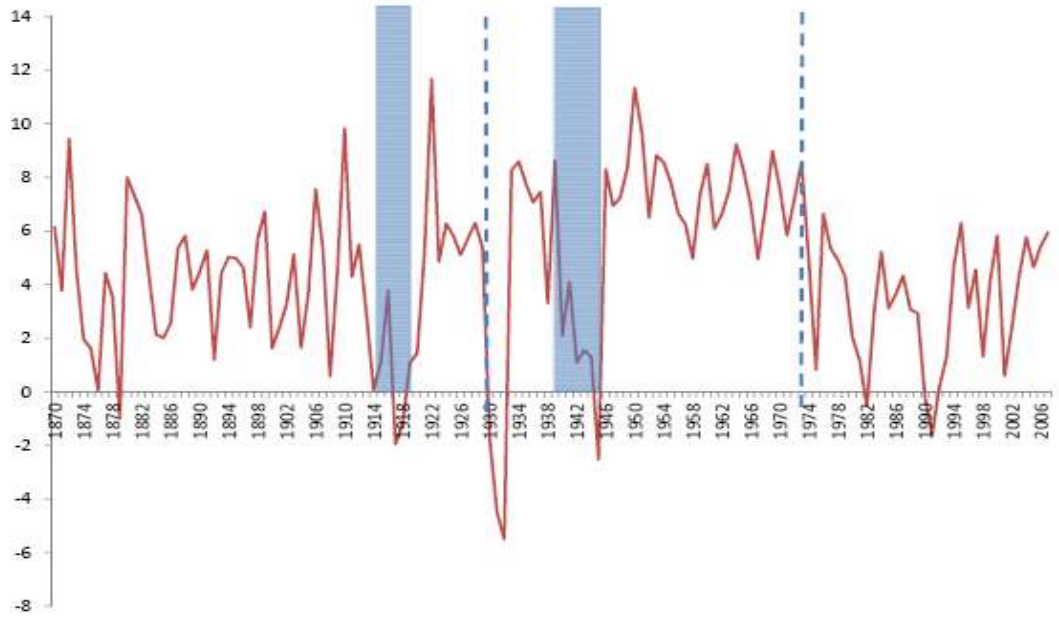


Figure 3. Average manufacturing growth rates, 1870-2007 (30 countries)

Source: see data appendix.

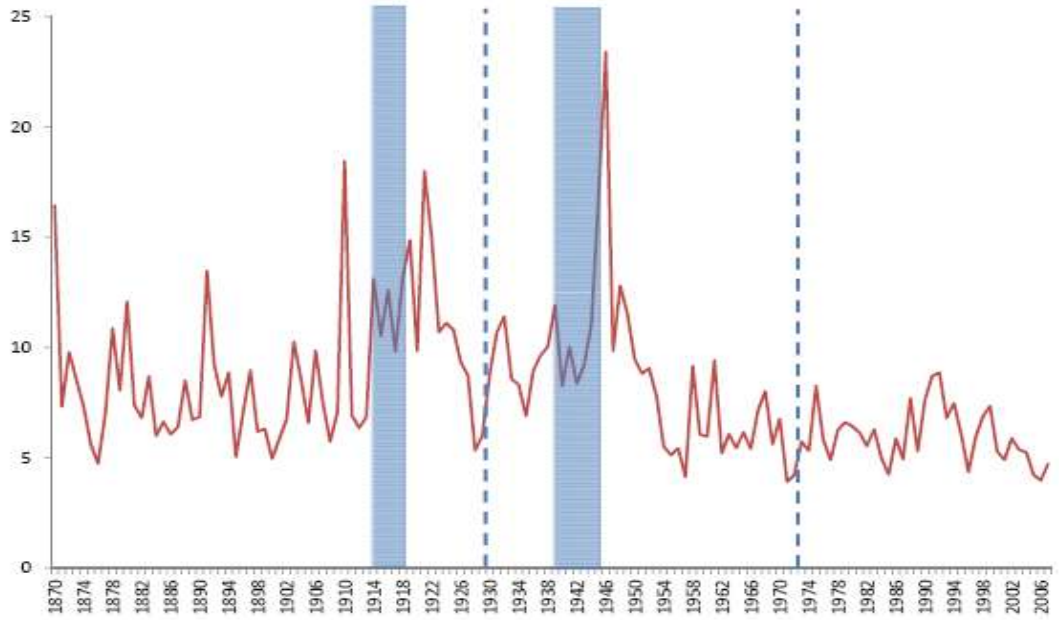


Figure 4. Standard deviation of growth rates, 1870-2007 (30 countries)

Source: see data appendix.

These 30 countries are not a random sample, since data typically became available earliest for the most developed countries. Tables 6 and 7 therefore provide evidence for a broader range of countries. Table 6 looks at the volatility

of growth rates over time within countries. For each period, we compute the standard deviation of each country's growth rates during that period. We only do this for countries for which data are available in every year of the period in question, excluding countries for which annual growth rates for some years were constructed using interpolation. We then compute for each period the cross-country averages of these standard deviations. Since the number of countries for which data are available increases over time, and since we want to be able to compare epochs, successive rows of the table compute these statistics for larger and larger samples: thus the second row, for example, computes them for the 16 countries for which the required data are available for the 1890-1913 and subsequent periods.

Table 6. Volatility of industrial growth rates

1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007	No. of countries
8.16	6.81	9.04	5.03	4.58	3.06	7
	6.73	9.94	5.42	5.13	4.36	16
		10.38	5.86	5.53	5.14	25
			5.94	5.73	5.41	45
				6.91	5.95	87
					7.28	125

Note: each entry represents the cross-country average of the country-specific standard deviations of industrial growth during the period in question. Source: see data appendix.

Two facts stand out from Table 6. The first is that the interwar period was the one in which growth rates were most volatile, and that volatility has been steadily decreasing since then. This conclusion comes from a row-by-row examination of the average standard deviations for consistent groups of countries. The second is that during the 20th century, growth has been more volatile for countries entering our sample later on: for any period after 1920, the numbers increase the larger the country sample (i.e. as we move down a particular column).

Figure 5 explains the reason for this: it shows that volatility was higher in peripheral regions than in the core in every period other than 1920-38 (when world wars and the Great Depression affected growth in the core much more than in the periphery). Since countries entering our sample later are typically followers rather than leaders, average volatility has tended to be higher in the

larger samples of countries available for later periods. This is reminiscent of the well-known fact that growth is more volatile in less well-developed countries (e.g. Poelhekke and van der Ploeg 2007); what is interesting is that this higher volatility is not just a feature of the overall macroeconomy, due for example to a higher reliance on primary production, or a more volatile terms of trade (Williamson 2008). Rather, it also seems to be a feature of the industrial sector.

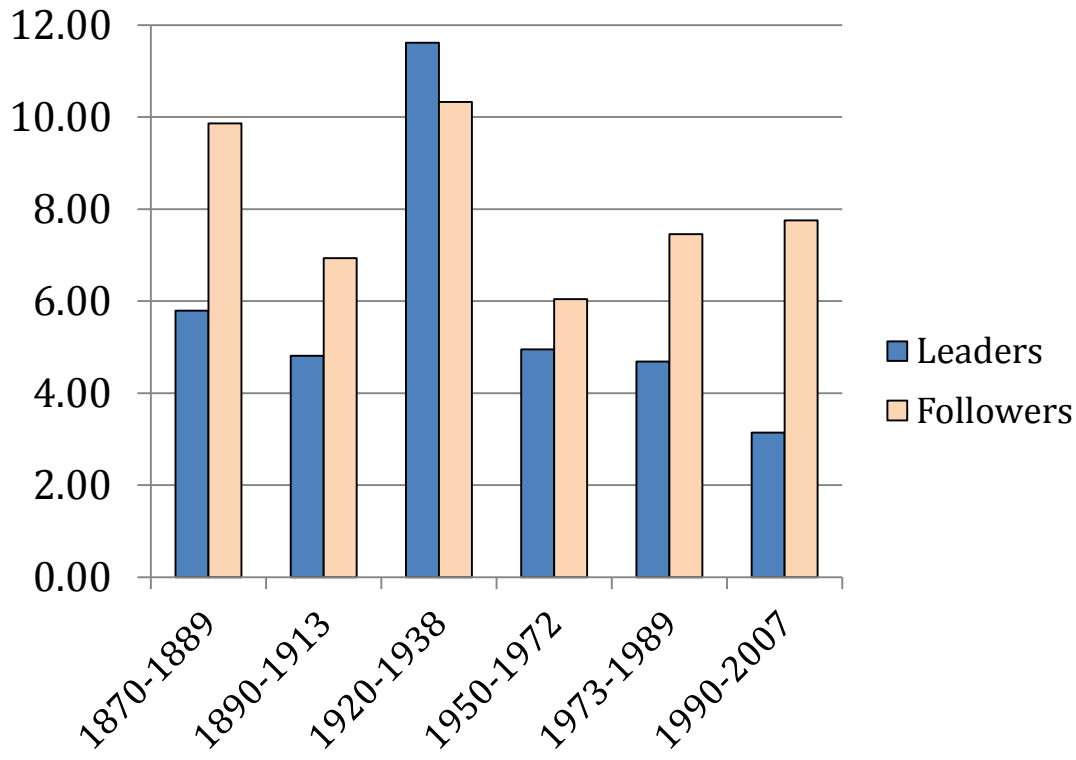


Figure 5. Volatility in core and periphery, 1870-2007

Source: see data appendix.

Table 7. Cross-country variations in growth rates

1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007	No. of countries
8.55	6.79	7.69	5.02	3.70	2.57	7
	7.49	9.12	5.81	5.50	4.77	16
		9.96	7.06	6.19	5.68	25
			6.99	6.28	6.03	45
				7.97	7.34	87
					8.87	125

Note: each entry represents the period average of the cross-country standard deviation of growth rates. Source: see data appendix.

Table 7 focuses not on volatility, but on the variation of growth rates across countries. It starts by computing the cross-country standard deviation of growth rates for each year. It then calculates the average of these standard deviations for each period. Once again, it does this for successively larger samples of countries. Table 7 confirms that the interwar period was the one that saw the highest variation of growth rates across countries. The one qualification to this statement is that the average standard deviation was higher in the 1870-1889 period, but this comparison is based on a sample of just seven countries. The variation of growth rates has been declining, for given country samples, since World War II. We conclude:

Stylized Fact #6: growth rates were most volatile, and most variable across countries, during the interwar period. Both the volatility and cross-country variation of growth have declined since then.

Stylized Fact #7: industrial growth rates were more volatile in follower regions than in the core for every period in our sample, apart from 1920-38.

7. Persistence over time

Finally, we turn to the issue of how persistent were high growth rates over time. More precisely, we want to know to what extent were high-growth countries in one period also the high growth countries in the following period. Table 8 provides, for each region and time period, a list of the top ten performers, ranked by their average growth performance over the period as a whole.[16] There are certain countries that consistently appear in the table: Russia, Bulgaria, China, Japan, India and Brazil being perhaps the most prominent: it seems as though the BRICs' rapid industrialization is a phenomenon with deep historical roots. (However, note that consistent with the logic of catching up, even these countries drop out of the table in later periods). On the other hand, it is also obvious from the table that there has been a good deal of churning over

[16] Table 4, in contrast, ranked countries according to how early they joined the modern growth club, which was defined in terms of growth performance over just ten years.

time, with many countries entering and exiting the leader board within a brief space of time (and, occasionally, re-entering at a later date).

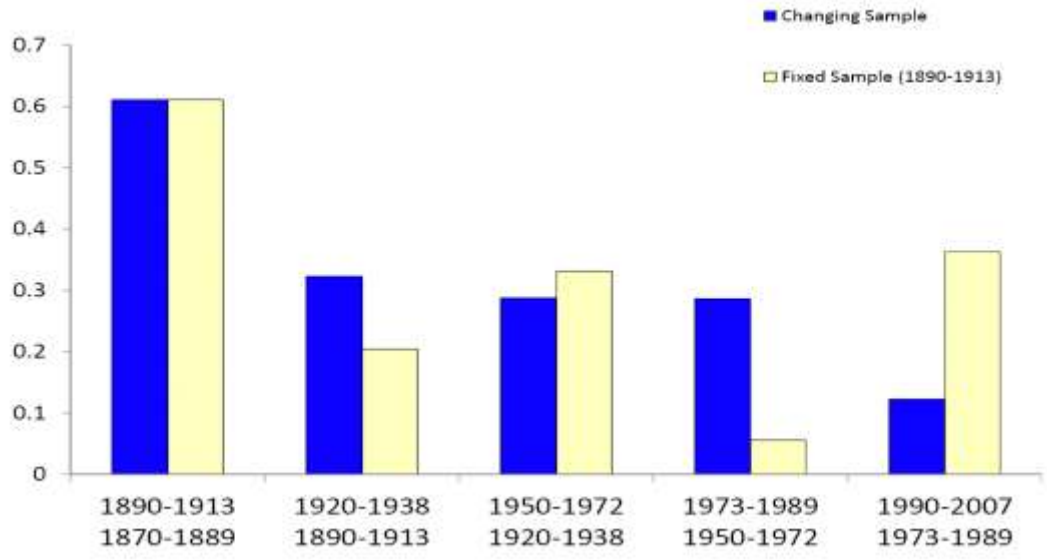
Figure 6 confirms that there has been relatively little persistence over time in long run industrial growth rates. It computes the correlation coefficient, and the rank correlation coefficient, between average country growth rates in adjacent periods. It does so both using a consistent 30 country sample, and using the largest sample of countries for which data exist for both periods (which sample naturally increases in size over time). As can be seen, these correlation coefficients were quite high in the 19th century, of the order of 0.5 to 0.6. By and large, a lot of the countries that were growing rapidly before 1889 were also growing rapidly after 1890. However, the correlation coefficients are much lower in the 20th century, of the order of 0.3 or less, suggesting that achieving rapid (or relatively rapid) growth in one period was not a particularly accurate predictor of performance in the subsequent period. We conclude:

Stylized Fact #8: while there are important exceptions, rapid long run industrial growth was not particularly persistent in the 20th century.

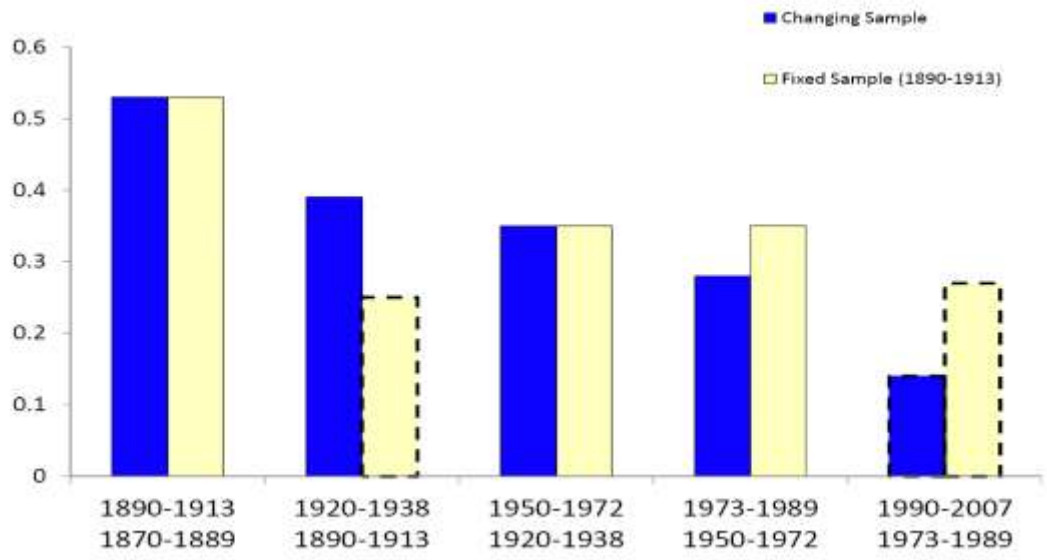
Table 8. The top ten performers by region and period

European Periphery					
1870-1889	**1890-1913**	**1920-1938**	**1950-1972**	**1973-1989**	**1990-2007**
Bosnia	Bosnia	Russia	Albania	Cyprus	Ireland
Russia	Romania	Latvia	Bulgaria	Malta	Lithuania
Austria	Serbia	Romania	Romania	Ireland	Slovak Republic
Hungary	Finland	Finland	Yugoslavia	Bulgaria	Poland
Finland	Russia	Bulgaria	Poland	Portugal	Finland
Spain	Bulgaria	Ireland	Cyprus	Russia	Hungary
Bulgaria	Italy	Estonia	Spain	Yugoslavia	Bosnia
Italy	Austria	Hungary	Italy	Latvia	Czech Rep.
Portugal	Hungary	Greece	Russia	Italy	Belarus
	Portugal	Poland	Greece	Finland	Estonia
Asia					
1870-1889	**1890-1913**	**1920-1938**	**1950-1972**	**1973-1989**	**1990-2007**
Japan	Korea	Korea	Singapore	Indonesia	Cambodia
Indonesia	China	Japan	Korea	Korea	Burma
Thailand	Philippines	China	Japan	Bhutan	Afghanistan
India	Japan	Taiwan	Malaysia	Tonga	Vietnam
	Taiwan	Philippines	Taiwan	Taiwan	China
	India	India	Pakistan	Hong Kong	Kazakhstan
	Thailand	Indonesia	Mongolia	China	Bhutan
	Indonesia	Burma	China	Maldives	Korea
	Burma	Thailand	Vietnam	Malaysia	Malaysia
			India	Thailand	Laos
Latin America and Caribbean					
1870-1889	**1890-1913**	**1920-1938**	**1950-1972**	**1973-1989**	**1990-2007**
Chile	Argentina	Colombia	Panama	St. Lucia	Trinidad & Tobago
Brazil	Peru	Peru	Puerto Rico	Grenada	Costa Rica
Argentina	Mexico	Argentina	Nicaragua	Dominica	Dominican Rep.
Uruguay	Chile	Costa Rica	Costa Rica	Paraguay	Honduras
	Uruguay	Mexico	Brazil	St. Vincent & the Grenadines	Belize
	Colombia	Guatemala	Venezuela	Antigua & Barbuda	Nicaragua
	Brazil	Brazil	Mexico	Belize	El Salvador
		Uruguay	El Salvador	Puerto Rico	St. Kitts & Nevis
		Chile	Honduras	Cuba	Peru
		Cuba	Peru	Ecuador	Suriname
Middle East and North Africa					
1870-1889	**1890-1913**	**1920-1938**	**1950-1972**	**1973-1989**	**1990-2007**
Turkey	Turkey	Turkey	Iran	UAE	UAE
		Egypt	Israel	Algeria	Oman
			Saudi Arabia	Egypt	Jordan
			Algeria	Tunisia	Iran
			Turkey	Saudi Arabia	Syria
			Egypt	Syria	Yemen
			Morocco	Sudan	Egypt
			Tunisia	Turkey	Saudi Arabia
			Syria	Jordan	Sudan
				Morocco	Tunisia
Sub-Saharan Africa					
1870-1889	**1890-1913**	**1920-1938**	**1950-1972**	**1973-1989**	**1990-2007**
		South Africa	Mozambique	Cameroon	Equatorial Guinea
		Congo, Dem. Rep.	Central African Rep.	Cape Verde	Mozambique
			Kenya	Swaziland	Namibia
			Zambia	Lesotho	Uganda
			Cameroon	Botswana	Lesotho
			South Africa	Mauritius	Sierra Leone
			Botswana	Mali	Angola
			Ghana	Central African Rep.	São Tomé & Príncipe
			Senegal	Gambia	Burkina Faso
			Gambia	Congo, Rep.	Benin

Source: Table A2.



Panel A. Correlations of country growth rates between periods



Panel B. Rank correlations of country growth rates between periods

Figure 6. Cross-country correlations between growth in subsequent periods

Source: Table A2.

8. Implications and Agenda

Rapid peripheral industrialization is not a phenomenon unique to the recent past. It was taking place at least as far back as the 1870s in Latin America and the European periphery, and was well underway in Asia by the end of the century. It had become widespread in all three regions by the interwar period. The highpoint of peripheral industrialization was not the 1990-2007 period, but the ISI period from 1950 to 1972, which was also the highpoint of the periphery's industrial convergence on the core.

It is difficult to generalize about some of the patterns uncovered here. Latin America and the European periphery began to rapidly industrialize behind tariff barriers, but nineteenth century Asia had free trade imposed upon it, and also enjoyed rapid industrial growth. What all three experiences had in common was that they occurred during the generally prosperous and globalizing period before World War I; but peripheral industrial growth remained strong, and spread to more regions and countries, during the crisis-ridden interwar period. Industrial growth was fastest during the 1950-72 ISI period, but this was true everywhere, not just in the periphery. Industry grew rapidly in these years in countries with many different institutional structures: in reglobalizing Western Europe, in communist Eastern Europe, and in newly independent peripheral countries pursuing inward-looking industrialization policies. A country like Ireland saw rapid industrial growth after its entry to the EU in 1973, but also during its autarkic interwar experiment (Table 8).

The relationship between openness and industrialization is not straightforward: it may be contingent on other factors, just as appears to be true of the relationship between openness and growth more generally (Clemens and Williamson 2004). Nor can explanations for performance based on invariant country characteristics easily explain the low persistence of leadership in the industrial growth stakes. One striking feature of the data is the way in which rapid industrialization began in different regions at different times: first in Latin America and the European periphery, then in Asia, then in MENA, and finally in sub-Saharan Africa. If it were not for this geographical clustering, the assumption

in Lucas (2000) that countries embark on modern growth in an essentially random way might seem as good a way of explaining the data as any other.

The dataset we have constructed will allow us to delve more deeply into the causes of peripheral industrialization, by focusing more closely on the different experiences of individual countries. To what extent can growth be explained by the sorts of convergence forces discussed by Lucas (2000) and Rodrik (2011), and what explains the geographical clustering in our data? Did low peripheral wages give follower countries' industries an increasing competitive advantage over time relative to those in the core? Did falling transport costs help peripheral countries industrialize, by enabling resource-scarce countries buy essential fuel and raw materials on world markets? And what, if any, were the roles of peripheral trade policy (Coatsworth and Williamson 2004, Williamson 2006), or the changing terms of trade (Prebisch 1950, Singer 1950), in fostering industrialization? We intend to address these and related issues in our future work.

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Appendix

Table A.1 1870-1938 Data Availability (at least 4 observations)

Group	Country	1870-1889	1890-1913	1920-1938
Leaders	Germany	X	X	X
	United Kingdom	X	X	X
	United States	X	X	X
European Core	Belgium	X	X	X
	France	X	X	X
	Netherlands	X	X	X
	Switzerland	X	X	X
Scandinavia	Denmark	X	X	X
	Norway	X	X	X
	Sweden	X	X	X
European Periphery	Austria	X	X	X
	Bosnia and Herzegovina	X	X	
	Bulgaria	X	X	X
	Czechoslovakia			X
	Estonia			X
	Finland	X	X	X
	Greece			X
	Hungary	X	X	X
	Ireland			X
	Italy	X	X	X
	Latvia			X
	Poland			X
	Portugal	X	X	X
	Romania		X	X
	Russia	X	X	X
	Serbia and Montenegro		X	
	Spain	X	X	X
	Yugoslavia			X
Newly Settled	Australia	X	X	X
	Canada	X	X	X
	New Zealand	X	X	X
Asia	China		X	X
	India	X	X	X
	Indonesia	X	X	X
	Japan	X	X	X
	Korea		X	X
	Myanmar		X	X
	Philippines		X	X
	Taiwan		X	X

	Thailand	X	X	X
Latin America	Argentina	X	X	X
	Brazil	X	X	X
	Chile	X	X	X
	Colombia		X	X
	Costa Rica			X
	Cuba			X
	El Salvador			X
	Guatemala			X
	Honduras			X
	Mexico		X	X
	Nicaragua			X
	Peru		X	X
	Uruguay	X	X	X
Middle east and north Africa	Egypt			X
	Turkey	X	X	X
Sub-Saharan Africa	Congo, Dem. Rep. of			X
	South Africa			X

Table A.2 Individual country growth experiences

Group	Country	1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007
Leaders	Germany	2.6	3.7	1.6	7.0	1.2	1.2
	United Kingdom	1.8	1.9	3.0	4.3	-0.1	0.8
	United States	4.8	4.5	1.2	4.4	1.8	4.2
European Core	Belgium	1.6	2.3	2.6	4.8	1.5	2.1
	France	2.6	2.0	2.4	6.3	0.7	1.8
	Luxembourg				-1.6	2.0	2.4
	Netherlands	3.3	2.9	4.2	7.1	1.9	2.3
	Switzerland	2.5	4.2	2.2	3.1	0.7	1.5
Scandinavia	Denmark	4.3	5.3	3.5	4.9	1.9	1.3
	Norway	0.7	3.0	3.8	4.6	0.2	1.6
	Sweden	3.3	6.1	4.4	5.4	1.4	6.4
European Periphery	Albania				16.8		1.2
	Austria	4.9	3.3	2.3	5.8	2.5	2.8
	Belarus						5.0
	Bosnia and Herzegovina	12.7	10.0				5.8
	Bulgaria	2.6	4.4	4.8	12.0	4.9	0.1
	Croatia						0.7
	Cyprus				9.2	5.8	0.2
	Czech Republic						5.7
	Czechoslovakia			2.3	5.2	2.2	
	Estonia			4.1		2.9	4.8
	Finland	3.7	5.0	6.7	5.9	3.5	6.4
	Greece			3.9	8.0	2.0	1.4
	Hungary	4.9	3.3	4.0	7.3	2.3	5.9
	Iceland						1.8
	Ireland				5.0	5.4	10.7
	Italy	2.4	3.5	2.5	8.4	3.5	0.9
	Latvia			11.0		4.1	0.3
	Lithuania						8.4
	Macedonia, FYR						-0.9
	Malta					5.5	1.1
	Moldova						2.5
	Montenegro						-1.1
	Poland			2.9	9.3	2.0	7.3
	Portugal	2.1	2.7	2.9	7.5	4.8	1.9
	Romania		9.8	7.3	10.1	1.7	0.9
	Russia	5.3	4.6	15.3	8.3	4.2	-0.5
	Serbia and Montenegro		7.0				-2.6
	Slovak Republic						7.5
	Slovenia						3.8
	Spain	3.4	1.3	-0.5	8.8	1.2	2.9
	Ukraine						-0.3
	Yugoslavia			1.3	10.0	4.1	

CA-AU-NZ	Australia	4.8	3.3	1.6	5.0	1.2	1.7
	Canada	5.1	6.1	2.5	4.7	2.3	3.0
	New Zealand	4.7	4.3	2.9	6.0	2.6	2.2
Asia	Afghanistan						11.4
	Armenia						2.4
	Azerbaijan					2.3	-9.5
	Bangladesh				1.7	4.8	6.6
	Bhutan					11.2	7.4
	Brunei Darussalam						2.6
	Cambodia						15.9
	China		7.8	5.3	9.2	8.4	9.8
	Fiji				2.6	3.1	3.5
	Georgia						7.0
	Hong Kong SAR of China					8.7	-3.0
	India	0.7	2.3	3.4	7.1	5.0	6.5
	Indonesia	1.3	1.3	2.7	3.1	12.9	5.1
	Japan	3.0	5.3	6.7	12.4	3.9	1.0
	Kazakhstan						8.2
	Kiribati					-19.5	2.4
	Korea		8.0	7.1	13.2	11.8	7.4
	Kyrgyz Republic						-2.4
	Lao People's Democratic Republic					6.6	7.1
	Macao SAR of China						2.7
	Malaysia				11.7	8.3	7.1
	Maldives					8.3	6.2
	Mongolia				9.5	7.4	-1.1
	Myanmar		0.1	2.6	3.4	3.3	12.0
	Nepal					6.2	5.0
	Pakistan				11.0	7.6	5.5
	Papua New Guinea					1.1	2.0
	Philippines		6.3	3.4	7.0	1.7	3.3
	Samoa						2.1
	Singapore				16.1	6.7	6.1
	Solomon Islands						-2.3
	Sri Lanka				6.0	4.6	5.6
	Taiwan		5.1	4.4	11.5	9.0	4.9
	Tajikistan					5.8	-1.6
	Thailand	1.0	1.8	2.3	2.3	7.7	5.9
	Tonga					9.1	-0.1
	Uzbekistan						1.5
	Vanuatu						-0.1
	Vietnam				8.9	1.1	10.7
Latin America and Caribbean	Antigua and Barbuda					6.8	2.3
	Argentina	6.4	8.8	4.2	4.9	-0.9	1.7

	Bahamas, The						1.9
	Barbados					1.5	-1.1
	Belize					6.7	4.3
	Bolivia				3.2	-0.9	3.4
	Brazil	7.2	0.0	3.2	7.8	2.9	2.1
	Chile	7.5	3.9	2.6	5.2	2.0	3.5
	Colombia		1.2	4.5	5.9	3.1	0.3
	Costa Rica			4.1	7.8	3.2	5.5
	Cuba			2.2	3.1	4.7	0.8
	Dominica					7.6	-0.6
	Dominican Republic				-6.3	3.4	5.0
	Ecuador				6.1	3.9	2.2
	El Salvador			1.7	6.9	-3.3	4.0
	Grenada					11.1	3.1
	Guatemala			3.3	6.3	1.9	2.6
	Guyana				3.0	-2.3	1.1
	Haiti				1.7	2.0	-2.7
	Honduras			2.0	6.4	3.6	4.6
	Jamaica				3.7	-1.2	-1.6
	Mexico		6.0	3.7	7.1	3.1	3.2
	Nicaragua			-2.3	8.6	-1.1	4.2
	Panama				9.7	3.6	0.4
	Paraguay				4.0	7.4	0.8
	Peru		6.8	4.2	6.3	0.9	3.9
	Puerto Rico				9.5	4.8	
	St. Kitts and Nevis					2.6	4.0
	St. Lucia					11.1	0.9
	St. Vincent and the Grenadines					7.0	-0.5
	Suriname					-4.1	3.9
	Trinidad and Tobago					0.9	7.1
	Uruguay	4.2	3.9	3.2	1.4	1.5	0.1
	Venezuela				7.5	2.5	2.8
Middle East and North Africa	Algeria				9.7	7.9	0.1
	Bahrain					-1.2	
	Egypt			1.6	6.9	7.9	5.6
	Iran, Islamic Republic of				11.9	3.6	7.3
	Iraq						-4.3
	Israel				10.9	3.0	3.7
	Jordan					4.7	7.5
	Kuwait						0.1
	Lebanon						2.2
	Morocco				4.8	4.2	2.9
	Oman						8.6

	Saudi Arabia				9.8	7.6	5.4
	Sudan					6.6	5.3
	Syrian Arab Republic				3.5	6.9	6.9
	Tunisia				3.5	7.7	4.6
	Turkey	1.2	1.2	8.1	7.6	5.0	4.1
	United Arab Emirates					18.8	9.5
	Yemen, Republic of						6.5
Sub-Saharan Africa	Angola					-10.5	6.9
	Benin					2.2	5.2
	Botswana				6.3	8.0	3.1
	Burkina Faso					2.7	5.8
	Burundi					5.3	-9.1
	Cameroon				7.8	9.6	3.9
	Cape Verde					8.8	3.5
	Central African Republic				8.6	6.6	0.3
	Comoros					4.7	1.8
	Congo, Dem. Rep. of			2.4	-4.2	-0.4	-3.9
	Congo, Rep. of				3.0	5.8	-2.4
	Cote d'Ivoire					3.3	2.0
	Djibouti						-2.1
	Equatorial Guinea						40.5
	Eritrea						1.4
	Ethiopia					3.9	4.7
	Gabon					2.5	3.4
	Gambia, The				3.5	6.2	1.7
	Ghana				5.3	-3.5	2.2
	Guinea						3.8
	Kenya				8.5	5.4	1.7
	Lesotho					8.1	9.6
	Madagascar					2.4	2.7
	Malawi					3.1	-1.3
	Mali					6.7	-0.7
	Mauritania					-0.6	1.2
	Mauritius					7.5	3.4
	Mozambique				9.5		12.3
	Namibia					3.4	12.0
	Niger					-5.9	2.9
	Rwanda				2.3	5.4	-2.2
	Senegal				4.4	3.7	3.0
	Seychelles					4.8	4.2
	Sierra Leone						9.1
	Somalia					0.2	
	South Africa			6.7	6.9	2.8	2.6
	Swaziland					8.6	2.2

São Tomé and Príncipe			6.5
Tanzania		4.9	5.1
Togo		1.0	4.4
Uganda		3.0	10.1
Zambia	8.3	2.1	2.8
Zimbabwe	-0.3	2.7	-3.7

Note: Individual country growth rates are computed as the β coefficient of the following regression: $Y=\alpha+\beta t$ where Y is the natural logarithm of industrial production and t is a linear time trend. Regressions are performed with at least for observations.

Table A.3 Industrial growth acceleration. Constant samples

Panel A: 1890-1913 sample

Groups	(1920-1938)-(1890-1913)	(1950-1972)-(1920-1938)	(1973-1989)-(1950-1972)	(1990_2007)-(1973-1989)
Leaders	-1.5	3.3	-4.3	1.1
European Core	0.0	2.5	-4.1	0.7
Scandinavia	-0.9	1.1	-3.8	1.9
European Periphery	0.8	3.2	-5.0	-0.8
CA-AU-NZ	-2.2	2.9	-3.2	0.3
Asia	0.0	3.5	-0.6	-0.9
Latam and Caribbean	-0.7	1.8	-3.7	0.3
Middle East and North Africa	6.9	-0.5	-2.6	-0.9

Panel B: 1920-1938 sample

Groups	(1950-1972)-(1920-1938)	(1973-1989)-(1950-1972)	(1990_2007)-(1973-1989)
Leaders	3.3	-4.3	1.1
European Core	2.5	-4.1	0.7
Scandinavia	1.1	-3.8	1.9
European Periphery	3.5	-5.1	-0.2
CA-AU-NZ	2.9	-3.2	0.3
Asia	3.5	-0.6	-0.9
Latam and Caribbean	3.2	-4.3	1.2
Middle East and North Africa	2.4	-0.8	-1.6
Sub-Saharan Africa	-3.2	-0.2	-1.9

Note: This table reports the growth rate difference between two sub periods, keeping the country sample constant throughout the whole period. Panel A takes the 1890-1913 sample formed by 39 countries and Panel B uses the 1920-1938 sample, formed by 51 countries.

Table A.4 Average industrial growth rates in countries with data for at least half of the period

Panel A: US, Germany and UK in Leaders

Groups	1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007
Leaders	3.0	3.4	1.9	5.2	1.0	2.1
European Core	2.5	2.8	2.9	4.0	1.4	2.0
Scandinavia	2.8	4.8	3.9	4.9	1.1	3.1
European Periphery	3.7	5.0	4.7	8.6	3.5	2.9
CA-AU-NZ	4.9	4.6	2.3	5.2	2.0	2.3
Asia	1.5	3.6	4.2	7.5	5.5	3.9
Latam and Caribbean	6.3	4.4	2.8	5.1	2.9	2.2
Middle East and North Africa	1.2	1.2	4.9	7.4	7.0	5.0
Sub-Saharan Africa			4.6	4.1	4.2	3.0
Countries	30	39	54	79	129	168

Panel B: US, Germany, UK (before 1939) and Japan (after 1939) in Leaders

Groups	1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007
Leaders	3.0	3.4	1.9	7.9	2.3	2.2
European Core	2.5	2.8	2.9	4.0	1.1	1.8
Scandinavia	2.8	4.8	3.9	4.9	1.1	3.1
European Periphery	3.7	5.0	4.7	8.6	3.5	2.9
CA-AU-NZ	4.9	4.6	2.3	5.2	2.0	2.3
Asia	1.5	3.6	4.2	7.0	5.5	4.0
Latam and Caribbean	6.3	4.4	2.8	5.1	2.9	2.2
Middle East and North Africa	1.2	1.2	4.9	7.4	7.0	5.0
Sub-Saharan Africa			4.6	4.1	4.2	3.0

Note: The table reports the unweighted average industrial growth rates by region. Individual country growth rates are computed as the β coefficient of the following regression: $Y=\alpha+\beta t$ where Y is the natural logarithm of industrial production and t is a linear time trend. Regressions are perfored in countries with data for at least half of the period.

Table A.5 Average industrial growth rates relative to the leaders in countries with data for at least half of the period

Panel A: US, Germany and UK in Leaders

Groups	1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007
European Core	-0.4	-0.6	1.1	-1.0	0.0	-1.1
Scandinavia	-0.1	1.3	2.1	0.0	-0.2	0.0
European Periphery	0.7	1.5	3.0	3.6	2.2	-0.2
CA-AU-NZ	2.0	1.1	0.6	0.2	0.7	-0.8
Asia	-1.4	0.1	2.5	2.5	4.1	0.8
Latam and Caribbean	3.4	0.9	1.1	0.1	1.5	-0.9
Middle East and North Africa	-1.7	-2.3	3.1	2.4	5.6	1.9
Sub-Saharan Africa			2.8	-0.8	2.8	-0.2

Panel B: US, Germany, UK (before 1939) and Japan (after 1939) in Leaders

Groups	1870-1889	1890-1913	1920-1938	1950-1972	1973-1989	1990-2007
European Core	-0.4	-0.6	1.1	-2.4	-1.1	-1.0
Scandinavia	-0.1	1.3	2.1	-1.5	-1.1	0.3
European Periphery	0.7	1.5	3.0	2.1	1.3	0.1
CA-AU-NZ	2.0	1.1	0.6	-1.3	-0.2	-0.5
Asia	-1.4	0.1	2.5	0.6	3.3	1.2
Latam and Caribbean	3.4	0.9	1.1	-1.4	0.7	-0.6
Middle East and North Africa	-1.7	-2.3	3.1	0.9	4.7	2.2
Sub-Saharan Africa			2.8	-2.3	1.9	0.1

Note: Average industrial growth rates by region relative to the leaders are computed in two steps. First, we compute the average growth rates for each region as in Table 1. Second, we subtract the GDP-weighted average of the period-average growth rates for the three leaders.

Table A.6 Industrial growth accelerations in countries with data for at least half of the period

Panel A: US, Germany and UK in Leaders

Groups	(1890-1913)-(1870-1889)	(1920-1938)-(1890-1913)	(1950-1972)-(1920-1938)	(1973-1989)-(1950-1972)	(1990_2007)-(1973-1989)
Leaders	0.3	-1.5	3.3	-4.3	1.1
European Core	0.3	0.0	2.5	-2.6	0.6
Scandinavia	2.0	-0.9	1.1	-3.8	1.9
European Periphery	-0.1	0.8	3.9	-4.7	-0.8
CA-AU-NZ	-0.3	-2.2	2.9	-3.2	0.3
Asia	1.2	0.2	3.5	-0.6	-1.4
Latam and Caribbean	-2.2	-0.7	3.2	-3.1	-0.6
Middle East and North Africa	0.0	6.9	2.4	-1.6	-1.7
Sub-Saharan Africa			-3.2	-2.3	-1.8

Panel B: US, Germany, UK (before 1939) and Japan (after 1939) in Leaders

Groups	(1890-1913)-(1870-1889)	(1920-1938)-(1890-1913)	(1950-1972)-(1920-1938)	(1973-1989)-(1950-1972)	(1990_2007)-(1973-1989)
Leaders	0.3	-1.5	4.3	-5.6	-0.2
European Core	0.3	0.0	2.5	-2.9	0.7
Scandinavia	2.0	-0.9	1.1	-3.8	1.9
European Periphery	-0.1	0.8	3.9	-4.7	-0.8
CA-AU-NZ	-0.3	-2.2	2.9	-3.2	0.3
Asia	1.2	0.2	3.2	0.1	-1.3
Latam and Caribbean	-2.2	-0.7	3.2	-3.1	-0.6
Middle East and North Africa	0.0	6.9	2.4	-1.6	-1.7
Sub-Saharan Africa			-3.2	-2.3	-1.8

Note: These tables report the average difference in groups' growth rates between successive sub-periods. Since the countries included in each group change over time, the columns of this table are not comparable.

Table A.7 Industrial growth acceleration in countries with data for at least half of the period. Constant samples

Panel A: 1890-1913 sample

Groups	(1920-1938)-(1890-1913)	(1950-1972)-(1920-1938)	(1973-1989)-(1950-1972)	(1990_2007)-(1973-1989)
Leaders	-1.5	3.3	-4.3	1.1
European Core	0.0	2.5	-4.1	0.7
Scandinavia	-0.9	1.1	-3.8	1.9
European Periphery	0.8	3.2	-5.0	-0.8
CA-AU-NZ	-2.2	2.9	-3.2	0.3
Asia	0.2	2.6	-0.2	0.1
Latam and Caribbean	-0.7	1.8	-3.7	0.3
Middle East and North Africa	6.9	-0.5	-2.6	-0.9

Panel B: 1920-1938 sample

Groups	(1950-1972)-(1920-1938)	(1973-1989)-(1950-1972)	(1990_2007)-(1973-1989)
Leaders	3.3	-4.3	1.1
European Core	2.5	-4.1	0.7
Scandinavia	1.1	-3.8	1.9
European Periphery	3.5	-5.1	-0.2
CA-AU-NZ	2.9	-3.2	0.3
Asia	3.5	-0.6	-0.9
Latam and Caribbean	3.2	-4.3	1.2
Middle East and North Africa	2.4	-0.8	-1.6
Sub-Saharan Africa	-3.2	-0.2	-1.9

Note: This table reports the growth rate difference between two sub periods, keeping the country sample constant throughout the whole period.

Table A.8 Countries entering and exiting the 5% growth club

Group	Country	Data Start	In	Out
Leaders	United States	1870	1886	2002
	Germany	1870	1939	1968
	United Kingdom	1870	1941	1962
European Core	Netherlands	1870	1880	1975
	Switzerland	1870	1887	1932
	France	1870	1927	1978
	Belgium	1870	1928	1975
	Luxembourg	1948	1991	1991
Scandinavia	Norway	1870	1892	1971
	Denmark	1870	1893	1973
	Sweden	1870	1896	2007
European Periphery	Finland	1870	1880	2007
	Russian Federation	1870	1880	2007
	Austria	1870	1883	1977
	Hungary	1870	1883	2007
	Spain	1870	1884	1980
	Bosnia and Herzegovina	1881	1892	1912
	Serbia and Montenegro	1898	1909	1910
	Bulgaria	1870	1911	1985
	Italy	1870	1911	1982
	Romania	1902	1913	1982
	Greece	1913	1924	1981
	Czechoslovakia	1913	1926	1966
	Portugal	1870	1927	1986
	Latvia	1913	1928	2007
	Poland	1913	1928	2007
	Estonia	1920	1931	2007
	Yugoslavia, Federal Republic of	1910	1942	1984
	Albania	1938	1949	1970
	Ireland	1936	1950	2007
	Cyprus	1962	1973	1987
	Malta	1970	1981	1985
	Slovak Republic	1990	2001	2007
	Belarus	1990	2003	2007
	Slovenia	1990	2005	2007
	Ukraine	1987	2005	2007
	Lithuania	1995	2006	2007
	Czech Republic	1995	2007	2007
	Moldova	1995	2007	2007
	Croatia	1990		
	Iceland	1997		
	Macedonia, FYR	1990		
	Montenegro	2000		

CA-AU-NZ	Canada	1870	1885	2002
	Australia	1870	1886	1971
	New Zealand	1875	1886	1979
Asia	Japan	1874	1899	1993
	China, P.R.	1889	1900	2007
	Philippines	1902	1913	1982
	Taiwan Province of China	1903	1914	2007
	Korea, Republic of	1910	1921	2007
	India	1870	1929	2007
	Indonesia	1880	1941	2001
	Pakistan	1950	1961	2007
	Sri Lanka	1957	1968	2003
	Bangladesh	1960	1971	2007
	Thailand	1870	1971	2007
	Vietnam	1962	1973	2007
	Mongolia	1964	1975	2007
	Singapore	1966	1977	2007
	Malaysia	1968	1979	2007
	Fiji	1965	1981	2000
	Myanmar	1901	1982	2007
	Nepal	1973	1986	2003
	Tonga	1975	1986	1990
	Bhutan	1981	1992	2007
	Hong Kong SAR of China	1982	1993	1993
	Kiribati	1982	1994	1998
	Lao People's Democratic Republic	1984	1995	2006
	Maldives	1984	1995	2007
	Papua New Guinea	1980	1999	2000
	Cambodia	1993	2004	2007
	Kyrgyz Republic	1990	2004	2005
	Armenia	1990	2005	2007
	Tajikistan	1985	2005	2007
	Georgia	1996	2007	2007
	Afghanistan	2002		
	Azerbaijan	1981		
	Brunei Darussalam	1989		
	Kazakhstan	2000		
	Macao SAR of China	1996		
	Samoa	1994		
	Solomon Islands	1990		
	Uzbekistan	1995		
	Vanuatu	1998		
Latam and Caribbean	Chile	1870	1881	1999
	Brazil	1870	1884	1982
	Argentina	1875	1886	1973
	Uruguay	1870	1886	1959
	Mexico	1891	1902	1983

	Peru	1896	1907	1971
	El Salvador	1920	1931	2001
	Colombia	1900	1937	1981
	Costa Rica	1920	1939	2004
	Cuba	1930	1941	1987
	Nicaragua	1920	1941	1979
	Venezuela	1936	1947	1981
	Guatemala	1920	1949	1982
	Honduras	1920	1949	2007
	Ecuador	1939	1950	1985
	Panama	1945	1956	1998
	Dominican Republic	1950	1961	2004
	Bolivia	1950	1967	1981
	Paraguay	1938	1969	1990
	Haiti	1950	1974	1981
	Guyana	1960	1977	2001
	Puerto Rico	1969	1980	1985
	Barbados	1970	1981	1982
	Belize	1970	1981	2007
	Trinidad and Tobago	1971	1982	2007
	Antigua and Barbuda	1977	1988	1989
	Dominica	1977	1988	1994
	Grenada	1977	1988	2004
	St. Vincent and the Grenadines	1977	1988	1990
	St. Lucia	1980	1991	1994
	St. Kitts and Nevis	1977	2001	2005
	Suriname	1975	2004	2007
	Bahamas, The	1989		
	Jamaica	1966		
Middle east and north Africa	Turkey	1880	1931	1999
	Morocco	1938	1949	1982
	Tunisia	1937	1950	2004
	Algeria	1948	1959	1989
	Egypt	1919	1962	2006
	Israel	1955	1966	2001
	Syrian Arab Republic	1957	1968	2007
	Iran, Islamic Republic of	1960	1971	2007
	Saudi Arabia	1968	1979	2007
	Sudan	1970	1981	2004
	Jordan	1975	1986	2007
	United Arab Emirates	1975	1986	2007
	Oman	1988	1999	2006
	Yemen, Republic of	1990	2001	2003
	Bahrain	1980		
	Iraq	1997		
	Kuwait	1995		
	Lebanon	1994		

Sub-Saharan Africa	South Africa	1913	1924	1978
	Congo, Dem. Rep. of	1929	1940	1959
	Zimbabwe	1939	1951	1978
	Kenya	1953	1964	1992
	Zambia	1955	1966	1994
	Ghana	1956	1967	2004
	Botswana	1965	1976	1997
	Cameroon	1965	1976	2007
	Central African Republic	1965	1976	1990
	Senegal	1959	1978	1983
	Gambia, The	1966	1979	1993
	Lesotho	1970	1981	2007
	Malawi	1970	1981	1981
	Rwanda	1965	1981	1988
	Swaziland	1971	1982	1997
	Burundi	1970	1985	1993
	Congo, Rep. of	1965	1985	1991
	Mauritius	1976	1987	2002
	Benin	1971	1989	2004
	Mali	1980	1991	1994
	Seychelles	1978	1991	2004
	Togo	1976	1993	2005
	Uganda	1982	1993	2007
	Burkina Faso	1970	2000	2006
	Cote d'Ivoire	1980	2000	2002
	Mauritania	1985	2000	2001
	Ethiopia	1981	2001	2007
	Namibia	1980	2001	2007
	Sierra Leone	1990	2001	2005
	Mozambique	1967	2002	2007
	Angola	1985	2003	2007
	Cape Verde	1986	2003	2003
	Tanzania	1985	2004	2007
	Comoros	1980		
	Djibouti	1990		
	Equatorial Guinea	2000		
	Eritrea	1992		
	Gabon	1980		
	Guinea	1988		
	Madagascar	1984		
	Niger	1985		
	Somalia	1970		
	São Tomé and Príncipe	2001		

Note: "**Data Starts"** is the first year for which industrial production growth data are available. "**In"** indicates the first year that a country experienced a 10-year average backward looking growth rate greater than 5 per cent. Backward looking average growth rates are computed following a regression-based approach. More precisely, we take the β coefficient of the following regression

model: $Y=\alpha+\beta t$ estimated using data for the *T-1* to *T-10* period and assign this growth rate to year *T.Y* is the natural logarithm of industrial production and *t*is a linear time trend. The 5 per cent threshold is computed by taking the average of the growth rates in the U.S., U.K. and Germany, during the 1870-1913 period. "**Out"** indicates the last year that a country showed a 10-year backward looking year-on-year average growth rate greater than 5 per cent.

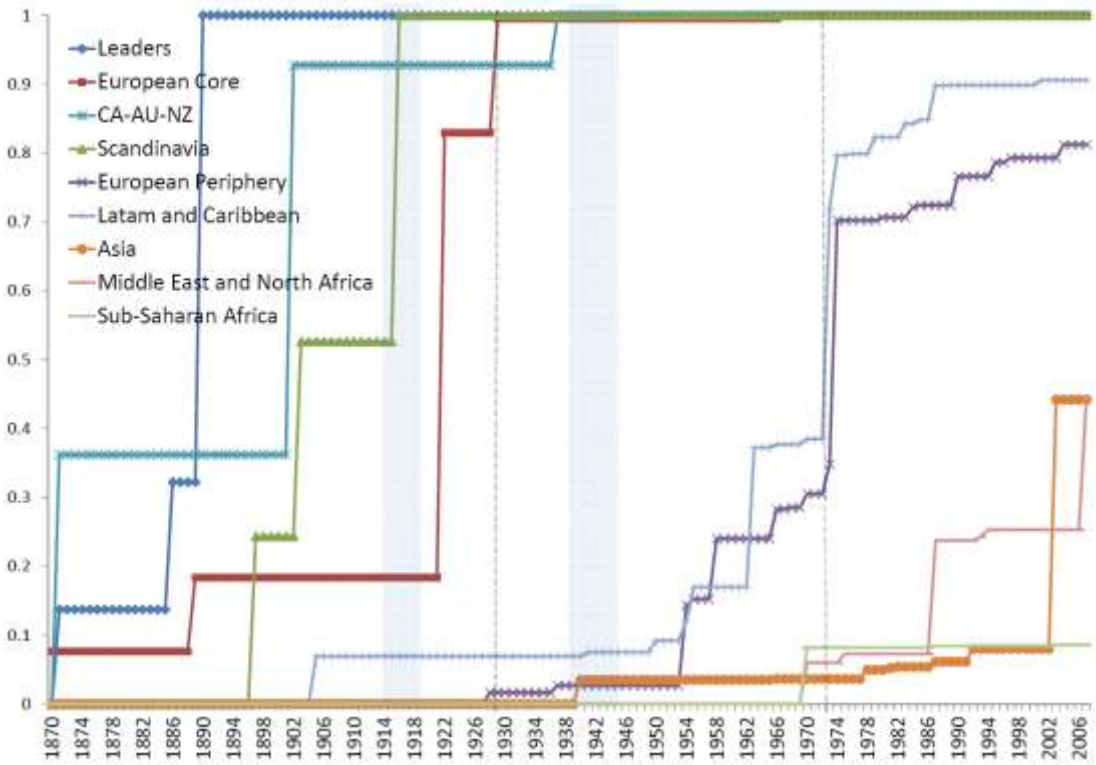
Table A.9 Dates when countries passed output per capita thresholds

Group	Country	Threshold 1	Threshold 2	Threshold 3
3 Leaders	United Kingdom	1871	1913	1936
	Germany	1886	1907	1927
	United States	1890	1912	1918
European Core	Belgium	1889	1928	1955
	France	1922	1951	1960
	Netherlands	1929	1954	1960
	Luxembourg	1967	1967	1967
Scandinavia	Norway	1897	1913	1939
	Denmark	1903	1924	1943
	Sweden	1916	1946	1959
European Periphery	Austria	1928	1954	1959
	Finland	1937	1954	1961
	Italy	1954	1961	1966
	Ireland	1955	1967	1974
	Spain	1958	1965	1969
	Portugal	1966	1973	1982
	Greece	1966	1972	1978
	Cyprus	1968	1979	1988
	Hungary	1970	1984	2001
	Romania	1973		
	Malta	1973	1975	1978
	Poland	1974	2000	2006
	Russian Federation	1974	1989	
	Latvia	1980	1987	
	Bulgaria	1984		
	Estonia	1985	1986	2005
	Slovak Republic	1990	1990	1998
	Slovenia	1990	1990	1990
	Macedonia, FYR	1990		
	Serbia and Montenegro	1990	1990	
	Croatia	1990	1990	1990
	Czech Republic	1995	1995	1995
	Lithuania	1997	2003	
	Iceland	1997	1997	1997
	Belarus	2004		
CA-AU-NZ	Australia	1871	1925	1945
	Canada	1902	1926	1943
	New Zealand	1937	1954	1964
Asia	Japan	1940	1958	1961
	Singapore	1966	1968	1971
	Korea, Republic of	1978	1985	1987
	Azerbaijan	1981		
	Hong Kong SAR of China	1982	1983	1987

	Malaysia	1987	1992	1996
	Brunei Darussalam	1989	1989	1989
	Thailand	1992	2003	
	Macao SAR of China	1996	1996	2002
	China, P.R.	2003		
Latam and Caribbean	Argentina	1905	1937	1947
	Uruguay	1941	1952	1979
	Dominican Republic	1950	1950	1950
	Chile	1954	1993	
	Venezuela	1955	1972	
	Mexico	1963	1974	1998
	El Salvador	1963		
	Jamaica	1966		
	Costa Rica	1970	1994	1999
	Barbados	1973		
	Brazil	1973		
	Colombia	1974		
	Trinidad and Tobago	1976	2005	
	Guatemala	1979		
	Cuba	1983		
	Panama	1985		
	St. Kitts and Nevis	1986		
	Peru	1987		
	Bahamas, The	1989	1989	1989
	Dominica	1998		
	Puerto Rico	2001	2001	2001
Middle East and North Africa	Saudi Arabia	1970	1985	
	United Arab Emirates	1975	1977	1977
	Turkey	1987	2006	
	Oman	1993	2006	
	Lebanon	1994		
	Kuwait	1995		
	Iran, Islamic Republic of	2007		
	Tunisia	2007		
Sub-Saharan Africa	South Africa	1970		
	Seychelles	1980	1991	1997
	Mauritius	1987	1998	
	Swaziland	2003		
	Equatorial Guinea	2005	2007	2007

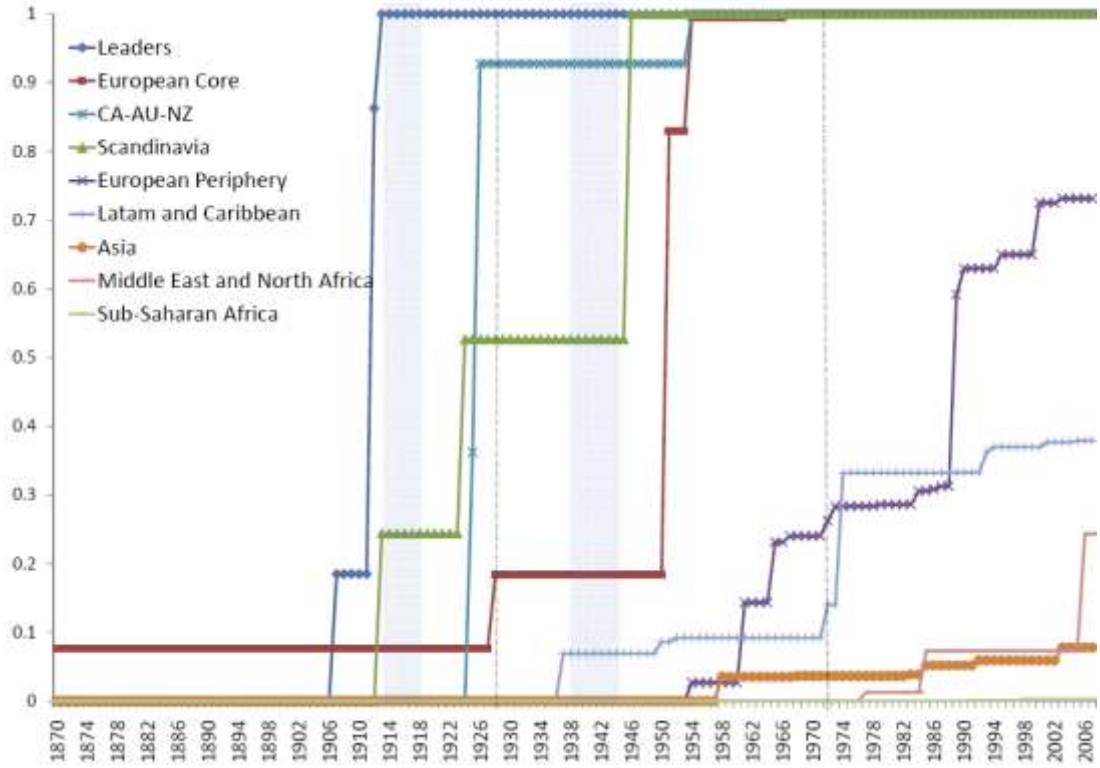
Note: **Threshold 1** is the first year the country surpassed the UK level for 1870. This threshold is 403 2001 U.S. dollars. **Threshold 2** is the first year the country surpassed the UK level for 1913. This threshold is 701.8 2001 U.S. dollars. **Threshold 3** is the first year the country surpassed the US level for 1928. This threshold is 1006.8 2001's U.S. dollars. Countries that do not surpass any of these thresholds are not reported.

Figure A.1. Regional diffusion curves: UK 1870 threshold



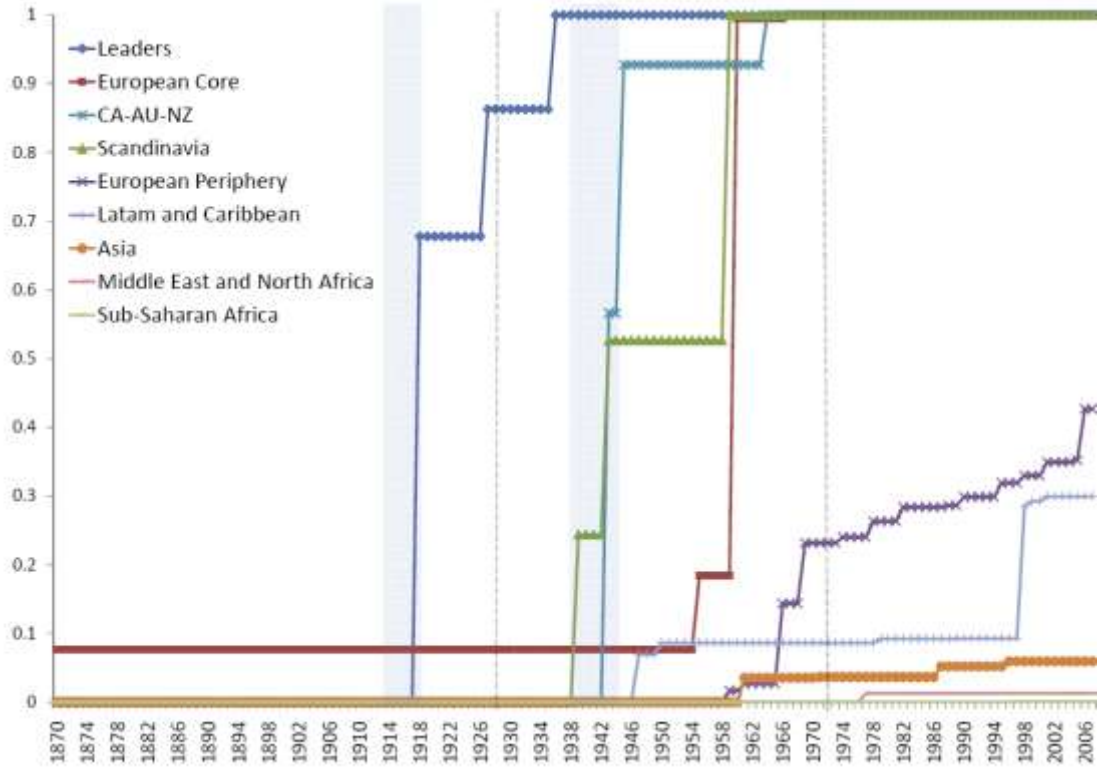
Note: These diffusion curves show the proportion of the region's population in 2007 living in countries exhibiting per capita manufacturing production greater than 403 US dollars. This threshold is equivalent to the British per capita manufacturing added value level in 1870. Shaded areas are the two World Wars. Dotted lines correspond to 1929 and 1973.

Figure A.2. Regional diffusion curves: UK 1913 threshold



Note: These diffusion curves show the proportion the region's population in 2007 living in countries exhibiting per capita manufacturing production greater than 701.8 US dollars. This threshold is equivalent to the British per capita manufacturing added value in 1913. Shaded areas are the two World Wars. Dotted lines correspond to 1929 and 1973.

Figure A.3. Regional diffusion curves: US 1928 threshold



Note: These diffusion curves show the proportion the region's population in 2007 living in countries exhibiting per capita manufacturing production greater than 1006.8 US dollars. This threshold is equivalent to the US per capita manufacturing added value in 1928. Shaded areas are the two World Wars. Dotted lines correspond to 1929 and 1973.

Data Appendix

Leaders

Germany

1870-1980: Broadberry, Stephen (1997), The Productivity Race. *British Manufacturing in Perspective, 1850-1990*. Table A3.1 (a), p. 42. Data for 1913-24, 1938-49 interpolated.
1980-2007: World Bank, World Development Indicators. Manufacturing (constant local currency units).

United Kingdom

1970-1981: Broadberry, Stephen (1997), *The Productivity Race. British Manufacturing in Perspective, 1850-1990*. Table A3.1 (a) p. 42. Data for 1938-45 interpolated.
1981-2007: United Nations, Industrial Statistics Database 2010 at the 2-digit level of ISIC Code (Revision 3). Manufacturing.

United States

1870-1989: Broadberry, Stephen (1997), *The Productivity Race. British Manufacturing in Perspective, 1850-1990*. Table A3.1 (a) p. 42. Data for 1870-89 interpolated.
1989-1998: United Nations, Industrial Statistics Database 2010 at the 2-digit level of ISIC Code (Revision 3). Manufacturing.
1998-2007: World Bank, World Development Indicators. Manufacturing (constant local currency units).

European Core

Belgium

1871-1901: Smits, Jan-Pieter, Pieter Woltjer and Debin Ma (2009), "A Dataset on Comparative Historical National Accounts, ca. 1870-1950: A Time-Series Perspective," Groningen Growth and Development Centre Research Memorandum GD-107, Groningen: University of Groningen. Industry value added.
1901-1960: United Nations International Trade Statistics 1900-1960. Index of Manufacturing Production 1953=100. Data for 1913-21, 1938-50 interpolated.
1960-1967: OECD Industrial Production Historical Statistics 1960-1975. Manufacturing industries.
1967-1981: United Nations, General Industrial Statistics Database 1953-93 CD. Manufacturing.
1981-2007: United Nations, Industrial Statistics Database 2010 at the 2-digit level of ISIC Code (Revision 3). Manufacturing.

France

1870-1950: Smits, Jan-Pieter, Pieter Woltjer and Debin Ma (2009), "A Dataset on Comparative Historical National Accounts, ca. 1870-1950: A Time-Series Perspective," Groningen Growth and Development Centre Research Memorandum GD-107, Groningen: University of Groningen. Total industry. Data for 1913-1919, 1938-1948 interpolated.
1950-1985: Smits, Jan-Pieter, Pieter Woltjer and Debin Ma (2009), "A Dataset on Comparative Historical National Accounts, ca. 1870-1950: A Time-Series Perspective," Groningen Growth and Development Centre Research Memorandum GD-107, Groningen: University of Groningen. Manufacturing.
1985-1999: United Nations, Industrial Statistics Database 2010 at the 2-digit level of ISIC Code (Revision 3). Manufacturing.
1999-2007: World Bank, World Development Indicators. Manufacturing (constant local currency units).

Luxembourg

1948-1960: OECD, Industrial Production Historical Statistics 1900-1962. Manufacturing Industries.
1960-1963: OECD, Industrial Production Historical Statistics 1960-1975. Manufacturing Industries.
1967-1981: United Nations, General Industrial Statistics Database 1953-93 CD. Manufacturing.
1981-1995: United Nations, Industrial Statistics Database 2010 at the 2-digit level of ISIC Code (Revision 3). Manufacturing.
1995-2007: World Bank, World Development Indicators. Manufacturing (constant local currency units).

The Netherlands

1870-1977: Smits, Jan-Pieter, Pieter Woltjer and Debin Ma (2009), "A Dataset on Comparative Historical National Accounts, ca. 1870-1950: A Time-Series Perspective," Groningen Growth and Development Centre Research Memorandum GD-107, Groningen: University of Groningen. Manufacturing. Data for 1943-1946 interpolated.
1977-2007: World Bank, World Development Indicators. Manufacturing (constant local currency units).

Switzerland

1870-1913: The Swiss Economic and Historical Database. Wavre index of industrial production. Table K10, column L.
http://www.fsw.uzh.ch/hstat/nls/sylkgenerator.php?datei=K.10Bau.BWS1851-1913R.slk&filename=K.10Bau.BWS1851-1913R.slk&chapter=./k/
1913-1944: The Swiss Economic and Historical Database. Index of Industrial Production David (1995). Table K14, Column N.
http://www.fsw.uzh.ch/hstat/nls/sylkgenerator.php?datei=K.14.Index.Ind.1913-92R.slk&filename=K.14.Index.Ind.1913-92R.slk&chapter=./k/

1944-1958: The Swiss Economic and Historical Database. Table K13, column Z. http://www.fsw.uzh.ch/hstat/nls/sylkgenerator.php?datei=K.13Lage.ziffer1925-68L.slk&filename=K.13Lage.ziffer1925-68L.slk&chapter=./k/
1958-1960: OECD, Industrial Production Historical Statistics 1955-1971. Manufacturing Industries.
1960-1967: OECD, Industrial Production Historical Statistics 1960-1975. Manufacturing Industries.
1967-1980: United Nations, General Industrial Statistics Database 1953-93 CD. Manufacturing.
1980-2007: World Bank, World Development Indicators. Manufacturing (constant local currency units).

Scandinavia

Denmark

1870-1913: Hansen, Aage (1974), *Økonomisk Vækst i Danmark*, Copenhagen: Akademisk Forlag.
1913-1960: United Nations, International Trade Statistics 1900-1960. Index of Manufacturing Production 1953=100. Data for 1913-1912, 1938-1950 interpolated.
1960-1967: Mitchell Brian R. (2007), *International Historical Statistics: Europe 1750-2005*, 6th ed. Palgrave Macmillan. Table D1, p. 459. Industrial production.
1967-1980: United Nations, General Industrial Statistics Database 1953-93 CD. Manufacturing.
1980-2007: World Bank, World Development Indicators. Manufacturing (constant local currency units).

Norway

1970-1930: VA in secondary sector. Data graciously provided by Ola Grytten
1930-1960: United Nations, Historical Data 1900-1960 on international merchandise trade statistics. Index of manufacturing production 1953=100. Data for 1938-1950 interpolated.
1960-1967: OECD, Industrial Production Historical Statistics 1960-1975. Manufacturing industries.
1967-1970: United Nations, General Industrial Statistics Database 1953-93 CD. Manufacturing.
1970-2007: World Bank, World Development Indicators. Manufacturing (constant local currency units).

Sweden

1970-1981: Smits, Jan-Pieter, Pieter Woltjer and Debin Ma (2009), "A Dataset on Comparative Historical National Accounts, ca. 1870-1950: A Time-Series Perspective," Groningen Growth and Development Centre Research Memorandum GD-107, Groningen: University of Groningen. Manufacturing.

1981-1993: United Nations, Industrial Statistics Database 2010 at the 2-digit level of ISIC Code (Revision 3). Manufacturing.
1993-2007: World Bank, World Development Indicators. Manufacturing (constant local currency units).

European Periphery

Albania

1938-1950: Lampe and Jackson (1982), *Balkan Economic History, 1550-1950. From Imperial Borderlands to Developing Nations*, Indiana University Press. Table 13.11, Industrial Output 1938-1950, p. 561. Data for 1938-49 interpolated.
1950-1970: Lampe and Jackson (1982), *Balkan Economic History, 1550-1950. From Imperial Borderlands to Developing Nations*, Indiana University Press. Table 14.1, Growth of Population, Labor force and Production, p. 580. Net Material Product in Industry (Constant Prices). Data for 1950-60, 1960-70 interpolated.
1993-1996: United Nations, Industrial Statistics Database 2010 at the 2-digit level of ISIC Code (Revision 3). Manufacturing.
1996-2005: World Bank, World Development Indicators. Manufacturing (constant local currency units).

Austria

1870-1913: Max-Stephan Schulze (2000), "Patterns of Growth and Stagnation in the Late Nineteenth Century Habsburg Economy," *European Review of Economic History* 4: 311-340. Table A3, Indices of manufacturing production in Austria (1913 prices, 1913=100), p. 339.
1913-1917: Max-Stephan Schulze (2005), "Austria-Hungary's economy in World War I," in Stephen Broadberry and Mark Harrison (eds.), *The Economics of World War I*. Cambridge: Cambridge University Press. Tables 3.10 and 3.11, pp. 85-86. Manufacturing.
1917-1921: League of Nations (1945), *Industrialization and Foreign Trade*. New York: League of Nations 1945. Table IV, p. 136. Annual index of manufacturing production (1913 = 100).
1921-1960: United Nations, Historical Data 1900-1960 on international merchandise trade statistics. Index of Manufacturing Production 1953=100.
1960-1967: OECD, Industrial Production Historical Statistics 1960-1975. Manufacturing Industries.
1967-1976: United Nations, General Industrial Statistics Database 1953-93 CD. Manufacturing.
1976-2007: World Bank, World Development Indicators. Manufacturing (constant local currency units).

Belarus

1990-2007: World Bank, World Development Indicators. Manufacturing (constant local currency units).

Bosnia and Herzegovina

1881-1915: Palairet, Michael (1993), "The Habsburg Industrial Achievement in Bosnia-Hercegovina, 1878-1914: An Economic Spurt That Succeeded?," *Austrian History Yearbook*, XXIV (1993), pp. 133-152. Index of Large Scale Industrial Value Added. Bosnia Hercegovina, 1881-1915 (All Industries 1907=1000), Table 1, p. 142.
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Colombia

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Dominican Republic

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Ecuador

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