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ECONOMICS 303Y1

The Economic History of Modern Europe to 1914

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Lecture Topic No. 20:

IV. THE SPREAD OF MODERN INDUSTRIALIZATION IN THE 19TH CENTURY: THE 'SLOW INDUSTRIALIZATION' OF FRANCE, 1789 - 1914

F. French Industrialization in the 19th Century to World War I, 1789 - 1914:

Industrial Growth or Industrial Stagnation - the Debate

F. French Industrialization in the 19th Century: 1789 - 1914 (to World War I)

1. The Problem of Coal in French Industrialization

a) **The Coal Problem**: was it a real problem and a major problem for 19th century French industrialization? There is much debate about this issue.

i) **many economic historians contend that, if France had suffered from a relatively slow pace of industrialization in the 19th century**, then the basic reason for this is simply a natural resource endowment problem: namely, that:

(1) it was essentially a relative insufficiency or scarcity of coal.

(2) And, therefore, this natural resource endowment problem can hardly be a fault to be attributed to French society, culture, or political history,

(3) this is therefore part of the 'path dependency' problem: i.e., natural deficiencies in natural-resource endowments.

ii) **remember that coal had become the most essential ingredient of 19th century industrialization:** as one historical geographer commented (as I have noted earlier): 'an industrial map of 19th century Europe was essentially a map of her coal-fields'. [1]

iii) **the crucial role of coal** for the Industrial Revolution era has already been seen, in terms of:

(1) coal in order to power steam engines, and then steam turbines in shipping

(2) refined and purified coal as coke: for furnaces in metallurgy

- remember that iron and steel must be produced with coal in the form of coke – there is no other substitute to effect the chemical reaction that liberates iron from iron oxide.
- and coal was also vitally necessary for the steam-powered machinery:
  - piston pumps for blast furnaces in smelting ore into iron and
  - steam-powered rolling mills in refining iron

(3) and then, in the later 19th century, steam turbines for the new electrical industry: to be seen in our examination of German industrialization in the 19th century, in my next set of lectures

(4) finally, also from the later 19th century, coal provided the foundations for an entirely new chemicals

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[1] That view has recently been disputed in the following article, whose views I do not share: Gregory Clark and David Jacks, 'Coal and the Industrial Revolution, 1700 - 1869', *European Review of Economic History*, 11:1 (April 2007), 39-72. See my earlier lecture notes to see why, and also my recent publication: John Munro, 'Tawney's Century: (1540 - 1640): the Roots of Modern Capitalist Entrepreneurship', in *The Invention of Enterprise: Entrepreneurship from Ancient Mesopotamia to Modern Times* (edited by David Landes, Joel Mokyr, and William J. Baumol), Princeton University Press, Princeton, New Jersey, 2010, 107–155. You can download the PDF offprint from this URL: http://www.economics.utoronto.ca/munro5/TawneysCenturyPUP2010.pdf

industry, which the Germans also came to dominate.[2]

iv) **On the screen, you can see how far behind France was in European coal mining in 1910, on the eve of World War I**: mining only 40 million metric tonnes, compared to 248 million mt in Germany and 275 million mt in Britain.

Table 1. Output of Coal in Millions of Metric Tonnes:

For selected European countries, decennial means: 1820-29 to 1910-13

Decade	Great Britain	Belgium	France	Germany	Russia
1820-9	20.00	n.a.	**1.30**	1.40	n.a.
1830-9	25.45	2.75	**2.45**	2.45	n.a.
1840-9	40.40	4.60	**3.95**	5.25	n.a
1850-9	59.00	7.70	**6.45**	11.95	n.a
1860-9	95.50	11.35	**11.35**	25.90	0.45
1870-9	129.45	14.70	**16.20**	45.65	1.60
1880-9	163.40	17.95	**20.85**	71.90	4.35
1890-9	194.15	20.70	**28.45**	107.05	9.05
1900-9	245.30	24.05	**34.70**	179.25	20.50
1910-3	275.40	24.80	**39.90**	247.50	30.20

v) **Thus France's coal output was only 14% of the British,** and 16% of the German coal output.

b) **Explanations for France's coal problems**:

i) **France then had and still has very small and scattered coal deposits**:

(1) some coal deposits were found in the Massif Central (at Le Creusot)

(2) but the main coal deposits were

- in the Lille and adjacent Pas de Calais regions of the NW,
- and thus actually an extension of the vast Belgian coal deposits.

[2] See the following lectures on German industrialization: no. 24.

ii) **The Lille region (département du Nord and Pas de Calais)**:

(1) provided the richest deposits and this region not surprisingly became the industrial heartland of 19th century France;

(2) and this region also boasted the world's largest coal mining company in the 19th century:

- the Anzin company (family firm founded with state aid in 1757),
- accounting for a third of France's coal output.

iii) **But elsewhere, apart from these two regions, French coal deposits were scattered, and very small scale**:

(1) they were costly to mine, and costly to service even with railroads.

(2) and even at the pithead, coal prices in these regions were 50% higher than in Britain.

c) **But was a relative insufficiency of coal a real problem, a major hindrance to industrialization?**

i) **There is widespread disagreement on this question in particular:** and on the more general question of the importance of natural-resource endowment.

ii) **Let me cite the renowned French economic historian François Crouzet: who states:**

- 'This thesis [about the scarcity of coal as a severe handicap] has become unfashionable: at the beginning of the Industrial Revolution (when water-power was widely used), coal was not a vital factor'.
- it was also a minor component of prime costs in most industries (except the heavy ones);
- France could have imported all the coal she needed, and at low prices;
- and France could have responded to the scarcity of coal by technical innovations, especially including and a better utilization of labour;
- the abundance of coal did not prevent the relative decline of British industry from the 1870s onwards....[3]
- I might also note that even more recently, the British historian Colin Heywood, in listing the traditional explanations for France's slow economic growth in the 19th century, referred to: 'such

[3] François Crouzet, 'French Economic Growth in the Nineteenth Century Reconsidered', *History*, new series, 59 (1974), 167-79. However, he finally concluded by stating in fact an opposite view: 'Still, the "coal factor" cannot be completely dismissed; it played a part in the slow replacement of charcoal by coke in the French iron industry, and in the belated introduction of some advanced textile machinery which needed a lot of power -- like the self-acting mule. And, after all, nearly all the large industrial districts of the nineteenth century developed on coal fields, and France's bad luck was to have only a couple of such vital growth areas.'

hoary old chestnuts as coal shortages...'[4]

iii) **The Case of the Netherlands:** the link between coal supplies and its supposed failure to industrialize:

(1) First let me stress, as I do in my Eco 301Y course, that the Dutch had indeed industrialized during the later 16th and 17th centuries to become, according to some historians, the 'industrial workshop of the world' – or of the early-modern European world;

(2) and certainly it was more advanced industrially than England ca. 1720 (and certainly rivalled England in fine quality woollens and linens).

(3) The Dutch, with relatively efficient and low cost shipping, did import many industrial inputs, along with foodstuffs (as did the English, of course, especially for textiles: Spanish merino wools and cottons).

(4) The cost of importing English coal, across the North Sea was relatively cheap:

- probably no more so than London's cost in obtaining such coal by coastal shipping (chiefly from Newcastle, in the NE)
- note: in the 18th & early 19th centuries over half of England's coastal shipping was involved in transporting coal

(5) The argument that the Dutch Republic (Kingdom of the Netherlands after 1815) lacked coal is not entirely true:

- There is coal in the Dutch province of Limburg, in the south-east
- the major urban centre of Maastricht, in Dutch Limburg,
    - is within a few kilometres, by rivers and canals, of the rich coal deposits in neighbouring Limburg in the Austrian Netherlands (modern day Belgium),
    - and just 24 km from the major coal-based industrial city of Liège.

(6) Indeed, the new, post 1815 Kingdom of the Netherlands

- did encompass the southern Low Countries, with their immensely rich coal fields,
- until the 1830 rebellion created the modern kingdom of Belgium.

(7) As Joel Mokyr has also pointed out, Holland long had rich supplies of an alternative fuel, if less efficient

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[4] Colin Heywood, *The Development of the French Economy, 1750 - 1914*, Studies in Economic and Social History (London, 1992), p. 11. But in a subsequent section he provides, in fact, many of the same arguments that I do in support of the contention that inadequate and costly coal supplies were indeed a negative factor in the 19th-century French economy, i.e., before the advent of hydro-electric and petroleum power.

fuel, in the form of peat.[5]

(8) Let us remember that the industrial revolution had earlier begun with water-power (and wind-power).

(9) While the Kingdom of the Netherlands certainly did industrialize in the 19th century, the pace and scale of that industrialization became greater in the south, in Belgium, and certainly in part because of ready access to its very rich coalfields.[6]

d) **France, Transportation Economics and the Railroad**:

i) **before the coming of the railroad, high transportation costs made most French coal uneconomic**: and also made it uneconomic to import coal from even neighbouring Belgium (which was quite rich in coal).

(1) Thus, in 1838, Belgian pithead coal had cost just 8 gold francs a tonne;

(2) but at the French frontier (Sedan), the cost rose to 45 francs a tonne;

(3) and at Reims, half way to Paris, the cost rose again, much more: to 64 francs a tonne (or 8 times the pithead price).

ii) **The same was true for regional differences in prices for pig iron:** in April 1826, a ton of pig iron cost:

(1) 150 francs in Champagne

(2) 265 francs in the centre of the country

(3) 300 francs on the eastern frontier

iii) **So the coming of the railroad in the 1840s did make a considerable difference**:

(1) indeed the table (on the screen) does show a very large increase in French coal mining from the 1840s,

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[5] Joel Mokyr, *Industrialization in the Low Countries, 1795 - 1850*, Yale Studies in Economic History (New Haven and London, 1976), pp. 204-06, in disputing the significance of comparative natural -resource endowments, also states: 'The Netherlands, though poor in coal, was rich in peat which for some uses constituted a good substitute for coal.' He also notes that the cost of importing both coal and iron by sea from Britain was generally or probably less than the costs that Belgian industry in Flanders (Ghent especially) faced in acquiring their own country's coal. Peat (Answers.com): 'A dark-brown or black residuum produced by the partial decomposition and disintegration of mosses, sedges, trees, and other plants that grow in marshes and other wet places. Forest-type peat, when buried and subjected to geological influences of pressure and heat, is the natural forerunner of most coal. Moor peat is formed in relatively elevated, poorly drained moss-covered areas, as in parts of Northern Europe.'

[6] Mokyr (1976) concludes with a more pessimistic view than I would necessarily endorse. In noting that GNP per capita was not rising and probably falling in the nineteenth- century Netherlands (with a rising population), he states that: 'It is thus not likely the Dutch failure to industrialize was really a healthy response to objective economic conditions.' He also admits, however, that 'it could be countered that since wages in Belgium did not rise significantly in the first half of the nineteenth century, it is not clear what the majority of the Dutch population could have gained by industrialization...' And yet he also contends that by the 1850s the Belgian GNP per capita had probably overtaken the Dutch (pp. 260-61). Economic history does not necessarily lend itself well to consistency.

with a quadrupling of output by the 1870s.

(2) Obviously railways also greatly cheapened the cost of imported coal, from both Belgium and the German Rhineland.

(3) France did indeed import a great deal of coal: normally 30% - 35% of France's annual coal consumption came from foreign imports,

(4) even after that expansion in domestic coal mining (i.e., imports averaged 50% of domestic production).

iv) **Because of such coal imports**, many historians, therefore, dismiss the supposed problem of domestic coal scarcity.

e) **But coal importation nevertheless remained costly, for three reasons**:

i) **the railroad, while greatly reducing transportation costs, did not make coal that cheap**:

(1) such transport costs, over considerable distances, still placed French industries at a disadvantage compared to British, Belgian, and German coal-burning industries,

(2) which were so much closer to their own domestic coal supplies (by rail or by canals).

(3) **That is why I stressed earlier than an industrial map of 19th century was essentially a map of her coalfields:** because transport costs necessitated locating industries as close as possible to coal fields, though not necessarily right on the coal-fields.

(4) **That was especially true of metallurgy,** when 10 tons of coal were necessary to smelt one ton or iron ore (compared to a ratio of about 1:1 today).

(5) **Comparisons with the British cotton industry and modern day Japan are irrelevant:** because the transportation and industrial economics were and are so very different.

ii) **secondly, imported coal was expensive because the French government levied high protective tariffs, for two reasons**:

(1) to protect the existing and high-cost coal mining industry in the Massif Central (and elsewhere in France).

(2) to provide economic incentives for exploration and development.

iii) **Thirdly, the problem of German coal cartels**:

(1) France, in importing a great deal of her coal from the German Rhineland-Westphalia, had to pay an artificially high price set by the German coal-mining cartels.

(2) Why did France import so much German coal?

- Because that coal was the closest to her largest steel industry,
- which was located on the site of her remaining iron ore deposits in Lorraine (the portion left to France after the Franco-Prussian war).

(3) Why did German steelmakers pay so much less for their coal?

- Because most were vertically integrated to own their own coal mines:
- and so avoided paying the cartel price for coal, a point that we will examine in greater detail when we come to German industry after 1860.

f) **The Consequences of High Cost Coal**:

i) **the case of the French iron industry:** production costs involving coal in the 1850s[7]

(1) coal accounted for 60% of variable costs in the French iron industry, compared to:

(2) 44% of variable costs of Ohio's iron industry (in the US)

(3) 30% of variable costs in the Germany's iron industry: in the Ruhr (Dusseldorf)

(4) 18% of variable costs in the iron industry of South Wales

ii) **High cost coal raised almost all industrial costs sharply,** except where French industry was able to realize important fuel economies, or later use alternative fuels.

iii) **High industrial costs meant a narrower market for French industrial goods,** i.e., within a protected domestic market.

iv) **High coal costs were probably a major reason why chemical and electrical industries,** both of them heavily based on coals, did so poorly in France, before the 1920s.

g) **How did 20th Century France overcome the problem of fuel costs:**

i) **Hydro-electric power:**

(1) indeed electrification of the French economy essentially had to await the development of hydro-electric power in the Alps, after 1910 -- hydro-electric power,

(2) which the French so aptly called 'la houille blanche', i.e., the 'white coal'.[8]

ii) **petroleum and diesel fuels:** after World War I, which is thus beyond the timespan of this course

b) **increased fuel economies in utilizing coal as an industrial fuel:** as in the previous observation that , in steel-making, for example, the ratio of coal to iron ore fell from 10:1 in the 1840s to about 1:1 after World War II.

2. <u>The Iron and Steel Industries in France</u>

a) **With such high coal costs, how did the French iron and steel industry compare with the British, German, and Russian industries?**

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[7] Colin Heywood, *The Development of the French Economy, 1750 - 1914*, Studies in Economic and Social History (London, 1992), p. 25.

[8] 'white coal' is the correct translation of *houille blanche. La houille:* means pit-coal, coal from the pit of the mine shaft. *Charbon de terre* is the other word for coal, but in this combination; *charbon de bois* means charcoal (i.e., produced from burning wood).

i) **As the table on the screen shows, for pig iron outputs and steel,** on the eve of World War I, France produced

(1) just 4.7 million metric tonnes of pig iron and 4.l mmt of steel --

(2) just 31% of the German pig iron output, and only 25% of the German steel output: and thus no contest with Germany.

Table 2. Decennial Means of the Output of Pig Iron and Steel in France, Germany, Russia, and the United Kingdom, in millions of metric tons,

1830-9 to 1910-3 (iron) and 1870-9 to 1910-3 (steel)

Index: Average of 1880-9 = 100. 1 metric tonne = 1000 kg. = 2,204.6 lb.

Decade	France	Index	Germany	Index	Russia	Index	United Kingdom	Index
IRON								
1830-9	0.286	16	0.129	4	0.172	31	0.921	11
1840-9	0.442	25	0.172	5	0.192	35	1.625	20
1850-9	0.731	25	0.334	5	0.243	44	3.150	39
1860-9	1.164	66	0.813	25	0.304	56	4.602	57
1870-9	1.337	75	1.678	52	0.400	73	6.648	81
1880-9	1.772	100	3.217	100	0.547	100	8.040	100
1890-9	2.192	124	5.155	160	1.539	281	8.090	101
1900-9	3.028	171	9.296	289	2.786	509	9.317	116
1910-13	4.664	263	14.836	461	3.870	707	9.792	122
STEEL								
1870-9*	0.260	52			0.080	33	0.695	30
1880-9	0.500	100	1.320	100	0.240	100	2.340	100
1890-9	1.015	203	3.985	302	0.930	388	3.760	161

Decade	France	Index	Germany	Index	Russia	Index	United Kingdom	Index
IRON								
1900-9	2.175	435	9.505	720	2.490	1038	5.565	238
1910-13	4.090	818	16.240	1230	4.200	1750	6.930	296

* 1875-9 only for Russia.

ii) **But comparisons are more favourable with the other two countries**:

(1) **Russia:** French steel production was not much less than the Russian (4.2 million metric tonnes),

(2) **Great Britain:** French steel production was 60% of the British steel output in 1910 (6.9 mmt).

b) **The Development of the French Steel Industry after 1870**: why did it grow with relative success?

i) **French iron ore deposits**: immense deposits of iron ore in Lorraine:

(1) to be sure, France had lost two-thirds of those deposits to Germany, after the Franco-Prussian war (1871),

- when the new imperial Germany seized the French provinces of Alsace-Lorraine,
- on the grounds that they had been part of imperial Habsburg Germany, before the conquests of Louis XIV, 1680-97;[9]

(2) but the one-third that remained to France contained perhaps the richest deposits, the easiest to mine.

(3) The best fields, at Longwy-Briey, were in fact discovered only in the 1880s (and developed only from 1891):

(4) Utilization of France's iron ore deposits

- about half of France's iron ore was exported (to Germany)
- and the other half was made into French steel, on the site of those ore deposits, as already noted, using imported Rhineland coal.

ii) **These iron ore deposits were, of course, heavily phosphoric**: but the Gilchrist-Thomas Basic Process

[9] The Treaty of Westphalia, ending the Thirty Years' War in 1648, assigned Upper Alsace to France; later, from 1680 to 1697, Louis XIV conquered the rest, i.e., Lower Alsace, acquisitions ratified by the Treaty of Ryswick in 1697, which, however, also recognized imperial German sovereignty over the duchy of Lorraine (occupied by France during the Thirty Years' War). The duchy of Lorraine finally passed to France, in 1766, by dynastic succession. Both Alsace and about two-thirds of Lorraine were ceded to the victorious Imperial Germany, with the French defeat in the Franco-Prussian War of 1870-71. Imperial Germany held Alsace and most of Lorraine from 1871 to 1918, when Germany's defeat in World War I allowed France to regain these provinces.

of 1878 permitted low cost utilization of these minette ores.

iii) **This Lorraine steel industry provides the one important exception to the general rule:** that 19th century iron and steel industries had to be located on or near coalfields (because of that 10:1 smelting ratio).

iv) **Other steel-making centres were, however, located near French coalfields**: especially in the Lille, Pas de Calais, and Massif Central regions (Le Creusot).

c) **Protectionism and the French Steel Industry**:

i) **From the mid-1870s the protectionist pressures mounted**:

(1) a severe European-wide industrial depression, with falling prices for iron and steel products, produced an industrial clamour for much higher tariffs

(2) French farmers, facing falling grain prices, made similar demands;

(3) German industry similarly received protection in 1879.

ii) **Aftermath of the French defeat in the Franco-Prussian war of 1870-71**:

(1) taught the French the necessity of having a viable iron and steel industry for armaments, for military defence;

(2) and the French iron and steel industry was thus able to appeal effectively for government protection and subsidies;

(3) and so it developed subsequently with that government protection.

iii) **High tariffs on iron and steel**: began in 1881 and reached their height with the Méline tariff of 1892.

iv) **Protectionism then promoted or bred cartelization of the French steel industry,** and considerable amalgamation soon followed, for reasons that will be better understood when we analyse German industrial cartels in a following lecture.

d) **Features of French iron and steel cartels**:

i) **the Comité des Forges** was the major cartel organization.

ii) **French cartelization also resulted in outright amalgamation,** with considerable vertical and horizontal integration, from iron mines to finished steel products.

iii) **That horizontal and vertical integration, with considerable increases in industrial scale,**

(1) was also accompanied by extensive mechanization, following the German models,

(2) i.e., from coal and iron mining to steel production;

(3) and in particular it involved achieving similar fuel economies.

iv) **The result was also increasing industrial concentration in the hands of fewer firms:**

(1) so that by 1900, about 10 very large scale firms produced about 80% of France's steel output.

(2) The two leading giants were the De Wendel and Schneider-Creusot firms -- both of which were essentially

family firms (though the latter did become dependent on bank financing).

v) **Government support for the French steel industry was important not only in terms of protective tariffs,** tacit support for cartels, subsidies, but also as a major source of demand for steel products: for armaments, especially (army and navy), for railroad construction, etc.

vi) **To repeat: we will better understand the economics of cartelization when we examine German industrialization,** where it is a much more prominent feature.

3. Textile Manufacturing in 19th Century France

a) **Textile Employment and Output:**

i) **As in Britain, and indeed as in so many industrializing countries in the 19th century,** the biggest manufacturing industry in terms of both employment and value of output together were textiles: the three most important being woollens, cottons, and linens (but not silks, in that upper range);

ii) **1839-1845 Industrial census**:

(1) textiles collectively accounted for 62.5% of total recorded manufacturing employment

(2) i.e.: 468,839 out of 751,296 workers.

(3) but these figures unfortunately exclude Paris, for which we have no census data

iv) **1861-65 Industrial census**: which does this time include Paris

- textiles now accounted for 45.5% – i.e., almost one half – of total such industrial employment (679,839 out of 1,493,682 workers)
- the decline in relative shares from 62.5% (or more – since Paris was excluded, to repeat in the 1839-45 census) to 45.5% is to be expected: everywhere, as industrialization developed, especially with the growth of metallurgical and engineering industries, the share provided by textiles necessarily fell, or contracted.

v) **Value of Output:**

- In the 1865 industrial census, textiles collectively accounted for almost a third -- 32.4% -- of the aggregate value of manufacturing output (2.3 out of 7.1 billion gold francs),
- second only to food processing: worth 2.8 billion francs

b) **The French Cotton Industry**:

i) **In the 1845 industrial census,** it was the largest single industrial employer,

- with 174,541 workers: accounting for 37.2% of employment in textiles
- and 23.2% of aggregate industrial employment (outside of Paris -- not included in the census).

ii) **In the 2nd census, of 1865,** however, the employment share accounted for by cotton manufacturing

slipped to 20.3% of total textile employment and just 9.2% of total industrial employment outside of Paris).

c) **The French Woollen Industry**:

i) **Earlier, the woollen industry,**

(1) **in the 18th century,** woollens & worsteds together had been the most important French textile industry.

(2) and, in the 19th century, it still remained the most important in one respect: in terms of value of output, accounting for roughly half the value of aggregate output in textiles.

ii) **In the 1839-45 industrial census,** woollen/worsted manufacturing was second only to cottons in industrial employment

iii) **In 1865 census, woollen manufacturing** had slipped to third place, accounting for 18.9% of textile employment and 8.6% of total industrial employment.

d) **Domestic and Overseas Markets**

i) **Certainly these textile industries loomed large in the domestic economy,** and commanded a dominant share of the domestic French market, thanks to tariffs (at least until the 1860 Cobden-Chevalier treaty) and high cost regional transport.

ii) **In foreign markets, however, neither woollens nor cottons fared well:**

(1) there was no way that they, and particular the cotton industry, could compete with the British industry,

(2) especially not when the British had so many captive markets abroad, and cheaper transport.

e) **Powered Mechanization:**

i) **Both cottons and woollens under went mechanization much more slowly than did the British industries** – though we should remember that the British woollen industry was itself much slower to do so than the cotton industry, before the 1850s.

ii) **Initially they had to depend upon water-power**,

(1) which was economic only in certain regions, having suitable water power: such as Normandy and Brittany, Massif Central;

(2) but finally some industries switched to coal-fired steam power in those few areas with relatively cheap coal: such as the Nord (Lille) and Alsace.

iii) **According to the leading French industrial historian, Claude Fohlen, three factors hindered both mechanization and the achievement of an increased scale of production**:

(1) protective tariffs;

(2) the conservative nature of the predominant family firms;

(3) the lack of cheap power for mechanization, in most regions.

iv) **As for the steam engine, let me cite John Vincent Nye: he has commented that in France:** 'the steam engine did not really displace water power for most of the nineteenth century'.

4. **<u>The Food Processing Industries:</u>**

a) **The most important were flour, sugar-refining, olive oil, and wine**: collectively accounting for 39.4% of the value of total industrial output in the 1865 industrial census.

b) **In terms of industrial employment, in the 1865 census:**

i) food-processing collectively was second only to textiles,

ii) though textiles together employed almost four times as many workers (outside Paris): 679,836 vs. 174,151 workers.

c) **Capital investment was,** however, and quite surprisingly, higher in food-processing than in textiles by 31%: 720 million francs vs. 550 million francs.

5. **<u>French Industry in 1914</u>**: **new industries and industrial scale**

a) **The new automobile industry provides perhaps France's major industrial success story in the early 20th century**:

i) **On the origins of the automobile industry, read David Landes, *Unbound Prometheus*:**

(1) in particular the Frenchman Beau de Rochas' development of the 4-cycle engine in 1862;

(2) and the German N.A. Otto's development of first practical internal combustion engine in 1876.

ii) **By 1900 France had developed Europe's leading automobile industry,** led by the Renault and Citroën firms.

(1) André Citroën's firm went bankrupt in 1935 (just after he died of cancer) and was taken over by the equally renowned firm of Michelin (famed for its automobile tires);

(2) Michelin converted Citroën's new prototype *avant-traction* automobile, known as the 'black swallow', into literally a runaway best-seller.

(3) As David Landes comments, in *The Unbound Prometheus* (pp. 450-51): on Citroen's success

> 'The "black swallow" was an unbelievable success. French gangsters would use nothing else for their getaways. For over twenty years it ruled the highways, [as] France's fastest, best-performing car in mass production. Only the Model T [Ford] and Volkswagen can show a similar record of longevity.'

iii) **On the eve of WWI, French automobile exports were double those of her nearest rival,** Great Britain.

iv) **Nevertheless, during the inter-war period,** Britain would rapidly overtake France in automobile production and exports, to become Europe's leading exporter, second only to the United States.

b) **Industrial power**:

i) **the development of hydro-electric power, from the French Alps, in early 20th century:** as France's answer to coal problem, as noted earlier.

ii) **and then petroleum power:** internal combustions engines, including diesel engines

c) **In merchandising**: France pioneered the use of department stores, which we shall consider in more detail with Britain.

d) **French Industrial Scale**: some questions

i) **The traditional literature paints a picture of small-scale, family owned French industry,** and generally high-cost, inefficient.

(1) See the Landes thesis in the bibliography for the essay topics on France.

(2) Trebilcock, commenting on this literature, notes sardonically that 'many of the failures perpetrated by the nonchalant British are also alleged against the indolent French'.

ii) **But more recent analysis shows that by no means all French industry was small scale (even when family owned);** and certainly not all by any mans were inefficient and high cost; and certainly not lacking in enterprise, as we've just suggested.

iii) **Where both technology and the market (or natural monopolies) permitted or dictated, French industrial firms were large scale:**

(1) as in the steel industry, already discussed;

(2) in railways and steam shipping;

(3) in hydro-electric power generation and distribution;

(4) and in automobiles.

iv) **For the French case in particular note the following determinants of industrial scale:**

(1) product choice and technology as prime determinants:

- as we saw in Britain the technology of cotton manufacturing did not dictate large-scale forms of industry as did the technology of metallurgy;
- that in cotton spinning or weaving no significant returns to scale beyond medium-sized firms.

(2) the size of the market, and in particular its demographic density, plus the combination of transport and transaction costs facing the producer in reaching his market.

(3) Thus population densities, urbanization, and relative transport-transaction costs were factors that helped limit or restrict industrial scale in 19th century France.

e) **The Recent Debate in the Periodical Literature:**

i) **John Nye (1987):** [10] provides an econometric analysis to show that in terms of French comparative advantage in product choice for manufacturing, many or most French industrial firms demonstrated an optimal scale, indicating that they would not have achieved increasing returns by augmenting industrial scale.

ii) **Pierre Sicsic (1994):** [11] that, in partial contrast to Nye, his econometric study indicates the following:

(1) that there were increasing returns to scale in many parts of French industry (as similar studies show for the 19th-century U.S.); but

(2) French firms in many industries -- textiles as well as metallurgy -- were not as small scale as often suggested: while somewhat smaller than corresponding British firms nevertheless larger than American (New England) firms in the 1860s.

iii) **Ulrich Doraszelski (2004):** [12] the most recent contributor to this ongoing debate, raises concerns about the methodology that both Nye and Sicsic employed, especially in econometrics

(1) He notes that 'a definitive assessment is very difficult to come by through econometric analysis due to the complexity of factors that affect it'

(2) Using a broad rather than narrow industry classification clearly inflates returns-to-scale estimates in the first census' [industrial census of 1839-47]

(3) 'Results based on data from the first census' [which did not, however, include Paris]

- suggest increasing returns to scale for some industries and constant returns for others,
- while results based on data from the second census [of 1861-65] suggest constant returns to scale throughout':
- thus supporting Nye and contradicting Sicsic.

(4) Given that there were some scale economies, did a failure to achieve optimal scale contribute to the problem of sluggish economic growth in the 19th century?

(5) From the first industrial census (1839-45), he finds that:

- in the two largest industries, textiles and food processing, there was 'a strikingly high degree of increasing returns in textiles and modest degree in food processing'
- in iron and metallurgy (3rd largest): '56% of output was produced with increasing returns'

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[10] John Vincent Nye, 'Firm Size and Economic Backwardness: A New Look at the French Industrialization Debate', *The Journal of Economic History*, 47:3 (September 1987), 649-70.

[11] Pierre Sicsic, 'Establishment Size and Economies of Scale in 19th-Century France', *Explorations in Economic History*, 31:4 (October 1994), 453-78.

[12] Ulrich Doraszelski, 'Measuring Returns to Scale in Nineteenth-Century French Industry', *Explorations in Economic History*, 41:3 (July 2004), 256-81.

(6) But the data in the second industrial census (1861-65) indicate that

- 'the role of increasing returns diminished' and thus
- that 'France had much less to gain from scale economies in the second half of the nineteenth century than in the first'.

(7) And thus two linked conclusions: chiefly supporting Nye and disagreeing with Sicsic

- 'that a large portion of the manufacturing sector had successfully exploited whatever scale economies were at its disposal by the later part of the [19th] century'.
- 'this [finding] casts some doubt on the notion that small firm size was at the root of sluggish economic growth, especially in the second half of the nineteenth century'.
- 'This is in line with the fact that France slipped behind gradually, mostly during the later part of the nineteenth century'
- 'From this point of view, scale economies must be regarded as an engine of growth, rather than a hurdle'.

(8) Citing Kinghorn and Nye, Doraszelski

- cites the fact that '95% of all French [industrial] establishments have 5 or fewer employees'.
- but that does not indicate the role of firm size in shares of aggregate industrial production.

f) **A survey of French industrial production in 1906 shows that**:

i) **large firms employing over 100 persons:** accounted for 25% of total French industrial production.

ii) **firms between 10 and 100 persons:** for 15% of industrial production.

iii) **small firms under 10 persons:** for 60% of industrial production.

g) **That much French industry was small-scale does, however, seem to be undeniable**:

i) **But much of that was in the form of consumer goods manufactures,** especially of luxury and semi-luxury goods, in which France long maintained and still held a comparative advantage.

ii) **For this type of industrial production,** it must be stressed, small-scale was an asset, indeed required to ensure proper quality controls: for silks, fine woollens, jewellery, metalwares, wines

6. The Debate About the Performance of the French Economy and French Industrialization in 19th Century [13]

[13] The most recent contribution, though covering events only up to the mid-19th century, is: Jeff Horn, *The Path Not Taken: French Industrialization in the Age of Revolution, 1750 - 1830*, in the series: Transformations: Studies in the History of Science and Technology (Cambridge, Mass and London: The MIT Press, 2006). He contends that 'French industrialization was not a failed imitation of the laissez-faire British model but the product of a distinctive industrial policy that led, over the long term, to prosperity comparable

a) **Introduction:**

i) **As I had noted in the introduction to this section on France,**

(1) the traditional views on the performance of the 19th-century French have largely been negative or pessimistic,

(2) and whether negative or positive, they have been certainly very judgmental.

ii) **For a long time, our views about the performance of the French economy in the 19th century were dominated by the writings of Sir John Clapham,** who stated (as I had noted earlier), in his famous book *The Economic Development of France and Germany, 1815 - 1914* (written in 1921), that France 'never went through an industrial revolution'.

iii) **Subsequently several prominent historians have supported Clapham's view:** that France did not industrialize as rapidly and as fully as did Britain and Germany in the 19th century.

(1) the chief ones are: Rondo Cameron, David Landes, more recently Clive Trebilcock, and most recently Patrick O'Brien;

(2) and also, to a modified extent, Nicholas Crafts as well.

(3) Rondo Cameron, however, has recently changed his mind on this issue, as will be noted shortly

iv) **Angus Maddison, in his book *Economic Growth in the West* (1964),** provides the least flattering picture: in comparing the economic growth rates of 12 European and North American countries in the 19th century (to 1914), he ranks France 11th (just ahead of Italy).

v) **These historians, beginning with Clapham,** have all emphasized, to one degree or another,

(1) the various barriers or impediments to French industrialization, from the 18th and 19th centuries;

(2) and contend that more rapid and complete industrialization came only after World War I (or, fro some, only after World War II).

b) **The optimistic view**: **The revisionist school**:

i) **More recently there has developed a revisionist school,** which has painted a far more optimistic and favourable picture of French industrialization in the 19th century and of French economic growth in general:

(1) the French historians: Crouzet, Fohlen, Levy-Leboyer;

(2) the American Richard Roehl especially;

(3) and the British historians: Roger Price, and Robert Aldrich;

(4) and also the earlier Patrick O'Brien and Caglar Keyder (in their 1977-78 publications), even if O'Brien has changed his mind (again).

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to Britain's'. Whether or not this new addition to the Revisionist School is valid remains to be seen.

(5) and, as suggested earlier, so did that 'Johnny-Come-Lately', the late American historian, Rondo Cameron.

ii) **In his most recent textbook, *A Concise Economic History of the World* (1989; revised edn. 1992),** the late Rondo Cameron (d. 2001) stated (p. 234):

> Of all the early industrializers, France had the most aberrant [i.e., abnormal] pattern of growth. That fact gave rise to a large literature, both in the nineteenth century and more recently, devoted to explaining 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 in France differed from that of Great Britain and the other early industrializers, the *outcome* was no less efficient and, in terms of human welfare, may have been more so. Moreover, looking at the patterns of growth of successful late industrializers, it appears [that] the French pattern may have been more 'typical' than the British.

iii) **In essence, Cameron argues that France proved to be remarkably successful,** when you consider three marked disadvantages it faced in the late 18th, early 19th centuries:

(1) low demographic growth rates: population grew by 'only' 50% from 1800 to 1914 (compared to a four-fold growth in British population).

(2) insufficient supplies of coal, and other crucial raw materials, and

(3) the interruptions of the French Revolution, with subsequent devastations:

(4) most especially, subsequent miliary defeats:

- defeat in the French Revolutionary and Napoleonic Wars, 1792 - 1815
- defeat in the Franco-Prussian War of 1870

iv) **and that, in per capita terms (i.e., discounting for low demographic growth rates),** most indices for France prove to be as favourable for most European countries.

v) **That is quite a remarkable switch from his earlier position:**

(1) it proves, I suppose, how persuasive the revisionist literature has been;

(2) but let us now see whether the traditional school or the revisionist school has the better case, or whether some less judgmental position in between may be found.

7. <u>Patterns of French Economic Growth and Industrialization during the 19th Century (to 1914): the Debate Revisited</u>

a) **Two major errors in talking about the French economy in the 19th century:** as I had indicated earlier,
(1) at the beginning of this series of lectures, in introducing the debate about the performance of the French economy in the 19th century (and then stating that this debate would be left to this final lecture on the French economy); and
(2) the lectures on agrarian changes in 19th-century France:
i) **the first error: to pretend that France was a homogenous economic entity,** rather than a country with several very different regional economies
ii) **the second error: to discuss the 19th century as though it were one continuous and consistent period of stagnation,** rather than a century with many different phases.
b) **Phases of Economic Growth:**
i) **the 19th century was certainly not a period of continuous economic stagnation,** but a century that witnessed several phases of quite rapid growth alternating with phases of slower growth, as in many other countries,
ii) **as follows:**

1815 - 1840	irregular, usually slow growth
1840 - 1860	very rapid economic growth
1860 - 1880	less rapid, irregular growth [Franco-Prussian war intervened, 1870-71]
1880 - 1895	stagnation and recession [period of the international 'Great Depression, 1873 - 1896', with general deflation]
1895 - 1914	recovery and rapid economic growth [with international inflation; pre-war build up]

iii) **You will not that:** these phases of growth and stagnation very closely parallel those already given (last day) for French agricultural development.
c) **A 'Middle View' of French Economic Growth**
i) **The pessimist school draws too bleak a picture of French economic growth:** the very harsh verdicts of the older historians are overdrawn, overstated.
ii) **Keep in mind the fact that France had achieved a high level of economic development by the 18th century:**
(1) with a prosperous agriculture in many regions, especially in the Normandy and north-west (near Belgium)
(2) with a more highly developed education and science than most of Europe,
(3) with a large and highly developed manufacturing sector (especially in textiles) in many regions;
(4) with very extensive foreign trade and an overseas colonial network -- indeed with a growth in foreign

trade that often outstripped the growth in British trade,

(5) at least until the 1780s, after which revolution and warfare tipped the scales against the French economy, especially in those regions most afflicted by war.

iii) **Thereafter, during the 19th century,** France did experience fairly substantial economic growth:

(1) compared with French economic growth in previous centuries and

(2) compared with many other European countries in the 19th century: so that clearly France was not below average.

iv) **Crafts (somewhat less favourably) and Crouzet (somewhat more favourably):** perhaps sum up the situation best in saying:

(1) **Crafts:** 'French economic growth was respectable but certainly not outstanding during the nineteenth century'; and

(2) **Crouzet:** 'the French performance during the nineteenth century was certainly not brilliant, but quite creditable, and that it is incorrect to speak of stagnation.'[14]

(3) **Crouzet also cites Sidney Pollard to the same effect:**[15]

- that French rates of growth in industrial output and national income in the 19th century (to 1914) 'were respectable rates, comparing well with those on the continent', and that
- 'They look better still in per capita terms'.

v) **As both Donald (now Deirdre) McCloskey and Nicholas Crafts have reminded us**:

(1) It is rather silly, in a way, to debate the rather small differences in growth rates between western European countries in the 19th century, when you consider how much more rapidly they were all growing, compared both to past centuries,

(2) but more especially compared to other countries or regions in the 19th century -- in Asia, Africa, and Latin America.

d) **Let us look at economic growth rates:**

i) **For the entire century 1815-1914, according to Crouzet:**

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[14] See François Crouzet, 'French Economic Growth in the Nineteenth Century Reconsidered', *History*, new ser. 59 (1974), 167-79; and his most recent thoughts, in François Crouzet, 'The Historiography of French Economic Growth in the Nineteenth Century', *The Economic History Review*, 2nd ser., 56:2 (May 2003), 215-42. The former article provides, however, much more statistical evidence, while the latter provides largely commentary on the existing literature.

[15] Crouzet (2003), p. 224, citing Sidney Pollard, 'The Europeanization of the International Economy, 1800-1870', in Derek Aldcroft and A. Sutcliffe, eds., *Europe in the International Economy, 1500 to 2000* (Cheltenham, 1999), pp. 50-101.

- France's overall economic growth rate was 1.5% per annum,
- compared to Britain's per annum growth rate of 2.6% (which, when compounded, is a fairly significant difference).

ii) **But in per capita terms, the French and British growth rates appear to be very similar,** especially after 1850:

- **Craft's figures show that:** from 1850 to 1914 the per capita product in France grew at a slightly faster rate than in Britain: 204% (France) vs. 197% (Britain).
- **Consider also the graph on the screen:** for industrial growth rates, constructed from data in Arthur Lewis, *Growth and Fluctuations, 1870 - 1913* (1978)**:** if we now compare the rates for the later period 1860, 1914, we see once more that they are roughly comparable.
- Most recently Angus Maddison provides the following comparison of *per capita* growth rates from 1820 - 1913: in percent per annum[16]
  - France 1.1%
  - Great Britain 1.0%
  - Germany 1.3%
  - mean of 12 West European countries 1.2%
  - he comments that only Germany, Belgium, Denmark, and Switzerland did better than France in this period.

e) **The Population Question:**

i) **As Crouzet admits, the per capita growth rates were similar,** because France's population grew at such a slower rate than Britain's.

ii) **But Britain's far more rapid demographic growth was undoubtedly stimulated by her economic expansion,** and the same was true, as we shall see, for Germany

iii) **Furthermore, may one consider population increases as an aspect and sign of growth?**

iv) **that economic stimulus for demographic growth in general and rapid urbanization in particular was clearly absent in France;** and this is a question that the revisionists gloss over.

v) **As we have argued earlier, for the British Industrial Revolution, population was both a cause and then a consequence of economic growth**:

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[16] Angus Maddison, *The World Economy: a Millennial Perspective* (Paris, 2001), table 2:22b, p. 96. Cited in Crouzet (2003), p. 222, n. 42, commenting that 'these rates are based on "hybrid estimates" of DGP at PPP [Gross Domestic Product calculated by purchasing power parity], using the work of Toutain and Lévy-Leboyer for France, and that of Deane and Cole and of Feinstein for Britain'. I should note, however, that the Deane-Cole estimates have been challenged by some historians, especially Crafts and Harley.

(1) Surely the fact that Great Britain's population grew almost four-fold from 1800 to 1910, while France's population grew by only 50% – the smallest rate of growth of any major European country in this century, reveals something very significant between the British and French experiences of economic growth during this period.

(2) In the pre-industrial era, per capita incomes have almost always grown more rapidly during periods of demographic stagnation or decline: especially during the late-medieval 'Great Depression', when Europe had lost about 40% of its population from diseases (plague) and warfare.[17]

(3) In my strongly held view, any arguments that claim a primacy for per capita growth rates, and ignore the demographic variables, and the relationships between population and economic growth, are seriously misguided.

v) **Finally, both Germany and the U.S. also experienced rapid population growth in this period, and also enjoyed much higher per capita growth rates:** as the graph shows,

(1) the German growth rate was about twice the French (and British) rates;

(2) while the Americans outstripped them by almost three to one.

vi) **But since both France and Britain were both more highly developed economies in 1870 than were Germany or the U.S.,** perhaps those different levels help explain differences in per annum growth rates.

f) **The Industrial Status of France in the early 20th century:**

i) **Thus,** even if the French and British growth rates after 1870 appear to be similar, we cannot pretend that French industrial output and per capita incomes were comparable to those of the British at the beginning of the 20th century:

ii) **see in particular the table from Crafts:**

Table 3. Per Capita Product in Selected European Countries, 1850 - 1910:

Measured in Constant 1970 U.S. Dollars

[17] As Ralph Davis commented many years ago: ' if the most powerful upward regulator of income per head was a calamitous drop in population', as has been argued for the 14th and 15th centuries, nevertheless 'the economy of modern Europe would never have come into existence on the basis of population decline'. Ralph Davis, *The Rise of the Atlantic Economies* ((London: Weidenfeld and Nicholson, 1973), p. 16.

COUNTRY	1850	1870	1890	1910	Percent-age Total Growth 1850-1910
BRITAIN	660	904	1,130	1,302	197%
FRANCE	432	567	668	883	204%
GERMANY	418	579	729	958	229%
BELGIUM	534	738	932	1,110	208%
NETHER-LANDS	481	591	768	952	198%

Source: Nicholas Crafts, 'Gross National Product in Europe, 1870 - 1910: Some New Estimates', *Explorations in Economic History*, 20 (October 1983), 387-401.

(1) **France and Britain experienced roughly the same rates of increase in per capita output from 1850 to 1914:** 205% per capita for France, compared to 197% for Great Britain (i.e., within the accepted margin for stastistical errors)

(2) **But the French per capita output in 1914 was only 68% of the British p.c. output:** i.e., $883 USD (1970 purchasing power) for France, compared to $1,302 USD for Great Britain

(3) **The French per capita income in 1910 was, in fact, the lowest of the five countries in the table:** 92.2% of the German p.c.i.; 92.8% of the Dutch (Netherlands), but only 79.5% of the Belgian.

(4) **What, however, these per capita income statistics, as arithmetic means, do not tell us are income distributions and income disparities, as would be measured by the Gini coefficient:** information that I

do not possess.[18]

iii) **Consider these statistics of Paul Bairoch,** which are still widely cited [from *Journal of European Economic History*, 11 (1982)]:

Table 4. Aggregate and Per Capita Indices of Industrial Production (United Kingdom in 1900 = 100), and percentage shares of world industrial production, for various countries: in 1860 and 1913

Country	Total Industrial Output		Per Capita Industrial Output		Percentage Shares of World Industrial Production	
With 1913 Frontiers	**1860**	**1913**	**1860**	**1913**	**1860**	**1913**
	Index	**Index**	**Index**	**Index**	**% share**	**% share**
United Kingdom*	45	127	64	115	20%	14%
Germany	11	138	15	85	5%	15%
France	18	57	20	59	8%	6%
Russia	16	77	8	20	7%	8%
ALL EUROPE	**120**	**528**	**17**	**45**	**53%**	**57%**
U.S.	16	298	21	126	7%	32%
Canada	1	9	7	46	--	1%

Source: Paul Bairoch, 'International Industrialization Levels from 1760 to 1980', *Journal of European Economic History*, 11 (Fall 1982), 269-333, tables 4 - 13.

[18] *The Gini Coefficient*: The ratio of the area between the 45 degree line depicting complete income equality and a Lorenz curve to the entire area of the triangle below the 45 degree line. The Lorenz curve is a curve showing the cumulative percentage of income plotted against the cumulative percentage of population.

* The United Kingdom of Great Britain and Ireland: the values for its aggregate and per capita industrial outputs for 1900 are taken as the base 100 for all the indices in columns 1 to 4. Note that columns 5 and 6 are percentages of total world industrial output.

(1) His data indicate that, on the eve of World War I, France accounted for only 6% of world industrial output, compared to

- shares of 15% for Germany
- and 14% for the United Kingdom
- 32% for the U.S.,
- and even 8% for Russia.

(2) Furthermore, while Germany's share had risen from 5% in 1860 to 15% in 1913, France's share had fallen from 8% to 6%.

(3) France's share of world industrial output was only 40% of the German or British shares, respectively (which were 15% and 14% of world output).

(4) In sharp contrast, the U.S. share was then 32% -- and Canada's was only 1%!

(5) **In terms of per capita industrial output, the statistics are just as negative for France**: in 1913

- France's per capita industrial output (on screen) was only 51% of the corresponding British output and
- only 69% of the German per capita industrial output.

v) **Relative Urbanization:** Finally, we should recall, from our discussion of French agriculture, that in 1900,

(1) France was only about 35% - 40% urbanized (vs. 60% in Germany, and 90% in Britain);

(2) and that over 40% of French population was then still engaged in agriculture.

g) **The Patrick O'Brien 'path dependency' thesis on French agriculture:** in the May 1996 issue of the *Economic History Review* (discussed last day).[19]

i) **he stresses (as indeed do I) that the chief barrier to French industrialization was her agricultural sector,** with very small scales, and with adverse land:labour and land:capital ratios.

ii) **Low agricultural productivity (compared to Britain and Germany) plus the social structure of French agriculture:**

(1) hindered demographic growth, urbanization, and the growth of markets,

(2) as well as hindering the growth in production of foodstuffs and raw materials and supply of capital for French industry -- all topics that we have gone through before in some detail.

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[19] Patrick O'Brien, 'Path Dependency, or Why Britain Became an Industrialized and Urbanized Economy Long Before France', *The Economic History Review*, 2nd ser., 49:2 (May 1996), 213-49.

h) **The Validity of Historical National Comparisons of economic performance:**

i) **Perhaps, however -- for another perspective,**

(1) it is unfair and unhistorical to argue that the French economy should have performed in a fashion similar to that of the British and or German,

(2) when all three economies and societies were so very different -- so that we could not expect industrial similarities.

(3) Such is the nature of human history.

ii) **Furthermore, is it proper to make national comparisons**: is the nation state or national economy a viable unit for economic comparisons?

(1) **first, we must consider that, in all three countries,** there were great regional disparities within countries, and regional similarities, similarities of industrialized areas, between the countries.

(2) **Many historians have objected, furthermore, that national comparisons are invidious ones to make,**

- since they tend to promote ethnic or racial prejudices.
- they argue that we should instead focus upon regional economies and regional comparisons, ignoring national boundaries (since many distinct economic regions -- e.g. coal belts -- do cross national frontiers.

(3) **On the other hand, there is some justification for analysing the national unit**:

- particularly since and as the role of the state and government economic policies (fiscal, monetary, trade) became more and more important.
- There are also national factors involved, in terms of language, education, culture and cultural patterns, etc. that play a role.

iii) **Much of the discussion for the second term, on European economic development from 1815 to 1914, is focussed in national terms:**

(1) i., for France, Germany, Russia, and then again Great Britain after 1870

(2) though regional differences will be noted where relevant and important.

(3) And despite all the foregoing, we inevitably will be making national comparisons with the British and German economies, not always in favour of the French economy.

(4) But do beware of the inherent biases.

j) **Questions to be asked about French industrialization**:

i) **If industrial growth rates in France were less than the British or the German,** though in rather different periods of the 19th century, what are some of the more specific industrial reasons for this?

ii) **What, more specifically, were the chief 'successes' and the chief 'failures'?** -- if we may use such

terms -- in 19th-century French industrialization? Most countries and most regions historically have had, after all, both successes and failures.

iii) **Which French regions fared the best?** Because France is a country with very distinctly different regional economic zones.

Table 1. **Aggregate and Per Capita Indices of Industrial Production (United Kingdom in 1900 = 100), and percentage shares of world industrial production, for various countries: in 1860 and 1913**

Country	Total Industrial Output		Per Capita Industrial Output		Percentage Shares of World Industrial Production	
With 1913 Frontiers	1860 Index	1913 Index	1860 Index	1913 Index	1860 % share	1913 % share
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United States	16	298	21	126	7%	32%
Canada	1	9	7	46	--	1%

Source: Paul Bairoch, 'International Industrialization Levels from 1760 to 1980', *Journal of European Economic History*, 11 (Fall 1982), 269-333, tables 4 - 13.

* The United Kingdom of Great Britain and Ireland: the values for its aggregate and per capita industrial outputs for 1900 are taken as the base 100 for all the indices in columns 1 to 4. Note that columns 5 and 6 are percentages of total world industrial output.

Table 2. **Indices of Industrial Output*:**

in the United Kingdom, France, Germany, and the United States in quinquennial means, 1860-4 to 1910-13

Mean of 1870-4 = 100

Period	United Kingdom	France	Germany	United States
1865-69	82.8	95.8	72.6	75.5
1870-74	100.0	100.0	100.0	100.0
1875-79	105.5	109.5	120.8	111.4
1880-84	123.4	126.6	160.6	170.4
1885-89	129.5	130.3	194.9	214.9
1890-94	144.2	151.5	240.6	266.4
1895-99	167.4	167.8	306.4	314.2
1900-04	181.1	176.1	354.3	445.7
1905-09	201.1	206.2	437.4	570.0
1910-13	219.5	250.2	539.5	674.9
* Excluding construction, but including building materials.				

Source: W. Arthur Lewis, *Growth and Fluctuations, 1870 - 1913* (London, 1978), pp. 248-50, 269, 271, 273.

Table 3. Per Capita Product in Selected European Countries, 1850 - 1910:

Measured in Constant U.S. Dollars of 1970 Purchasing Power

COUNTRY	1850	1870	1890	1910	Percent-age Total Growth 1850-1910
BRITAIN	660	904	1,130	1,302	197%
FRANCE	432	567	668	883	204%
GERMANY	418	579	729	958	229%
BELGIUM	534	738	932	1,110	208%
NETHER-LANDS	481	591	768	952	198%

Source:

Nicholas Crafts, 'Gross National Product in Europe, 1870 - 1910: Some New Estimates', *Explorations in Economic History*, 20 (October 1983), 387-401.

Table 4: Per Capita European Growth Rates, 1820 - 1913 (per annum)

France	1.1%
Great Britain	1.0%
Germany	1.3%
mean of 12 West European countries	1.2%

Source:

Angus Maddison, *The World Economy: a Millennial Perspective* (Paris, 2001), table 2:22b, p. 96. Cited in Crouzet (2003), p. 222, n. 42, commenting that 'these rates are based on "hybrid estimates" of DGP at PPP [Gross Domestic Product calculated by purchasing power parity], using the work of Toutain and Lévy-Leboyer for France, and that of Deane and Cole and of Feinstein for Britain'. I should note, however, that the Deane-Cole estimates have been challenged by some historians, especially Crafts and Harley.

Table 5. Output of Coal in Millions of Metric Tonnes:

For selected European countries, decennial means: 1820-29 - 1900-09 (and 19110-13)

Decade	Great Britain	Belgium	France	Germany	Russia
1820-9	20.00	n.a.	1.30	1.40	n.a.
1830-9	25.45	2.75	2.45	2.45	n.a.
1840-9	40.40	4.60	3.95	5.25	n.a
1850-9	59.00	7.70	6.45	11.95	n.a
1860-9	95.50	11.35	11.35	25.90	0.45
1870-9	129.45	14.70	16.20	45.65[a]	1.60
1880-9	163.40	17.95	20.85	71.90[b]	4.35
1890-9	194.15	20.70	28.45	107.05[c]	9.05
1900-9	245.30	24.05	34.70	179.25[d]	20.50
1910-3	275.40	24.80	39.90	247.50	30.20

Germany: proportion of total coal output accounted for by lignite:

a. in 1871 22.4%
b. in 1880 20.5%
c. in 1890 21.4%
d. in 1900 27.0%
e. in 1910 31.3%

1 metric tonne = 1000 kilograms = 2,204.6 lb.

Source: Carlo Cipolla, ed., *Fontana Economic History of Europe,* Vol. IV:2, p. 770.

Table 6. Decennial Means of the Output of Pig Iron and Steel in France, Germany, Russia, and the United Kingdom, in millions of metric tons,

1830-9 to 1910-3 (iron) and 1870-9 to 1910-3 (steel)

Average of 1880-9 = 100. 1 metric tonne = 1000 kg. = 2,204.6 lb.

Decade	France	Index	Germany	Index	Russia	Index	United Kingdom	Index
IRON								
1830-9	0.286	16	0.129	4	0.172	31	0.921	11
1840-9	0.442	25	0.172	5	0.192	35	1.625	20
1850-9	0.731	25	0.334	5	0.243	44	3.150	39
1860-9	1.164	66	0.813	25	0.304	56	4.602	57
1870-9	1.337	75	1.678	52	0.400	73	6.648	81
1880-9	1.772	100	3.217	100	0.547	100	8.040	100
1890-9	2.192	124	5.155	160	1.539	281	8.090	101
1900-9	3.028	171	9.296	289	2.786	509	9.317	116
1910-13	4.664	263	14.836	461	3.870	707	9.792	122
STEEL								
1870-9*	0.260	52			0.080*	33	0.695	30
1880-9	0.500	100	1.320	100	0.240	100	2.340	100
1890-9	1.015	203	3.985	302	0.930	388	3.760	161
1900-9	2.175	435	9.505	720	2.490	1038	5.565	238
1910-13	4.090	818	16.24	1230	4.200	1750	6.930	296

*1875-9 only.

Table 7. The Populations of Selected European Countries in millions, in decennial intervals, 1800-1910

Year	Great Britain	Belgium	France	Germany	Russia
1800	10.7	3.1	27.3	n.a.	35.5
1810	12.0	n.a.	n.a.	n.a.	n.a.
1820	14.1	n.a.	30.5	25.0	48.6
1830	16.3	4.1	32.6	28.2	56.1
1840	18.5	4.1	34.2	31.4	62.4
1850	20.8	4.3	35.8	34.0	68.5
1860	23.2	4.5	37.4	36.2	74.1
1870	26.0	4.8	36.1[a]	40.8[b]	84.5
1880	29.7	5.3	37.7	45.2	97.7
1890	33.0	6.1	38.3	49.4	117.8
1900	37.0	6.6	39.0	56.4	132.9
1910	40.9	7.4	39.6	64.9	160.7

[a] Excluding Alsace-Lorraine.

[b] Including Alsace-Lorraine.

Sources: B.R. Mitchell and P. Deane, *Abstract of British Historical Statistics* (Cambridge, 1962), pp. 8-10.

Carlo Cipolla, ed., *Fontana Economic History of Europe*, Vol. IV:2, pp. 747-48.

Table 8. **Demographic and National Income Data for France and Britain, 1800 - 1910**

Category	1830	1840	1850	1870	1890	1910
Income Level in 1970 $US						
France	$343		$432	$567	$668	$883
Britain		$567		$904	$1,130	$1,302
Birth Rate*						
France	29.9		26.8	25.9	21.8	19.6
Britain		35.9		35.2	30.2	25.1
Death Rate*						
France	25.0		21.4	28.4	22.8	17.8
Britain		22.2		22.9	19.5	13.5
Labour Force in Agriculture+						
France	n.a.		51.8	49.3	45.9	41.0
Britain		25.0		20.0	16.3	15.1
Agri Income as % GNP+						
France	38.5		33.0	33.5	28.0	28.7
Britain		24.9		18.8	13.4	10.3
Manuf Income as % of GNP						
France	35.9		39.3	36.0	36.8	38.6
Britain		31.5		33.5	33.6	31.8
Gr Dom Inv as % GNP						
France	n.a.		12.4	12.5	14.0	13.6
Britain		10.5		8.5	7.3	7.0

* Birth and Death Rates: crude rates measured per thousand
+ Agriculture includes extractive industries as well
n.a. = data are not available

Source: Nicholas Crafts, 'Economic Growth in France and Britain, 1830 - 1910: A Review of the Evidence', *The Journal of Economic History*, 44 (March 1984), Tables 2-3, pp. 53-54.

Table 9. Establishment Size Measures within Manufacturing Industries in France, Germany, the United States, and Great Britain, 1905-1913

Industrial Firm	FRANCE	GERMANY	US	BRITAIN
A. Average number of workers per establishment				
Textiles	8	3	73	78
Paper & Printing	20	11	15	20
Lumber	4	4	25	15
Leather	5	4	58	31
Iron & Steel	712	265	535	247
Food	4	3	8	13
Ceramics	18	21	29	42
Chemicals	24	16	25	42
B. Average number of workers in establishments employing more than 50 workers				
Textiles	198	161	199	
Paper & Printing	163	132	162	
Lumber	110	105	108	
Leather	136	132	178	
Iron & Steel	825	433	576	
Food	144	135	123	
Ceramics	190	144	112	
Chemicals	183	209	138	

Industrial Firm	FRANCE	GERMANY	US	BRITAIN
C. Percentage of workers employed in industrial establishments with more than 50 workers				
Textiles	46	38	93	
Paper & Printing	57	51	67	
Lumber	13	22	81	
Leather	27	25	90	
Iron & Steel	100	98	99	
Food	8	13	67	
Ceramics	63	55	85	
Chemicals	64	70	85	

Source:

Janice Rye Kinghorn and John Vincent Nye, 'The Scale of Production in Western Economic Development: A Comparison of Official Industry Statistics in the United States, Britain, France, and Germany, 1905-1913', *Journal of Economic History*, 56:1 (March 1996), 90-112.