A New View of European Industrialization*

By RONDO CAMERON

According to the standard or traditional interpretation, the industrialization of Europe and the world began with an "industrial revolution" in England (or Great Britain) which other nations subsequently imitated. The interpretation has a long and venerable history. Indeed, it can be traced to Karl Marx who, looking upon Britain in the 1860s, at the peak of its industrial supremacy, wrote: "The country that is more developed industrially only shows, to the less developed, the image of its own future". For long a standard feature of textbooks on European economic history, this interpretation has been enshrined in the prestigious Cambridge Economic History of Europe and in David Landes's Unbound Prometheus, an extended version of his chapter in the Cambridge series. Although expressed in novel form, Rostow's Stages of Economic Growth actually represents a reinforcement of the traditional interpretation. That interpretation has recently been reasserted clearly and

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2 David S. Landes, The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present (Cambridge, 1969).

concisely by Sidney Pollard, who wrote: "The process started in Britain and the industrialization of Europe took place on the British model; it was, as far as the Continent was concerned, purely and deliberately an imitative process". 4

The traditional interpretation is venerable, but it is not beyond criticism. My criticisms are twofold. First, the very concept of an "industrial revolution" is misleading; I have argued elsewhere that the term is a misnomer. 5 Second, the notion that England served as a "model", and that other countries (governments?) consciously imitated the English example, is so oversimplified as to be seriously misleading. I shall elaborate these criticisms in turn. First, however, a few general remarks may be helpful.

The concern of this article is the process of industrialization, that is, the economic and other (social, political, etc.) changes that occurred as European societies ceased to be primarily agrarian in economic structure and devoted proportionately more of their resources and labour to the production of non-agricultural commodities and services. Industrialization is not identical either with economic growth or economic development, although it is closely associated with both, especially in what Kuznets has termed "the modern economic epoch". 6 The process of economic growth, including in the modern era the special case of industrialization, involves the interaction of four broad classes or categories of factors: population, resources, technology, and institutions. 7 The precise way in which these factors interact will determine the outcome of the process; but since the "factors" are in reality congeries of diverse entities, the variety of possible outcomes is virtually infinite.

In the process of nineteenth-century industrialization various factors played determining roles at different times and places. In this article I shall choose two for special attention: coal, a natural resource that grew in importance with the growth in demand for mechanical power and for fuel in metallurgical industries; and human capital, as represented by education and literacy, which

5 Rondo Cameron, 'The Industrial Revolution: A Misnomer', in Jurgen Schneider, ed. Wirtschaftskräfte und Wirtschaftsweges: Festschrift für Hermann Kellenbenz (5 vols., Stuttgart, 1981), v, pp. 367-76. A slightly different version was published in The History Teacher, 15 (1982), pp. 377-84. The following paragraphs draw heavily on this article. Other scholars, of course, have objected to the use and misuse of the term, among them A. P. Usher, George Unwin, and Joseph Schumpeter. A number of years ago, D. C. Coleman wrote an eloquent article in which he attempted to protect the "classical" industrial revolution from semantic degradation. In it he suggested that "the term has achieved its wide application at the expense of losing its true significance", and that "perhaps it is time for a new 'historical revision' of the 'industrial revolution'." See Coleman, 'Industrial Growth and Industrial Revolutions', Economica (1956), reprinted in E. M. Carus-Wilson, Essays in Economic History (1962), pp. 334-52. See also Douglass C. North, Structure and Change in Economic History (New York, 1981), p. 162: "The period that we have come to call the Industrial Revolution was not the radical break with the past that we sometimes believe it to have been". Michael Fores, 'The Myth of a British Industrial Revolution', History, 66 (1981), pp. 181-98, argues along somewhat different lines that there was no industrial revolution.
7 These factors should not be confused with the "factors of production" of classical economics, although there is a relationship between the two groups. For an elaboration of this framework for the study of economic growth and applications to the pre-industrial era see Rondo Cameron, 'Economic History, Pure and Applied', Journal of Economic History, xxxvi (1976), pp. 3-27; also idem 'Technology, Institutions and Long-Term Economic Change', in Charles P. Kindleberger and Guido di Tella, eds., Economics in the Long View: Essays in Honour of W. W. Rostow (3 vols. 1982), 1, pp. 27-43.
The term révolution industrielle was first used by Frenchmen in the early years of the nineteenth century to emphasize the importance of the mechanization of French industry, then in progress, by comparing it with the revolution of 1789. Karl Marx used the term casually in Das Kapital (though not in the Communist Manifesto), but it acquired currency in English only with the publication, in 1884, of Arnold Toynbee’s Lectures on the Industrial Revolution in England. Toynbee was a social reformer, not a scholar. His principal interest was in remedying what he believed to be the moral degradation of the British working classes. Invited to lecture at Oxford, he devoted his lectures to the interrelation of economic events and economic policy, especially to the emergence of laissez-faire policies, which he regarded as a disaster for the workers. Despite scholarly objections, the expression caught the public’s fancy and was eventually incorporated into historical terminology. Early descriptions of the phenomenon emphasized the “great inventions” and the cataclysmic nature of the changes. They also stressed what were assumed to be the deleterious consequences of the new mode of production. Although increases in productivity as a result of the use of mechanical power and machinery were admitted, most early accounts highlighted the use of child and female labour, the displacement of traditional skills by machinery, and the unwholesome conditions of the new factory towns. For most of its history, for most people, the term industrial revolution has had a pejorative connotation.

Many of the debates were devoted to trying to determine the dates of the “revolution”. The dates implicit in Toynbee’s lectures, 1760 to 1820, were arbitrarily determined by the reign of George III, on which Toynbee had been invited to lecture. Scholars such as H. L. Beales, aware that the rapidity of change had been exaggerated in the conventional treatments, argued for a longer period, such as 1750 to 1850, and even for no terminal date at all. On the other hand, John U. Nef, who decreed the idea of an industrial revolution as “essentially false”, nevertheless found that an “unprecedented acceleration of industrial progress began, not in 1750 or 1870, but in the 1780s”. Nef’s conclusion was taken up by Rostow and given even greater precision by assigning the dates 1783-1802 for England’s “take-off”. Still,
R. M. Hartwell, one of the most prolific and fervent advocates of the term, admits that "... although the industrial revolution was a great discontinuity, it was not one which could be identified by a sharply dated turning point or take-off, as measured by macro-economic indexes".\(^{14}\)

Despite efforts both to lengthen and shorten the span of the "revolution", the conventional dating received the imprimatur of no less an authority than T. S. Ashton, in his influential little book *The Industrial Revolution, 1760-1830*.\(^{15}\) This is doubly ironic, because Ashton, unlike most of his predecessors, viewed the outcome of the period as an "achievement" rather than a "catastrophe", and because he had no special fondness for the term.\(^{16}\) (The dates are not unrelated to the fact that the book was one in a chronological series.) "The changes were not merely 'industrial', but also social and intellectual. The word 'revolution' implies a suddenness of change that is not, in fact, characteristic of economic processes. The system of human relationships that is sometimes called capitalism had its origins long before 1760, and attained its full development long after 1830: there is danger of overlooking the essential fact of continuity."\(^{17}\)

But most proponents of the term emphasize discontinuity. "Whoever says Industrial Revolution says cotton", according to Eric Hobsbawm.\(^{18}\) Insofar as the statement is accurate, it also reveals the inadequacy and pretentiousness of the term. It is true that the major inventions in cotton spinning—Arkwright's water frame and carding engine, and Crompton's mule—were made within a relatively short time and quickly adopted by other manufacturers. By 1802 cotton yarn and cloth displaced woollens as Britain's leading export. Even so, the industry remained relatively small and highly concentrated. As late as 1841, factory workers in the cotton industry constituted less than 5 per cent of the non-agricultural labour force, and the industry as a whole produced only 10 per cent of the industrial output of Britain.\(^{19}\) While this is an impressive achievement for a single industry, it is far from constituting an industrial revolution in either of the two broad senses stipulated by Coleman.\(^{20}\)

Far more important, in the long run, than the mushroom growth of the cotton industry were developments in the coal, iron, and engineering industries—and these were, in themselves, long run developments. Although technical innovation in coal-mining proper—that is, at the coal face—was limited, almost non-existent, two of the most important innovations of the


\(^{16}\) The words in quotation marks are from the dust jacket of the first edition of Ashton, *Industrial Revolution*.

\(^{17}\) Ibid. p. 2.


\(^{20}\) Coleman, 'Industrial Growth and Industrial Revolution', p. 335.
industrial era were intimately related with the growth of the coal industry—and occurred near the beginning of the eighteenth century. On the supply side, the Newcomen steam pump, the first of which was erected in 1712, made it possible to sink deeper shafts and thus to obtain more coal. On the demand side, the introduction of coke smelting of iron ore by Abraham Darby in 1709 freed the iron industry from its dependence on charcoal derived from increasingly scarce and expensive timber.

Although introduced in 1709, coke smelting spread slowly even within England, and not at all abroad until late in the century. The decision to adopt the new process depended on discriminating estimates of both costs and revenues, and in regions where timber was abundant and coal was scarce no incentive to adopt the new process existed. In England after 1750, the rising price of charcoal together with other technical innovations, notably the introduction in the 1780s of Henry Cort’s puddling and rolling process, which extended the use of coal fuel to the refining phase of production, greatly accelerated both total iron production and the proportion made with coal fuel. By the beginning of the nineteenth century pig iron output had expanded to more than 200,000 tons, virtually all made with coke, and Britain had become a net exporter of iron and iron products. Britain reached the peak of its supremacy in the iron industry in about 1870, when the total output of pig iron was almost 6 million tons, or slightly more than half the world production.

The history of steam power and engineering reveals even more clearly the lengthy nature of the process of industrialization. In its early years the Newcomen steam pump, or atmospheric engine, was confined entirely to pumping water from coal mines, for which it had been designed. Later, it was extended to other mining operations, notably in Cornish tin mines, to raise water to operate water wheels, and for public water supplies. It underwent gradual refinement before James Watt’s major improvements, in the last quarter of the century, made steam power more widely applicable. In the opinion of one authority, “the Newcomen engine . . . was the main factor in the exploitation of the mineral wealth of Britain, thereby laying the foundations of the industrial development of the country”.21

Even so, and even with Watt’s and other improvements, such as high-pressure direct-acting engines, the “triumph” of steam power was a slow process. Such is the conclusion of Von Tunzelmann’s important study.22 In 1800, when Watt’s basic patent expired, the combined output of water power installations was almost four times that of all steam engines.23 Moreover, the use of water power continued to increase in direct competition with steam in the first half of the nineteenth century. According to Arthur Raistrick, “Water wheels in sheer numbers and variety of uses remained the dominant power unit from 1755 to 1830”.24 It is not widely appreciated that water wheels, like

wooden sailing ships, reached their peak technical efficiency after 1850, whereas hydraulic turbines and column-of-water engines were nineteenth-century inventions. As late as 1870 the industrial utilization of steam engines, even in Great Britain, was confined largely to mining, textiles, and metallurgy; several industries relied as much, or more, on water power. The greatest absolute increase in steam power, amounting to almost a ten-fold rise, came between 1870 and the end of the nineteenth century. Nonetheless, the first Census of Production of 1907 recorded significant amounts of water power still in use.

The most recent research and analysis support the view, implied by this evidence, that industrialization in Britain was gradual during the “classic” industrial revolution period. After a careful and penetrating re-examination and re-estimation of the indices of industrial production on the basis of available quantitative evidence, C. Knick Harley reached the “principal conclusion” that “the growth of industrial production was much slower between 1770 and 1815 than either most narrative accounts . . . or [previous] quantitative research . . . have suggested”. In similar vein, N. F. R. Crafts, in an equally detailed “review of the evidence”, concluded that “Growth was substantially slower during the years 1780-1831 than is believed by conventional wisdom . . . The economy did not experience a ‘take-off’ in the last two decades of the eighteenth century. The pace of growth quickened at that time, but not dramatically so.”

The census of 1851 reveals clearly the extent to which the British economy had been “revolutionized” by the middle of the nineteenth century. Agriculture was by far the largest occupation, followed by domestic service. Workers in the building trades outnumbered cotton workers of “every kind”. Shoemakers were more numerous than coal miners, blacksmiths than ironworkers. More than half a century ago, Clapham—who, incidentally, did not employ the term industrial revolution—deduced from that census that “The course was set towards the ‘industry state’, but the voyage was not half over”.

II

By analogy with Great Britain, the term industrial revolution has also been applied to the onset of industrialization in other countries, although without

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general agreement on dates. For example, the American historian, A. L. Dunham, assigned 1815 and 1848 as the inclusive dates of his study of the “industrial revolution” in France, but admitted that the period marked “the infancy and the beginning of the adolescence of the industrial revolution, but not its maturity, which was not attained until after 1860”.

In a critique of this work the French historian Claude Fohlen remarked, “The industrial revolution in France . . . covers a period of approximately a century, from 1750 or 1770 to 1870 . . . . The term revolution is ill-suited to a phenomenon that occurred over such a long period of time.”

By assigning specific dates for “take-off” in various countries (as, for example, 1830-1860 for France and 1833-1860 for Belgium) Rostow implied a specious accuracy for his analysis, but in almost every case his dates have been disputed—even when his terminology was accepted—by scholars familiar with the detailed history of their countries. The economist Jean Marczewski wrote: “If this precise phase of economic development is to be called take-off, then take-off in France occurred around the middle of the eighteenth century, or, at the latest, towards 1799. Personally, I am inclined to choose the earlier date, because the share of industry in physical product actually began to increase steadily from 1715-20 onwards.” Marczewski thus aligns himself with Fohlen. Their view is also shared by François Crouzet who, in comparing economic growth in France and England in the eighteenth century, observed that “The growth in average real output and income per head might therefore have been roughly of the same order of magnitude in both countries”, a view also shared by the American economic historian, Richard Roehl, who wrote emphatically, “I wish instead to maintain here the proposition that . . . modern economic growth in France has its beginning [in the eighteenth century]”.

The nineteenth century statistician Natalis Briavoinne (one of the early users of the term révolution industrielle) wrote in 1838 that the Belgians “marched immediately after England in the way of discoveries and progress; for a long time they have occupied the first place industrially on the Continent”. The historian, Jan Craeybeckx, believes that “it was above all the
30 years that preceded independence [in 1830] that served as a point of departure for the industrialization of Belgium", a view that is generally shared by Belgian historians, although some would date Belgium’s modern economic growth, like that of France, from the middle of the eighteenth century.

In dating the “beginning” of Germany’s industrial revolution a wide choice, ranging from the late eighteenth to the late nineteenth century, is available. Majority opinion seems to favour the middle decades of the nineteenth century; even so, there is no general agreement on whether it was the 1830s, the 1840s, or the 1850s. Richard Tilly remarked on scholars’ inclinations to “reject the watershed notion of development attached to concepts like ‘industrial revolution’ or ‘take-off’. Perhaps aggregate interpretations of Germany’s industrialization that stress discontinuity require revision, after all.” Similarly, for the Habsburg dominions, or at least the Austrian (Cisleithanian) half of the Dual Monarchy, every major cyclical upswing in the economy in the latter half of the nineteenth century—1850-57, 1867-73, 1896-1903—has its advocates; yet, increasingly, it appears that no “great spurt” occurred, and that the roots of Austrian industrial growth, like those of France and Belgium, are to be found in the eighteenth century.

Turning to Scandinavia, we find similar contradiction and confusion. In each of the countries the cyclical upswings of the 1850s, the 1870s, and the 1890s have their proponents, yet in each of them the result of the most recent research is to push the beginnings of industrialization further back in time and to reduce its disruptive effects. For Sweden, for example, Lennart Jörberg leans toward the 1870s for the beginning of the “true” industrial revolution, but sees significant industrial growth taking place from at least 1830. For Norway, Sima Lieberman reported that “The available data fail to show a Rostow-like industrial ‘take-off’ or a Gerschenkron-like economic ‘spurt’ in nineteenth-century Norway”. Finally, after an exhaustive survey of the literature on Denmark, Svend Aage Hansen comes to the conclusion that “the fact that Danish industry seems on the whole to have experienced a tranquil and protracted evolution does not make it easier to pinpoint anything that can be called a revolution. . . . Danish industrialization took place in the form of a relatively smooth and evolutionary process of development.”

37 See for example, Pierre Lebrun, Marinette Bruwier, Jan Dhondt, and George Hansotte, Essai sur la révolution industrielle en Belgique, 1770-1847 (Brussels, 1979). This volume is part of an ambitious multi-volume, multi-authored project on the “Histoire quantitative et développement de la Belgique”.
42 Svend Aage Hansen, Early Industrialisation in Denmark (Copenhagen, 1970), pp. 8, 15. Hansen adds (p. 10), “In fact the concept of ‘early industrialization’ as defined by Cameron is more precise, and therefore a far better tool to work with, than the term ‘industrial revolution’ which has been the one most commonly employed hitherto in the debate on Danish industrialization”.
As a matter of intellectual history, it is not easy to account for the persistence in scholarly discourse of the terms industrial revolution and take-off, particularly their application to countries other than Britain. In part, it is probably simply a matter of habit; scholars taught in their youth to believe in the reality of sudden, discontinuous change in economic life find it difficult to adjust their vocabulary to the new knowledge. In part, especially for scholars in “follower” countries, it may be a matter of national pride which encourages identification of industrial revolutions in other countries, too. Or, more charitably, scholars educated to believe in the reality of an industrial revolution in Britain might logically assume that, always and everywhere, industrialization took the form of discontinuous development. For that is the heart of the matter: the belief in sudden, discontinuous economic change as the necessary prerequisite for a modern industrialized economy. That belief is, of course, a canon of Marxist historiography, but it is surprising and curious to see such staunch non-Marxists (or anti-Marxists) as Walt Rostow and Alexander Gerschenkron adopt it as well. In fact, gradual industrialization has been the norm, explosive growth the exception.

III

The question whether continental industrialization followed "the British model" has received categorical denials from two historians. In a perceptive study of Swedish economic growth, Lennart Jörberg wrote: "Neither in Sweden nor on the Continent of Europe did the pattern follow that of England". Likewise, in a brilliant and stimulating article, Sidney Pollard averred that, "European industrialization should not be seen as the repetition of a model, but as a single, if complex, process".

What was the British model? The main outlines are quite clear: the primacy, among consumer goods, of cotton textiles; among producer goods, of iron, steel and engineering products; and—above all—among intermediate goods, of coal. We must also define the meaning of "continental emulation", the term used by David Landes. Apparently it can mean one, or both, of two things: (1) The governments of continental countries wanted to catch up with, or surpass, Britain's industrial and commercial power, and instituted policies to that end, such as industrial spies, protective tariffs, and government construction of (or subsidies to) industrial plants and railways; (2) continental entrepreneurs recognized the superiority of British technology, and wanted to profit by introducing it to their own limited, and often protected, markets.

Such responses are, of course, perfectly natural, and not limited to Europe

43 'Structural Change and Economic Growth' in Crouzet et al., eds. *European Economic History*, p. 259.
44 'Industrialization and the European Economy', *Econ. Hist. Rev.* 2nd ser. XXVI (1973), p. 646. It would appear that Pollard changed his mind between the date of that article and the publication of the book cited in n. 4. Perhaps he will change it again, as he wrote in the latter regarding industrialization in the second half of the nineteenth century, "there is now not merely a single model to be followed, that of Great Britain, but a choice of models offering more or less apt alternatives" (p. 221). In personal correspondence with me after the publication of the book he wrote, "Perhaps I could admit at once that the British origin is not meant to imply a model in the sequence or speed, but in the kind of technology and social institutions created" (Pollard to Cameron, 12.10.82). I am still dubious; I prefer the formulation in the article cited above.
in the late eighteenth and nineteenth centuries. They occur whenever and wherever significant technological advance occurs; the attempts of François I to naturalize Venetian techniques of glassmaking and of Japanese manufacturers of computers to secure IBM's developmental plans are cases in point. Moreover, such efforts operate in both directions. At the very time that continental governments and industrialists were endeavouring to master the British techniques of cotton spinning, iron production, and so on, British industrialists strove to naturalize new techniques introduced on the continent, such as the Leblanc process for artificial soda. It is necessary, therefore, to distinguish between the mere diffusion of technology and the distinctive patterns of industrialization that occurred on the continent as a result of that diffusion.

With respect to the standard interpretation, only those regions and nations that had similar resource endowments to Great Britain—mainly abundant coal—followed the British pattern. All other regions and nations either followed a different pattern, or failed to industrialize to a significant degree. There were, in fact, several identifiable patterns, each with individual variations by country and by region, depending, among other factors, upon relative resource endowments; amounts of human capital (as indicated by levels of literacy and formal educational institutions); degree of market orientation and obstacles to marketing arrangements, particularly in the agrarian sector; the associated pace and pattern of agricultural development; demographic behaviour; and government policies.

The Belgian case is the closest example of a country (region) following the British model. A coal mine near Liège obtained the first Newcomen steam pump on the continent in 1720, only eight years after the first one introduced in England. Industrial growth in the eighteenth century was gradual but fairly steady, led by the coal industry and the associated metallurgical concerns of the Sambre-Meuse valley. A fine woollen industry using some water-powered machinery developed in the eastern part of the country around Verviers, and a rural linen industry grew vigorously in Flanders. The pace accelerated substantially after annexation by France, with the opening of the Scheldt and, more importantly, the French market. The latter was of signal importance for the establishment of a cotton-spinning industry using British technology, and for the expansion of the woollen, metallurgical, and especially coal industries. A machinery industry of some significance also took root in the vicinity of Liège. During the Dutch regime (1815-30) both foreign and

46 Pollard is entirely correct in stressing that industrialization is basically a regional, not a national phenomenon; Pollard, Peaceful Conquest, pp. 3-12, idem, Region und Industrialisierung (Gottingen, 1980); 'Industrialization and the European Economy'. Much of the argument of the last-mentioned article is similar to that of this one, and I gladly acknowledge my indebtedness. See also Richard Roehl, 'Britain and European Industrialization: Pathfinder Pursued?', Review, vi (1983), pp. 455-73.
native entrepreneurs took the initiative in introducing the puddling process and coke smelting of iron ore, as well as establishing lead, zinc, and glass industries.\textsuperscript{50} Subsequently, in the 1830s and 1840s, most firms in these industries, as well as those in the coal industry, adopted the joint stock form of organization; this development occurred with the assistance of the Société Générale de Belgique and the Banque de Belgique (both privately owned joint stock banks), which was accompanied by a remarkable wave of expansion.\textsuperscript{51}

The metallurgical industries in Belgium, zinc and lead as well as iron, were larger relative to the size of the country than in Great Britain, and acquired a greater bias towards heavy industry over time. The textile industries, on the other hand, were somewhat smaller. Nevertheless, industrialization in Belgium did follow, to some extent, “the British model” and made Belgium the first industrial nation on the continent. The reasons are not difficult to discover. Proximity to Britain was a factor (as was also proximity to the French and German markets). Small size, together with relative ease of transport (rivers and canals, early railways), facilitated the process. Most important, Belgium had abundant, easily accessible coal deposits. As Fig. 1a shows, Belgium had the largest production per capita of any continental country until after 1910. This relative abundance supplied other Belgian industries, almost all of which were fuel-intensive, with cheap fuel, and even provided a surplus for export, as in the case of Britain.

Looking beyond Belgium, what we see is “not . . . a series of mere repetitions of the ‘first’ industrialization but a . . . system of graduated deviations from that industrialization”, in Gerschenkron’s words—but not necessarily related to the “degree of backwardness” of the economies, as he would have it.\textsuperscript{52} At first sight, Germany appears to have followed the British model, but the perception is distorted by the heavy weight of the Rhine-Ruhr and Silesian complexes in indices of Germany’s industrialization.\textsuperscript{53} Those areas with abundant coal developed into centres of heavy industry, and the coincidence with the advent of railways resulted in the mutual reinforcement of both sectors.\textsuperscript{54} When regional differences within Germany are taken into account, however, the picture looks quite different: more varied, less uniform. Although it is generally known that the agrarian east lagged behind the west in industrialization, it is not as widely appreciated that many parts of central and southern Germany either did not participate significantly in the industrialization process in the nineteenth century, or did so according to a different


\textsuperscript{51} Lebrun et al., \textit{Révolution industrielle en Belgique}, pp. 281-93, 386-401, 433-59; Cameron, \textit{France and Europe}, ch. XI.

\textsuperscript{52} Alexander Gerschenkron, \textit{Economic Backwardness in Historical Perspective} (Cambridge, Mass. 1962), p. 44.

\textsuperscript{53} Statistics of the output of heavy industries are more common and more easily accessible than production figures for other industries, and hence are frequently used in international comparisons of the extent of industrialization. In a textbook that I co-authored, the first edition of which was published in 1965, I used the output of coal, pig iron, and steel as indicators of the “progress of industrialization”; Jerome Blum, Rondo Cameron, and Thomas G. Barnes, \textit{The European World: A History}, 2nd ed. (Boston, 1970), p. 700. I now know better, but many other writers of textbooks perpetuate the error.

\textsuperscript{54} Rainer Fremdling, \textit{Eisenbahnen und deutsches Wirtschaftswachstum, 1840-1879} (Dortmund, 1975), esp. pp. 60-82.
Figure 1a. *Per Capita Production of Coal, 1820-1913*

Belgium: production per capita
France: production per capita
Germany: production per capita
United Kingdom: production per capita


Figure 1b. *Per Capita Consumption of Coal, 1820-1913*

Belgium: consumption per capita
France: consumption per capita
Germany: consumption per capita
United Kingdom: consumption per capita
pattern. In Bavaria, for example, "The majority of the population even by the end of the nineteenth century were [sic] still employed in the primary sector. The fact that agriculture continued to function on a vastly different basis is of crucial importance . . . ." Moreover, as late as the 1840s approximately 60 per cent of the adult population of Bavaria was illiterate, in sharp contrast to the high literacy rates in Prussia and some other states. Other central and south German states, such as Saxony and Württemberg, although they turned to manufacturing more quickly than Bavaria, did so chiefly with water as the motive power. For example, Saxony, the most highly industrialized German state in 1840, with a substantial cotton industry, had no more than fifty steam engines, in contrast to the Prussian Rhine province with more than two hundred. The persistence of artisanal industry (Gewerbe), employing little or no mechanical power, was also widespread in many parts of Germany.

Among the early industrializers France remains the most aberrant case. That fact gave rise to a large literature, both in the nineteenth century and more recently, devoted to explanations of the supposed "backwardness" or "retardation" of the French economy. Still more recently, however, new empirical research and theoretical insights have shown that the earlier debates were based on a false premise. In fact, although the pattern of industrialization differed from that of Great Britain and the other early industrializers, the outcome was not less efficient and, in terms of social welfare, may have been more humane. Moreover, when one looks at the patterns of growth of successful late industrializers, it appears that the French pattern may have been more "typical" than the British.

Two factors in the French situation account in large measure for its unjustified reputation for "retardation": the dramatic fall in marital fertility, which reduced the growth rate of population to less than half that of other major nations; and the scarcity and high cost of coal, which resulted in a lower output of the heavy industries (iron and steel in particular) than in other large nations, such as Britain and Germany. Moreover, these two factors in

56 Ibid.
combination help to account for several other features of the French pattern of industrialization, such as the low rate of urbanization, the scale and structure of enterprise, and the sources of industrial power.

As Fig. 1a makes clear, at the beginning of the twentieth century coal production per capita in France was about one-third that of Belgium and Germany, and about one-seventh that of Great Britain—even though France was exploiting its known reserves at a much higher rate (and higher cost) than the other countries. Per capita consumption (Fig. 1b) was somewhat higher, thanks to imports. France imported, on average, about one-third of its total consumption in the nineteenth century, but that in itself imposed constraints on the use of coal. Consequently, France relied on water power to a much greater extent than its coal-rich neighbours. French scientists and engineers (for example, Burdin, Fourneyron, Poncelet) made important contributions to water-power technology, including the invention of the highly efficient turbine. Thanks in part to improved technology, water power remained competitive with steam until the middle of the century even in Great Britain.59

On the continent it retained its importance far longer. In France as late as 1899, 56 per cent of the horsepower of newly installed prime movers came from hydraulic motors.60 But the characteristics of water as a source of power imposed constraints upon its use. The best locations were generally remote from centres of population; the number of users at any given location was limited to one or a very few; the size of the installations was similarly limited. Thus, important though water power was for French industrialization, the resulting pattern included small firm size, geographical dispersion of industry and slow urbanization, characteristics displayed also by other coal-poor industrial nations.

A striking example is that of the Austro-Hungarian empire. Although comparable with the western great powers in territory and population, the Habsburg monarchy lagged behind the others in industrialization in general, and in heavy industry in particular. Fig. 2, which charts the per capita production and consumption of coal in Germany, France, Austria (Cisleithania only), and Russia, vividly depicts the situation. Per capita production in France and Austria was virtually equal, especially from 1880 onwards, although French consumption was somewhat higher, and Austrian production included a large share of inferior lignite.61 Production in both countries was well below Germany (and of course Great Britain), although substantially higher than in Russia.

Until recently the Habsburg monarchy suffered both the neglect and contumely of economic historians. The empire that failed politically, as evidenced by its dissolution immediately before the end of World War I, was also deemed to have failed economically. In the last decade or so, however, research has led to considerable historical revision. Now it appears that in the Czech lands and Austria proper modern economic growth began, as in France

59 See above, p. 8.
and Belgium, in the last two decades of the eighteenth century, and possibly earlier. It is indubitable that very respectable growth occurred in the first half of the nineteenth century; estimates of per capita growth of industrial production for Austria range from 1.7 to 3.6 per cent per annum, and those rates accelerated somewhat in the second half of the century. Nevertheless, although the overall picture is not as bleak as formerly depicted, there is no doubt that modern industry in the Austro-Hungarian empire lagged behind that in the more western nations, especially Germany.

Regional disparity existed within the empire to an even greater extent than in France and Germany, and that, too, served to create an exaggerated impression of backwardness. There was a marked difference between the western or Austrian (Cisleithanian), and eastern or Hungarian (Transleithanian) "halves" of the empire. Fig. 3, showing per capita coal production for each, as well as joint imports and exports of coal, makes this clear: Austria was well in advance of Hungary. But disparity was also striking within each constituent part. In Cisleithania, just before World War I, Bohemia and

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Moravia accounted for 56 per cent of “Austrian” industrial production; Austria, proper, for 30 per cent; Galicia and Bukovina for 9 per cent; and Dalmatia for less than 5 per cent; although the last three accounted for 40 per cent of the population. In Transleithania the disparities were no less marked, with Hungary proper (the Budapest region in particular) being well in advance of the other regions.

No doubt there are many reasons for this lag. The difficulties and cost of transportation as a result of the terrain, the limited access to the sea, and the low rate of urbanization are frequently cited as obstacles to industrialization. There can be no doubt of their importance, although the low rate of urbanization is, as in France, a reflection of the slow pace of industrialization and the rural location of many industries. Population growth was also lower than the European average, although not as low as that of France. The only other factor that can compare with the paucity of coal, however, is the low level of human capital, as reflected in the low levels of literacy. These were distributed within the empire in roughly the same proportions as industry itself, which add force to the correlation. Table 3 indicates the literacy rate in Cisleithania as a whole to have been about the same as in France and Belgium. The regional variations were enormous, however, ranging in 1900 from 99 per cent literate in Vorarlberg to 27 per cent in Dalmatia. Unfortunately, we do not have comparable data for Transleithania, but it is known that the literacy rates there were substantially lower than in the western areas of the empire.

67 Ibid. p. 114.
By contrast with the major coal-rich and the coal-poor industrial nations, the successful late industrializers included some small nations almost totally without domestic supplies of coal: the Netherlands, Switzerland, Denmark, Norway, and Sweden. The justification for describing these countries as

Table 1. Manufacturing Output Per Capita: Europe, 1913
(Ten leading nations, in rank order)

<table>
<thead>
<tr>
<th>Lewis</th>
<th>Bairoch</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. United Kingdom</td>
<td>1. United Kingdom</td>
</tr>
<tr>
<td>2. Belgium</td>
<td>2. Belgium</td>
</tr>
<tr>
<td>3. Germany</td>
<td>3. Switzerland</td>
</tr>
<tr>
<td>4. Switzerland</td>
<td>4. Germany</td>
</tr>
<tr>
<td>5. Sweden</td>
<td>5. Sweden</td>
</tr>
<tr>
<td>6. France</td>
<td>6. France</td>
</tr>
<tr>
<td>7. Denmark</td>
<td>7. Denmark</td>
</tr>
<tr>
<td>8. Netherlands</td>
<td>8. Austria-Hungary</td>
</tr>
<tr>
<td>10. Austria*</td>
<td>10. Netherlands</td>
</tr>
</tbody>
</table>

* Lewis lists Austria separately from (and ahead of) both Czechoslovakia and Hungary, even for 1913.


"successful" industrializers is presented in Table 1: two separate lists of what two authors regard as the ten most highly industrialized nations (on a per capita basis) in Europe in 1913. Although the methods involved in the construction of the lists are not beyond criticism, they are quite independent of one another, and include the same ten countries in roughly the same rank order. Both lists contain the names of the aforementioned five small nations, as well as the five countries previously discussed.  

It would be helpful to have similar data for earlier dates. Only Bairoch supplies such, and he is disarmingly cheerful in admitting the large probable margin of error. Nevertheless, for what they are worth, Table 2 presents his estimates of the ten most highly industrialized nations in 1800 and 1860.

The countries listed are the same as in 1913, although the rank order is slightly different. That raises the question of the degree of backwardness present in the small countries before the onset of industrialization. Lars Sandberg has described Sweden as an "impoverished sophisticate", claiming that it was "one of the very poorest countries in Europe in the middle of the nineteenth century". This view is open to challenge, but few will deny that "Sweden had the highest rate of growth of per capita GNP ... between 1860.

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68 Alfred Maizels, *Growth and Trade: An Abridged Version of Industrial Growth and World Trade* (Cambridge, 1970), p. 299, Table B4, 'Estimates of net value of manufacturing production per head of total population in selected countries, 1899-1957', provides a rank order in 1913 for some of the countries listed in Table 1. They are in terms of U.S. dollars at 1955 prices, and range as follows: Belgium-Luxembourg, 240; United Kingdom, 200; Germany, 180; France, 165; Sweden 145; Norway, 120; Netherlands, 105.


Table 2. Per Capita Levels of Industrialization, 1800 and 1860
(U.K. in 1900 = 100)

<table>
<thead>
<tr>
<th></th>
<th>1800</th>
<th></th>
<th>1860</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>United Kingdom</td>
<td>16</td>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
<td>Belgium</td>
<td>10</td>
<td>2.</td>
</tr>
<tr>
<td>3.</td>
<td>Switzerland</td>
<td>10</td>
<td>3.</td>
</tr>
<tr>
<td>4.</td>
<td>France</td>
<td>9</td>
<td>4.</td>
</tr>
<tr>
<td>5.</td>
<td>Netherlands</td>
<td>9</td>
<td>5.</td>
</tr>
<tr>
<td>7.</td>
<td>Germany</td>
<td>8</td>
<td>7.</td>
</tr>
<tr>
<td>8.</td>
<td>Sweden</td>
<td>8</td>
<td>8.</td>
</tr>
<tr>
<td>10.</td>
<td>Austria-Hungary</td>
<td>7</td>
<td>10.</td>
</tr>
</tbody>
</table>

Source: Bairoch, 'International Industrialization', p. 281, Table 4, and p. 330, Table 15.

... and 1913”. The other Scandinavian countries, and Switzerland and the Netherlands, recorded similar experiences; how did they do it?

Figure 4. Coal Consumption Per Capita, 1820-1913*

Figure 4 shows their per capita consumption of coal (virtually all imported) and presents several features of interest. First, even at the peak of 1900 or 1910, their consumption was only about one-fifth that of Great Britain, about one-third that of Belgium and Germany, and about the same as France. Obviously, coal must have been economized, mainly in the primary conversion of iron ore into pig iron. Although all developed sophisticated metal-working

71 Ibid.
and machinery industries, they did so (except Sweden, with abundant charcoal and high grade iron ore) on the basis of imported pig iron and steel, mainly from Britain and Germany. The other main uses of coal were as fuel for locomotives, steam ships, and stationary steam engines. Norway, Sweden, and Switzerland had abundant water power, of which they made good use even before the advent of hydroelectricity in the 1880s and 1890s. (The slight decline in per capita coal consumption in Switzerland after 1900 reflects the electrification of Swiss railways, begun about that time.) The higher per capita consumption of the Dutch throughout the period, and of Denmark until around 1890, reflects the ease with which those countries could obtain coal from Britain's north-eastern coalfields (and the Dutch river-borne coal from the Ruhr); the Netherlands, in fact, could import coal from Tyneside almost as cheaply as London.

Second, by comparison with Italy, Spain, and Russia (the two latter with domestic supplies of their own), the steep rise in coal consumption of the other four from about 1870 is a reasonable index of the pace of industrialization. All five of the smaller countries depended heavily on international markets for both imports and exports, and all developed specialized export industries. Of the five, Sweden was the least heavily dependent on international markets. In 1870 exports accounted for 18 per cent of national income; in 1913, for 22 per cent of a much larger national income. At the beginning of its rapid industrialization Swedish exports consisted almost exclusively of primary products, especially timber and oats, with some iron ore and pig iron. As industrialization proceeded, intermediate products and finished manufactures became more prominent: especially wood pulp for paper, paper itself, electrical machinery, and ball bearings.

Norway's exports of timber, fish, and shipping services accounted for 90 per cent of total exports—about 25 per cent of national income—as early as the 1870s; by the early twentieth century those exports accounted for more than 30 per cent of national income, with shipping services alone responsible for 40 per cent of foreign earnings. Denmark specialized to an even greater degree in the export of processed dairy and animal products, importing cheap grain for animal food. In the early twentieth century it exported 63 per cent of its total agricultural production, principally butter, pork products, and eggs. The Netherlands specialized in processing imported raw materials—wheat flour, tobacco, chocolate, and sugar—for re-export to the Continent. The Dutch also depended heavily on the service occupations for foreign earnings. In 1909, 11 per cent of the labour force was employed in commerce, 7 per cent in transport; the service sector as a whole employed 38 per cent of the labour force and produced 57 per cent of the national income. Switzerland, possessing no natural resources to speak of (unlike Sweden), with little arable land in relation to its area and population (unlike Denmark and the Netherlands), and lacking comparable opportunities for transit traffic enjoyed by the Netherlands, relied to an even greater extent than the others on the

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ingenuity of its entrepreneurs and the skills of its labour force. Swiss exports consisted mainly of intricate specialized machinery and metal products, fancy textiles (embroidered cottons and silk), clocks and watches, chemicals and pharmaceuticals, and processed foods and beverages. Despite its small size, Switzerland was the centre of the world’s second largest organic chemical industry at the beginning of the twentieth century, producing only a fifth as much as Germany; nonetheless Swiss output equalled that of the rest of the world combined, and 90 per cent was exported.

Sandberg has made a convincing case for the importance of human capital in Sweden’s economic growth, although he probably exaggerates the extent of Sweden’s poverty before 1850. Similar arguments can be made for each of the other countries. It would be desirable, as W. N. Parker has suggested, to “disaggregate” human capital into its components, of which education (or literacy) is only one, albeit large. Such a task is far beyond the scope of this article, in which literacy rates and educational achievement will serve as proxies for that highly useful and important metaphor.

Largely for non-economic (religious and cultural) reasons, all of the countries considered in this section already had high levels of adult literacy before the onset of industrialization. Already all possessed, or quickly acquired, comprehensive educational systems, ranging from broadly based elementary schools to long established universities and newly created specialized technical institutes. Human capital, unlike physical capital, is difficult to quantify, and even more difficult to fit into a production function, but it affects the economic process in myriad ways; by influencing the decisions of consumers as well as producers; by contributing to labour productivity and management performance; and not least by informing (or misinforming) the decisions of economic policy makers. The outstanding industrial performance of the five small nations considered here can be neither understood nor explained without taking into account their large relative stocks of human capital.

V

The remaining countries of Europe—the Mediterranean countries, southeastern Europe, and Imperial Russia—can be disposed of more briefly for present purposes. One of their common characteristics is that they failed to industrialize significantly before 1914, with resulting low levels of per capita income and a high incidence of poverty.

To be sure, if one looked not at national aggregates but at individual regions, regional variation would emerge, as with Germany, France, the Habsburg monarchy, and even Great Britain. For example, the pronounced differences between north and south in Italy existed long before the advent of the twentieth century. Had the Kingdom of Sardinia (without the island

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74 Sandberg, ‘Impoverished Sophisticate’; see also idem, ‘Ignorance, Poverty, and Economic Backwardness in the early Stages of European Industrialization: Variations on Alexander Gerschenkron’s Grand Theme’, Jnl. Eur. Econ. Hist., 11 (1982), pp. 675-97, for a more wide-ranging treatment of the same subject. Sandberg’s conclusions with respect to southern and eastern Europe, as well as to Scandinavia, are essentially the same as those presented here.

of Sardinia; i.e., Piedmont and Liguria) still existed in 1900 or 1913, no doubt Sardinia would have ranked close to France and Switzerland in per capita income and indices of industrialization. Had Lombardy-Venetia still been a part of the Habsburg empire, no doubt that entity’s averages in the same categories would have been higher. Spain, despite general backwardness, contained some economically progressive areas, such as Catalonia and Viscaya. In Imperial Russia the Grand Duchy of Finland more nearly resembled its Nordic neighbours than it did the Slavic or Asian provinces. The Moscow region boasted an important textile industry, and in the last decade or so of the nineteenth century a major centre of heavy industry developed in the Ukraine, based upon the coal deposits of the Donetz Basin and the iron ore of the Krivoi Rog, and employing foreign capital, technology, and entrepreneur. One could, in fact, make a case for the Donbas having followed the “British model”, based on abundant coal and imported human capital.

Table 3. Adult Literacy, Selected Countries (per cent)

<table>
<thead>
<tr>
<th>Country</th>
<th>circa 1850</th>
<th>circa 1900</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>90</td>
<td>(99)</td>
</tr>
<tr>
<td>United States (white only)</td>
<td>85-90</td>
<td>94</td>
</tr>
<tr>
<td>Scotland</td>
<td>80</td>
<td>(97)</td>
</tr>
<tr>
<td>Prussia</td>
<td>80</td>
<td>88</td>
</tr>
<tr>
<td>England and Wales</td>
<td>67-70</td>
<td>(96)</td>
</tr>
<tr>
<td>France</td>
<td>55-60</td>
<td>83</td>
</tr>
<tr>
<td>Austria (excl. Hungary)</td>
<td>55-60</td>
<td>77</td>
</tr>
<tr>
<td>Belgium</td>
<td>50-55</td>
<td>81</td>
</tr>
<tr>
<td>Italy</td>
<td>20-25</td>
<td>52</td>
</tr>
<tr>
<td>Spain</td>
<td>25</td>
<td>44</td>
</tr>
<tr>
<td>Russia</td>
<td>5-10</td>
<td>28</td>
</tr>
</tbody>
</table>


Nevertheless, these “islands of modernity” remained surrounded by seas of backwardness. One of the reasons they did so is explained, in part, by a

Table 4. Primary School Enrolment Rate, Selected Countries (per 10,000 population)

<table>
<thead>
<tr>
<th>Country</th>
<th>1830</th>
<th>1850</th>
<th>1900</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>1,500</td>
<td>1,800</td>
<td>1,969</td>
</tr>
<tr>
<td>Germany</td>
<td>1,700</td>
<td>1,600</td>
<td>1,576</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>900</td>
<td>1,045</td>
<td>1,407</td>
</tr>
<tr>
<td>France</td>
<td>700</td>
<td>930</td>
<td>1,412</td>
</tr>
<tr>
<td>Spain</td>
<td>400</td>
<td>537</td>
<td>1,038</td>
</tr>
<tr>
<td>Italy</td>
<td>300</td>
<td>463</td>
<td>(1860) 881</td>
</tr>
<tr>
<td>Rumania</td>
<td>—</td>
<td>214</td>
<td>(1870) 617</td>
</tr>
<tr>
<td>Serbia</td>
<td>—</td>
<td>303</td>
<td>(1882) 420</td>
</tr>
<tr>
<td>Russia</td>
<td>—</td>
<td>98</td>
<td>(1870) 348</td>
</tr>
</tbody>
</table>


76 Lennart Jorberg, *The Industrial Revolution in Scandinavia, 1850-1914* (1970), p. 7, passim. (This booklet was subsequently republished as a chapter in Carlo M. Cipolla, ed. *Fontana Economic History of Europe, iv(2)*).

77 See, for example, John P. McKay, *Pioneers for Profit: Foreign Entrepreneurship and Russian Industrialization, 1885-1913* (Chicago, 1970).
second common characteristic: abysmally low levels of human capital.\textsuperscript{78} Tables 3 and 4 present crude indices of the quantities of human capital in various nations: adult literacy rates circa 1850 and 1900, and primary school enrolment rates between 1830 and 1900. By both criteria, Italy, Spain, and Russia ranked at the bottom among the larger nations, and there is no doubt that the Balkan countries ranked no higher. In primary school enrolments, Rumania and Serbia were above Russia, but lower than Spain and Italy.

The laggard countries shared a third common characteristic which seriously affected their possibilities for economic development: the lack of any meaningful agrarian reform, and consequent low levels of agricultural productivity. Discussion of the successful industrializers did not include a reference to the agrarian sector (except for Denmark), since all had achieved relatively high levels of agricultural productivity. But, of course, any detailed analysis of the reason for the success of the latter and the failure of the former would have to include an investigation of agricultural productivity.\textsuperscript{79}

VI

One short article cannot do justice to all of the determinants of such a complex social process as that of industrialization, which explains the focus here upon what I regard as the prime determinants of that process, coal and human capital—with incidental mention of agrarian reform. Others have been deliberately omitted, international investment and the role of financial institutions, for example, which have been the subject of my research elsewhere.\textsuperscript{80} Both of those were important, but their importance is neither so indisputable nor their role so unidirectional by comparison with coal and human capital. For example, Russia's total capital imports were the largest in Europe before 1914, yet Russia was not a major industrial power. The Scandinavian countries, on the other hand, with much smaller totals, recorded the largest per capita imports of capital, which certainly facilitated their smooth transition to industrial nation status. Belgium before 1850, and Germany in the 1840s, 1850s, and 1860s received important injections of foreign capital in their strategic mining and metallurgical industries. Foreign, mainly French, capital financed a large proportion of the railways of Belgium, Spain, Portugal, Italy,

\textsuperscript{78} Sandberg, 'Ignorance, Poverty and Economic Backwardness'.

\textsuperscript{79} For example, instead of producing a class of peasant proprietors engaged in market-oriented agriculture, as had agrarian reform in Sweden and Denmark, the desamortización of church and communal lands in Spain further increased the concentration of landownership among a class of absentee landlords and contributed to the growth of a landless agricultural proletariat—with adverse consequences for productivity. See Jordi Nadal, \textit{El fracaso de la revolución industrial en España, 1814-1913} (Barcelona, 1975), pp. 62-7, 81-6, and Gonzalo Anes Alvares, 'La agricultura española desde comienzos del siglo XIX hasta 1968', in Banco de España, \textit{Ensayos sobre la economía española desde comienzos del siglo XIX} (Madrid, 1970), pp. 240-6. See also David R. Ringrose, \textit{Madrid and the Spanish Economy, 1560-1850} (Berkeley and Los Angeles, 1983), pp. 325-30, for a perceptive discussion in the Spanish context of the debilitating effects of a backward agriculture on the entire economy.

Switzerland, Austria-Hungary, the Balkans, and Russia—with very mixed results. Much the same could be said for financial institutions; some performed admirably in the transition to industrial society; others—whatever their profitability to their owners—made little or no contribution.81

VII

In conclusion: there was not one model for industrialization in the nineteenth century—the British—but several. Coal and human capital were the two basic ingredients, but in combination with one another and with other elements they produced a variety—a spectrum, in fact—of patterns of industrialization. To take an important example outside the European experience, industrialization in the United States prior to about 1870 depended upon human capital and abundant natural resources other than coal (but including water power); after 1870 coal was added to the others, resulting in the spectacular leap by the United States to the forefront of the industrial powers.

The customary depiction of an “industrial revolution” in Great Britain and its repetition in continental Europe and elsewhere distorts the historical record. It also conceals the distinctive varieties of industrialization, and ignores the ingenuity and achievements of the men and women who contributed to it.

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81 In addition to the works cited in the previous note, see Richard Tilly, Financial Institutions and Industrialization in the Rhineland, 1815-1870 (Madison, 1966); Gabriel Tortella-Casares, Los orígenes del capitalismo en España (2nd ed. Madrid, 1982); Richard Rudolph, Banking and Industrialization in Austria-Hungary (Cambridge, 1976); John R. Lampe and Marvin R. Jackson, Balkan Economic History, 1550-1950 (Bloomington, 1982), ch. 8; and Udo E. G. Heyn, Private Banking and Industrialization: The Case of Frankfurt am Main, 1825-1875 (New York, 1981).