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ECONOMICS 303Y

The Economic History of Modern Europe to 1914

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Lecture Topic No. 15:

**III. GREAT BRITAIN AS THE UNCHALLENGED INDUSTRIAL POWER,
1815 - 1873**

**D. Agriculture in Great Britain: Innovation, Expansion, and Contraction,
1815 - 1914:**

D. Agriculture in Great Britain: Innovation, Expansion, and Contraction, 1815 - 1914:

1. Main Trends in 19th-Century British Agriculture:

a) **This lecture, commencing the second semester, logically follows from the end of the last semester:**

i) **i.e., following from the previous two lectures that ended the first semester:**

(1) on the transportation revolution: in steam powered railroad and steam shipping, and

(2) on Free Trade: which, in Britain, hinged on the entire question of agricultural protection.

ii) **thus today's lecture will demonstrate the ultimate, far reaching, and dramatic consequences of both Free Trade and that transportation revolution:**

(1) **of the Transportation Revolution:** especially in the combined role of railroads and steam shipping in opening up and developing vast new grain lands for international commerce; and thus

(2) **of Free Trade:** beginning with the Repeal of the Corn Laws in 1846.

- thus in ultimately permitting a flood of cheap foreign grain imports from the 1860s.

- and those grain imports became all the cheaper as transport costs fell so sharply

iii) **the consequence of these two factors combined – the transportation revolution and Free Trade (itself a veritable revolution):** was to bring about a drastic shrinkage of Britain's agricultural sector, so that only about 7% of the population was engaged in agricultural in 1914, when this course ends.

iv) **The adoption of the Gold Standard was also a vital component of British Free Trade** (as seen in the last lecture, on foreign trade in December).

(1) there could have been no genuine Free Trade without the Gold Standard: to prevent currency manipulations

(2) fixed exchange rates:

- in that the value of each currency was defined as a fixed weight (grams) of pure gold

- as the necessary component of the Gold Standard thus prevented protectionism in the form of exchange rate depreciation or 'devaluations'

(3) devaluations were frequently used as artificial devices to promote exports and curb imports

(4) consider this situation in light of the current problems of world trade, and the role of the euro zone.

v) **We shall see proof of my arguments about the benefits of Free Trade:** when we go to continental Europe to examine the changes in the post-1860 economies of France, Germany, and Russia:

(1) For all these countries maintained or restored agricultural protection,

(2) in order to prevent a contraction of their agricultural sectors, with a flood of cheap imports.

(3) so that, indeed, their agricultural sectors contracted far less than did the British agricultural sector

(4) consequently their citizens experienced much higher cost food and other agricultural products, and living costs in general"

- because of less productive (more costly) agriculture, their living standards (real incomes) remained

lower than the British, up to World War I

- again, the chief factor in the rise of real incomes in Great Britain after the 1850s was relatively cheaper foodstuffs

vi) **Britain's economic transformation by the Law of Comparative Advantage:**

(1) **The key message to be understood is this:**

- that the combination of the international Transportation Revolutions and Free Trade – more accurately, Free Trade plus the Gold Standard– together forced the British economy to obey the law of comparative advantage:
- to contract its agricultural sector (in which it had no such advantage, except in some specialized crops and some aspects of livestock production), and thus:
- to divert capital, labour, and resources to industry, finance, commerce, and shipping, where the British did enjoy such advantages in exports,

(2) That allowed Great Britain (with Ireland) to acquire its food – and especially grains – far more cheaply through imports that were financed by exporting those goods and services.

vii) **No other country in the world had its economy more dramatically altered**

(1) by this combination of the transportation revolution + Free Trade + Gold Standard,

(2) and, consequently, by an agricultural contraction that shifted resources to be used more productively in other sectors of the economy.

viii) **Welfare effects:** can at least be deduced from the fact that Britain consistently enjoyed the highest real incomes in Europe from the 1870s to World War I, as I will demonstrate with abundant statistics in the final lectures of this course.

b) **Historical survey of the major changes in British agriculture during the 19th century:**

from the Napoleonic Wars in to the outbreak of World War I in 1914,:

i) **1793 - 1815: period of the French Revolutionary and Napoleonic Wars:**

(1) very high, inflated grain prices:

- as population pressure mounted forcing England to import more and more grain,
- and as foreign grain supplies were often cut off in time of war.

(2) But grain price increases were partly inflationary, during the era of the 'paper pound' (1797-1821, though grain prices began to fall from 1815.)

ii) **1815 - 1846: Post Napoleonic Wars: the Era of the Corn Laws**

(1) Marked the completion of the so-called Agricultural Revolution:

- with enclosures, convertible husbandry, multiple course crop rotations, etc.
- but not yet with any significant mechanisation.

(2) grain farmers experienced a mild recession, with falling prices.

(3) As a result of that recession, British farmers clamoured for protection:

- in the form of the Corn Laws [to be analysed separately], which dominated this era,
- until their repeal and the adoption of Free Trade in 1846.

iii) **1846 - 1873: Free Trade and High Farming**

- with an unexpected expansion and general prosperity for most farmers:
- a veritable Golden Age of British Farming, despite fears about Free Trade.

iv) **1873 - 1914: Agricultural Depression:**

(1) To repeat with justified emphasis, this finally was the era, but only from the 1870s, when both Free Trade and the Transportation Revolution brought home bitter fruits for British grain farmers especially, with severely falling prices.

(2) Agriculture experienced a much more pronounced shift to livestock raising;

(3) nevertheless there was still an overall contraction in the agricultural sector: with a fall in its share of the GDP from about 25% in the 1860s to 7% by the eve of World War I.

c) **Major Features of Agrarian change in summary:**

i) **first, over the long-run**, the predominant feature was a shift away from grain or arable agriculture into livestock raising, essentially reflecting a shift of relative prices in favour of livestock products;

ii) **second, the role of agriculture in the Free Trade Movement**, and the ultimate impact of both Free Trade and the Transportation Revolutions on agriculture, especially the grain sector.

iii) **third, from the 1870s, as these two forces hit Britain,**

(1) a very radical reduction in the grain-growing sector and then -

(2) an overall contraction in the agricultural sector, by 1914

2. Farming in the Era of the Corn Laws, 1815 - 1846

a) **Behaviour of Prices during the Corn Law era:** showing some shift in relative prices that further favoured livestock production.

i) **the behaviour of grain prices, with the end of the Napoleonic Wars in 1815 (as we saw in the Free Trade lecture**, in December):

(1) grain prices plunged almost immediately, right after the wars, with the resumption of normal trade

(2) and then, grain prices fluctuated around a much lower level until the 1830s.

(3) though admittedly at a generally higher level than those for pre-war grain prices.

ii) **livestock prices, however, did not fall as much**, remained stable, or even rose in some periods.

iii) **This shift in relative prices favouring livestock products is a fairly constant trend throughout the**

19th century, from the Napoleonic Wars to World War I, from 1815 to 1914.

iv) **Differences in elasticities of demand and supply explain that shift**: but especially in demand (price elasticity and income elasticity):

- (1) cheaper grain, with inelastic demand, liberated more income to be spent on livestock products (and indeed other non-grain products);
- (2) livestock products are more elastic in supply to the agricultural sector than are grain crops;
- (3) For it is easier to adjust livestock products for the market, especially with convertible husbandry.

b) **Reasons for the Price Slump in Grains after 1815**:

i) **in part just monetary factors**:

- (1) with the end of inflationary wartime deficit financing, the end of the paper pound and the return to a gold-backed pound (from 1821), monetary contraction and deflation quickly set in.
- (2) But since grain prices fell more than did the price level, and certainly more than industrial prices, we also have to look at various real factors also.

ii) **real factors**:

- (1) **restoration of grain imports with return to peace**: very important since Britain had become a net food importer from the 1770s (and remained so to this very day).
- (2) **Expansion and completion of Enclosures**: and the related spread of modern farming techniques, sufficient to raise the general level of agricultural productivity [to be demonstrated later in the lecture].
- (3) **Then, from the 1830s, the development of the railroad**: which had a very significant impact in cutting costs and lowering agrarian prices.

c) **Other Cost-Cutting Innovations after 1815**:

i) **widespread use of guano fertilizers**: from Peru (reflecting British trade expansion with South America in the 1820s): bat dung.

ii) **introduction of steam-powered agricultural machinery**:

- (1) the Scottish mechanical thresher:
- (2) and steam-powered ploughs, using portable steam-engines
- (3) but chiefly only from the 1840s

iii) **improved scientific livestock breeding**: to increase the size and weight of cattle to increase the amount of meat so produced.

d) **Patterns of Agrarian Change**:

i) **as noted and stressed, a gradual shift away from grain farming into livestock farming**

- (1) often as part of convertible husbandry or Norfolk four-course rotations, with stall-fed livestock
- (2) in response to that shift in relative prices, which, as noted, favoured livestock farming.

(3) see the graph: which shows that livestock product prices were rising in relation to grain prices, from the 1820s, and more markedly so from the 1840s

ii) **Cause and effect were also interrelated in agrarian changes:**

(1) because the spread of improved farming techniques that reduced costs and thus prices were also undertaken in response to falling grain prices:

(2) i.e., the necessity to cut costs just in order to survive

(3) and/or to shift out of grain into convertible husbandry,

(4) or completely into livestock farming.

e) **Barriers to Further Agricultural Changes, 1815 - 1846:**

i) **Continued population growth accompanied by low and falling agricultural wages:** thus curbed the incentive to mechanize agriculture (i.e. to substitute costly capital for cheap labour).

ii) **Lack of capital, or access to sufficient capital, for many farmers:**

(1) the new husbandry, with more livestock, required 40% more capital than the traditional three-field system.

(2) and that was true, even without the application of agricultural machinery.

iii) **Geography and Adverse soils:**

(1) especially the critical problem of water drainage in the eastern Midlands.

(2) heavy, wet clay soils were quite unsuitable for the new husbandry and multiple course rotations; (3) such soils thus restricted local agriculture to the traditional grain-oriented three-field system.

iv) **Agricultural protection under the Corn Laws:**

(1) Protective tariffs had sheltered many grain farmers from the necessity of making adjustments. (2) This brings us to the next and important topic of the Corn Laws

f) **The Corn Laws:** the bulwark of agricultural protection.

i) **Please note once again that the word 'corn' in England (and in Europe) means grain in general,** or the chief grain of the region, which in England was wheat.

ii) **The English Corn Laws, which went back to the later 17th century,** were the bulwark of agricultural protection: they provided

(1) a combination of import tariffs, import prohibitions, and

(2) export bounties (government subsidies to export)

(3) all of which were designed to protect and foster grain English grain growing.

iii) **After the Napoleonic Wars, with the immediate post-war slump in grain prices,** this protection was sharply increased.

iv) **Much land that had been brought under the plough during wartime high prices was now uneconomic for grain farming,**

v) **so that British farmers demanded complete protection**, i.e., against imported foreign grains.

vi) **The Corn Law of 1815**: was thus enacted in response to the sharp fall in post-war grain prices.

(1) This law prohibited wheat imports unless prices rose above the war time average of 80 shillings (s.) = £4 sterling, a 'quarter' (a grain measure = 8 bushels or 64 gallons).

(2) But this 1815 Corn Law proved almost impossible to enforce.

(3) Thus forcing a major amendment in the Corn Laws, in:

vii) **The Corn Law of 1828**:

(1) it substituted a sliding scale of import duties, in place of import prohibitions: i.e., the lower the market price for grain, the higher would be the duties imposed

(2) with no duties imposed when prices rose higher than 73s. a quarter.

(3) The object was to make it expensive to import grain during normal times, but to permit grain imports during times of high or famine prices.

viii) **1839: formation of the Anti-Corn Law League in Manchester**:

(1) in the midst of a severe industrial depression, from 1836 to 1842

(2) which I have mentioned several times now: an era bad harvests, high prices, and high unemployment.

ix) **Harvest and Famine Crises of 1846**: Drastic harvest failures in northern Europe, with famine grain prices and a severe economic crisis (which we saw with the Bank of England).

x) **The result**:

(1) was the Repeal of the Corn Laws, as we saw in more detail in the previous topic on Free Trade (in December), by, ironically, the Tory (Conservative) government of Robert Peel.

(2) Remember from the last lecture that the Conservatives had long championed the Corn Laws, to secure support from the mass of rural voters, from land owners to tenants

(3) That Repeal of the Corn Laws thus meant the complete removal of agricultural protection.

3. The Golden Age of British Farming: 'High Farming', 1846 - 1873

a) **The Consequences of Repealing the Corn Laws in 1846**:

i) **contrary to what so many farmers had feared or expected, the results were by no means disastrous**:

(1) true, grain imports did increase: in fact, in proportional terms, they more than doubled (Table 11),

- from feeding 8.2% of the population in 1831-40 (1.4 million)

- to feeding 18.4% of the population in 1841-50 (3.6 million)

(2) and grain prices did fell somewhat,

- but only by about 5s. a quarter

- or less, as the table on screen (and in the appendix) shows

(3) Then in the 1850s and 1860s, grain prices (including potato prices) collectively actually rose somewhat (graph).

ii) **Disaster for grain farmers would indeed come later,**

(1) but only twenty or more years later:

(2) in the interim, British grain farmers were still partly protected by high transportation costs

- or what was rightly called the ‘tariff of bad roads’
- i.e., high shipping costs, before the onset of the revolution in steam-powered maritime transport.

iii) **Furthermore, the entire agricultural sector benefited from a general economic boom:**

(1) This was a European-wide economic boom, for the mid century decades.

(2) As we saw in the previous lecture on Free Trade (in December):

- from the late 1840s to the early 1870s, Britain especially, but also most West European countries,
- experienced a tremendous boom in international trade, in exports and imports combined, obviously.

iv) **The Livestock and other non-grain sectors benefited especially:**

(1) thus while wheat and some other grain prices did fall gently,

(2) prices for livestock, dairy products, fruits and vegetables, industrial crops, etc., generally rose fairly sharply over this period (in both nominal and real terms), as the graph shows.

b) **Factors Promoting Agricultural Prosperity:**

i) **Considerable growth in urbanization:**

(1) with industrialization and the railroad.

(2) Thus larger, more concentrated markets for foodstuffs.

(3) Remember the obvious point: urban dwellers do not produce their own food, which they must purchase from sources outside the city: either rural hinterlands or imports

ii) **Effect of the railroad, as noted before,**

(1) in bringing all agrarian areas within the market economy, and

(2) especially in improving markets for livestock and dairy products and

(3) in creating new urban markets for perishable fruits and vegetables.

iii) **Rising Living Standards: Engels Law, Inferior Goods, and Giffen Goods**

(1) both pessimists (Marxists) and optimists (Conservatives) seem to be in agreement that, from the later 1840s, the real wages and living standards of the working classes (of almost everybody) were now, finally, rising and rising strongly.

(2) **Engels Law:** The significance of rising real incomes for agriculture can be seen in Engels Law, concerning the income elasticity of demand: i.e.,

- with rising real incomes, proportionately less of an average family’s real income is spent on bread

or cheap carbohydrates (inferior goods) and thus

- proportionately more of that average family's disposable income is spent on meat, dairy products, fruits and vegetables, etc.

(3) The Economic Significance of Inferior goods:

- goods for which demand falls when their prices fall or when real incomes rise;
- and vice versa: demand rises when their prices rise, or real incomes fall

(4) The Economic Significance of Giffen Goods

- A Giffen Good is a special case of an Inferior Good
- This term is named after Sir Robert Giffen 'to whom Alfred Marshall attributed the observation that, among the labouring classes, when the price of bread (the main item of their diet) rose, their consumption rose; and when its price fell, their consumption also fell'.¹
- and a rise in his real income will conversely lead to a relative decline in the consumption of the inferior good (bread).
- In the case of a Giffen good, a rise in its price will cause a rise in its (relative) consumption; and a fall in its price will similarly cause a relative fall in its consumption.
- Thus apparently contradicting the basic 'law of demand': namely, that demand, i.e., the quantity demanded, varies inversely with the price.
- For this to be true (that demand varies directly with the price), the income effect must outweigh the substitution effect.
- i.e., expenditures on bread represent a large proportion of a labourer's real income,
 - so that a rise in its price has an important effect in reducing his real income, *ceteris paribus*, forcing a reduction in his expenditures on other more expensive foodstuffs,
 - thus also forcing him to consume more bread in their place, so long as there are no other cheaper foodstuffs (with the same nutritional value) that can be substituted for the bread.²

(4) The overall significance of the combined fall in the real price of bread grains and in rising real incomes (especially for the working classes): Thus a significant force in providing growing prosperity for

¹ Graham Bannock, R.E.Baxter, R. Rees, *The Penguin Dictionary of Economics*, 3rd edn (London, 1984), pp. 190-91.

² *Ibid.*, p. 191: 'The overall change in the quantity of the good demanded following a change in its price is the resultant of these two effects: the income effect and the substitution effect. If the income effect works so as to change the demand in the same direction as the price change (i.e., the good is an inferior good), while the substitution effect works so as to change demand in the opposite direction to the price change (always the case), and if the former effect outweighs the latter, the net effect is that the quantity demanded changes in the same direction as price. It was this special case which was observed by Giffen.'

these non-grain sectors of agriculture.

4. Technological Change in the Age of High Farming, 1846 - 1873

a) **British agriculture underwent significant technological changes from the 1840s**

i) **The two most important features were:**

(1) mechanization: with steam powered-machinery

(2) the resort to chemical fertilizers

ii) **These two aspects were interrelated:** especially in terms of the impact of mechanization upon the supplies of livestock for draught animals and on the fodder crops to feed them

b) **Greater Mechanization of Agriculture during 'Age of High Farming': steam-powered machinery**

i) **key incentive to mechanize lay in the increasing scarcity of agricultural labourers:** and the 1840s marks the first time that the absolute numbers of agricultural workers actually fell.

(1) From the 1840s to the 1870s, their numbers fell by 22%.

(2) Evidence indicates that this fall, the drift of labour away from the land, *preceded* any significant mechanization;

(3) and so mechanization should not be seen as the cause of the fall in labour supply, of labour displacement.

ii) **Factors producing an outflow of labour from agriculture:**

(1) **railroad construction from the 1830s:** drew heavily on rural labour.

(2) **labour mobility that railroads provided:** moving people to the towns.

(3) **increased steam-powered urban industrialization,** certainly with a decisive shift of textile manufacturing from rural to urban areas,

(4) **especially when most industries** were offering much higher wages than agriculture.

iii) **Examples of Steam-Mechanization in British Agriculture:**

(1) increased use of the aforementioned steam-powered ploughs

(2) steam powered Scottish threshers (which first came into use during the 1820s).

(3) from the 1850s, the American mechanical reaper: the McCormack Reaper.

(4) Also: mechanical, steam-powered harvesters, binders, separators.

c) **The Drainage of the Midland Clay Soils:** from the 1840s

i) **invention of drain-tile making machines in the 1840s:** an aspect of mechanization

(1) i.e., clay pipes for water drainage.

(2) Steam pumps and mass produced drain tiles cut drainage costs by up to 40%.

ii) **Government Assistance, in 1846:** British government offered low cost, subsidized loans for drainage in the East Midlands.

iii) **Such drainage schemes** offered possibility of converting these heavy wet clay soils (alluvial) from three-field rotations to convertible husbandry or to Norfolk Farming (multiple rotations without fallow), with much higher yields.

iv) **Reality, however, did not match such hopes:**

- (1) it has been estimated that by the 1880s only about 20% of the clay soils had been adequately drained;
- (2) and at a very high costs, which largely reflected mis-investment.

d) **Comparisons of Mechanization in European and North American agriculture**

i) **in Europe:** not surprisingly, British agriculture, by 1900, came to be much more mechanized than continental European agriculture, with the exception of some parts of eastern Germany.

ii) **but in North America, especially the US, the contrary was true: By**

(1) **by the later 19th century, early 20th century, American agriculture was, also not surprisingly, much more extensively mechanized than was the British:**

(2) in 1910, American agriculture was about 80% mechanized, while British agriculture was only about 50% mechanized.

iii) **Differing factors:** to explain the relative extent of mechanization in U.S. vs. Great Britain

- (1) Higher wages in U.S. farms: more incentive to mechanize, i.e., to substitute capital for labour
- (2) Capital was more readily accessible to U.S. farmers.
- (3) farming scale was much larger in the U.S. than in Britain:
 - large scale necessary to justify application of machinery
 - though many small British farms rented portable and itinerant steam engines
- (4) Terrain was also much flatter in much of the U.S, especially the major grain-growing areas of the Great Plains: and thus such terrain was much less injurious to machinery.

e) **The Impact of Mechanization on Livestock Husbandry, Food Supplies, and Fertilizers.**

i) **First, Mechanization and the Food Supply:** contributions to productivity and growth

- (1) First, obviously, these machines, in displacing labour, vastly increased labour productivity (and indirectly land productivity).
- (2) thus significantly increasing output at falling marginal costs.

ii) **increased efficiency of capital:**

- (1) in that farm machines were displacing not only labour, but other forms of capital,
- (2) especially capital in the form of draft animals: horses and oxen principally

iii) **The impact on livestock husbandry: draught animals**

- (1) in doing so, agricultural machinery thus machines significantly economized on arable food production:
 - i.e., foodstuffs that otherwise would have been used as fodder crops to feed these animals.

- According to one economic historian, for example, in the US, in the 1920s, even with extensive mechanization, but before complete mechanization, draft animals were still consuming about 25% of total arable outputs.³

iii) **However, the pronounced shift, especially in British agriculture during the late nineteenth-century into livestock-oriented agriculture necessarily entailed:**

- a related shift in arable production to the cultivation of those fodder crops (other than grasses and hay) for feeding non-draft farm animals:
- i.e., cattle and sheep, for meat, milk, butter, cheese, and industrial products.

iv) **but consider also the impact from the displacement of draft animals:** the fertilizer problem

(1) as just noted, that would have meant a some shift or switch in agricultural production from fodder crops, for feeding livestock, to other arable crops, for human consumption (grains, vegetables), or for industrial uses.
 (2) but since so many fodder crops had been nitrogen-fixing legumes, that switch would thus have necessarily diminished the addition of nitrogen to the soils, from growing those fodder crops

v) **the manure problem:** furthermore the reduction in the use of draft animals also meant a reduction in the quantity of animal manure available for fertilizing the soils.

iv) **thus the next and obvious question:** what further technological changes occurred to remedy this potential deficiency in natural nitrogen production, for fertilizing the soil?

f) **Chemical Fertilizers:** provided the solution in what was the key advance of this era.

i) **This was much more of a German than a British innovation:** the application of synthetic or chemical fertilizers as opposed to natural.

ii) **The German chemist Justus von Liebig was the father of modern agricultural chemistry:** (1) In 1840, he published [originally, of course, in German]: *Chemistry and Its Application to Agriculture*;
 (2) and as we shall see later under German agriculture, the Germans quickly took the lead in this field, advancing beyond the British.

iii) **The British, however, if behind the Germans, were certainly much ahead of the French:**

³ See D. Gale Johnson, review for EH.Net (28 November 2001), of: Vaclav Smil, *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production* (Cambridge, MA: MIT Press, 2001). xxii + 338 pp. \$34.95 (hardcover), ISBN: 0-262-19449-x. [D. Gale Johnson, Professor of Economics, Emeritus, University of Chicago. <j015@midway.uchicago.edu>]

In his review, Johnson states that : ‘What Crookes did not foresee, and what Smil does not recognize, was the role the tractor played in contributing to the food supply, especially in the industrial nations, after World War I. It was estimated that draft animals utilized a quarter of all the harvested output of American agriculture in the 1920s (Gray, 1924). In fact, researchers in the United States Department of Agriculture wrote a long article in the early 1920s in which they indicated that the United States would have to reduce its consumption of animal products in order to feed a population of 150 million (Gray, 1924)’.

(1) 1838: foundation of the Royal Agricultural Society.

(2) 1843: establishment of the Rothamstead Experimental Station: important for promoting the use of more productive seeds, better crop rotations, selective livestock breeding, fertilizers, disease control.

(3) J. B. Lawes: British scientist who discovered a very important, powerful fertilizer called superphosphates: by applying sulphuric acid (H_2SO_4) to animal bones.

g) **Overall results of productivity changes in British agriculture:** it has been estimated that from the 1830s to 1870s crop yields improved by 50%.

h) **The following statistics demonstrate not only the productivity gains in British agriculture,** but provide a useful comparison with the agrarian sectors of the other countries we will be examining:

**Table 1: Indices of European and American Agricultural Productivity
From 1810 to 1910**

**Annual net output per agricultural worker (male)
measured in million of calories**

COUNTRY	1810	1840	1860	1880	1900	1910
Britain	14.0	17.5	20.0	23.5	22.5	23.5
France	7.0	11.5	14.5	14.0	15.5	17.0
Germany		7.5	10.5	14.5	22.0	25.0
Russia		7.0	7.5	7.0	9.0	11.0
U.S.A		21.5	22.5	29.0	31.0	42.0

Source: Paul Bairoch, 'Niveaux de développement économique de 1810 à 1910,' *Annales: Économies, sociétés, civilisations*, 20 (1965), 1096, Table 1.

Table 2: Crop Yields in France, Britain, and Germany, 1906-10

Kilograms of Output per Hectare of Land: Five-Year Means

(1 hectare = 2.47 acres)

Crop	France	Britain	Germany
Wheat	135	221	201
Rye	106	182	170

Crop	France	Britain	Germany
Barley	130	196	196
Oats	126	189	197
Potatoes	86	138	136

Source: J.A. Perkins, 'The Agricultural Revolution in Germany, 1850-1914,' *Journal of European Economic History*, 10 (Spring 1981), p. 115.

Table 3. Output of Principal Grain Crops of Selected European Countries, in millions of quintals, in decennial averages, 1871-90 to 1905-14

Decade	Britain	France	Germany	Russia
1781-90	35.0	85.3		
1800-13	43.0	94.5		268.6
1815-24	49.5	104.0		n.a.
1825-34	n.a.	116.3		n.a.
1835-44	n.a.	131.4		310.1
1845-54	64.0	146.6	122.6	363.3
1855-64	68.0	158.5	153.7	381.2
1865-74	70.0	160.1	204.8	410.1
1875-84	n.a.	161.8	248.4	451.0
1885-94	56.9	160.1	304.6	515.4
1895-1904	52.5	172.1	391.0	479.3
1905-14	51.7	171.9	457.9	543.1

1 quintal = 100 kilograms = 0.10 metric ton = 220.46 lb.

Source: Carlo Cipolla, ed., *Fontana Economic History of Europe*, Vol. IV:2, pp. 752-53.

5. The Agricultural Contraction ('Depression'), 1873 - 1914

a) Statistics on Agricultural Contraction:

i) **Between the 1860s and 1914**, agriculture's share of the GNP in Britain fell from 20% to just 7% (engaging only 5% of the population).

ii) **the contraction in grain farming was particularly severe in this period**, as the two tables on the screen shows.

(1) From 1870s to 1910, wheat prices fell 43%: from 51.3s per quarter to 29.4s/qtr.

(2) Total grain production in Britain fell 26%, from 1870s to 1914: from 70.0 million quintals (100 kg) to 51.7 million.

(3) As a share of total value of agricultural output, grains fell from 26% in 1870s to just 13% in 1910:

Shares of Agricultural Output by Products (by market values)

Commodity	1870 -76	1904 - 10
Wheat	13.6%	5.4%
All Grains	25.5%	13.0%
All Arable Crops	41.4%	28.5%
Animal Products	58.6%	71.5%
Total Agricultural Output	100.0%	100.0%

b) **Chief reason for this agricultural contraction:** was, to repeat (for about the tenth time, now), the combination of the world-wide steam powered transportation revolution and Free Trade

i) **see the graph on the screen (figure 4): for the dramatic drop in trans-Atlantic transport costs in the grain trade:**

(1) the rapid decline had begun in the 1860s (though having risen because of the US Civil War)

(2) and then those costs rose briefly in the late 1860s and early 1870s –

- (3) insurance and transaction costs also figure into these rates: reflecting European wars
- (4) the precipitous fall commences in the early 1870s, and is continuous to the mid 1890s
- (5) part of this decline, however, may be monetary forces of deflation, a problem that we will examine later, towards the end of the second term
- (6) Partly a paradox: because the steep fall in ocean freight rates is usually cited as a major real factor in explaining the overall deflation of 1873 - 1896 (era of the 'Great Depression')
- ii) **The fall in ocean freight rates, in transport costs in the grain trade**, thus finally allowed Free Trade to bear its bitter fruit for British grain farmers, in terms of foreign grain imports
- c) **Foreign Grain Imports into Great Britain:**
- i) **Up to the 1860s, as I also noted earlier, on imports:** see Table 11
- (1) relatively small amounts, though growing amounts, of foreign grain had been entering Britain;
- (2) As noted, with the Repeal of the Corn Laws in 1846, the share of total British consumption based on foreign grain imports rose – more than doubled – from 8.2% in 1831-40 to 18.4% in 1841-50
- ii) **Rising grain imports from the 1860s: with the transport revolution**
- (1) But, then from the 1860s to the pre-war era, 1901-14, the percentage of total grain consumption based on foreign imports rose sharply and rapidly, to account for the bulk of British grain consumption: from 42.8% (10.5 million consumers) to 83.4% (32.9 million consumers)
- (2) Thus, in the pre-war era, in the early 20th century, just over four fifths of the British population were consuming foreign-produced grains.

Table 11 **Shares of the Population of Great Britain Dependent on Imported Foreign Wheat**
in percentages of total population and estimated number of consumers
in decennial means, 1801-10 to 1901-14

Decade	Percentage of Total Population	Estimated Number of Consumers of Foreign Wheat in millions
1801-10	7.0	0.8
1811-20	5.5	0.7
1821-30	4.9	0.7
1831-40	8.2	1.4
1841-50	18.4	3.6

Decade	Percentage of Total Population	Estimated Number of Consumers of Foreign Wheat in millions
1851-60	28.8	6.3
1861-70	42.8	10.5
1871-80	60.0	16.6
1881-90	70.0	21.9
1891-00	76.5	26.7
1901-14	83.4	32.9

Source:

Mette Enrnæs, Karl Gunnar Persson, and Søren Rich, 'Feeding the British: Convergence and Market Efficiency in the Nineteenth-Century Grain Trade', *The Economic History Review*, 2nd ser., 61: No. S1 (August 2008): *Special Issue: Feeding the Masses*, ed. Steve Hindle and Jane Humphries, pp. 140-71.

iii) **sources of foreign grains:** see Table 10, in the Appendix

(1) from the 1870s to the 1890s,

- the predominant source of that grain was the United States, accounting for just under half (43.3% to 47.8%)
- the next most important source was Russia: with about 20% of total imports

(2) from the 1890s to World War I, the US share fell by half (to 23.8%), and the Russian share fell to 14.5%, with the growth of imports from newer sources: Canada, Argentina, India, Australia-New Zealand.

iv) **Thus, as noted, high transportation costs had continued to provide some protection to British grain farmers,** up to the 1860s,

v) **at the same time,** the rapid growth of European population and industrial urbanization had been consuming most of the increased European supplies.

vi) **But finally, as stressed before, the combination of railroads and steam shipping together:** opened up vast new grain-growing lands in Ukraine and S.E. Europe, in Canada and the U.S., in Australia, South America (Argentina), and also India – as the table shows..

vii) **Cheap sea transport allowed a growing flood of that new grain to pour into Britain and Europe,** with the consequent plummeting of grain prices so evident in the table.

viii) **Note also the effects of the operation of the international gold standard:**

(1) when all major currencies were tied to and evaluated into gold, they were therefore freely convertible into each other and into gold,

(2) the gold standard thus meant an automatic transmission of price changes to the British economy without any deviations.

(3) and, as noted, gold-standard countries could not protect themselves against imports by engaging in currency depreciation (i.e., to make imports more expensive).

c) Consequences:

i) **That problem was the most severe in Great Britain because of her Free Trade policies**, which, as we have seen in the previous lecture (in December), were rigidly maintained up until World War I.

ii) **In Britain, the consumption of home-grown wheat:** fell from 61% of the total in 1860s to just 27% (27.1%, to be more exact) in 1900.

iii) **But on the continent, as we shall see later, most countries reacted to the agricultural slump by restoring agricultural tariffs;** and with that protection their grain-farming sectors did not contract as much.

iv) **In Britain, the other non-grain sectors**, especially livestock, also did not contract as much, because

(1) international competition in those areas was not so severe.

(2) relative prices for these products remained much more favourable than prices for grains, etc.

iv) **Thus these forces completed the shift away from grain into livestock and dairy farming:** and what survived of British agriculture was and remained very highly efficient.

v) **Though British grain farmers suffered, Britain as a whole benefited greatly from these changes:** benefited from the law of comparative advantage, the gains of trade, with much cheaper food.

(1) It was far cheaper for Britain to import foodstuffs exchanged for manufactured goods and services than it was for Britain to produce all of her food at home.

(2) But the food produced at home in the now small surviving agricultural sector was very efficiently produced at low cost, in an agriculture now strongly devoted to livestock, dairying, and truck farming (fruits and vegetables).

vi) Population Growth, Economic Growth, and Trade: Grain Imports

(1) note, and remember, that the population of Great Britain (Table 10) more than tripled in the 19th and early 20th centuries:

- from about 12 million, in 1810, just before end of the Napoleonic Wars in 1815
- to about 41 million in 1910, before the outbreak of World War I (in 1914)
- In England and Wales: from 10.563 million in 1811 to 36.136 million in 1911

(2) Thus the importance of these economic developments and Free Trade: for there is absolutely no way that England and Wales (or Great Britain) could possibly have fed itself from its own agrarian resources.

(3) Thus Britain could only have done so, fed that rapidly growing and very large population, through industrialization and foreign trade: by exporting industrial and various shipping and financial services in order to import those necessary foodstuffs, and to do so cheaply.

(4) Cheap food imports were thus the consequence of:

- the aforesaid transportation revolution
- Free Trade, combined with the Gold Standard (to prevent currency value fluctuations)
- rapid growth of the industrial, commercial, and financial sectors

(5) Note from Table 12 that, while Britain's population almost quadrupled from 1800, no other Western European country came close to that demographic increase.

(6) While Russia's demographic growth did match the British, the consequences were entirely different, for reasons that we shall see next term.

Table 1.

UNITED KINGDOM: GRAIN PRICES

**Decennial Means of Wheat Prices in the United Kingdom
and of Bread Prices in London, 1770/79 to 1910/9
Mean of Prices for 1800-09 = 100**

Year	Wheat Prices		Bread Prices	
	Shillings per Quarter*	Index: 1800-9 = 100	pence per loaf of 4 lb	Index: 1800-9 = 100
1770-9	46.85	55.3	6.5	54.2
1780-9	46.12	54.4	6.4	53.3
1790-9	57.62	68.0	7.7	64.2
1800-9	84.71	100.0	12.0	100.0
1810-9	91.40	107.9	13.6	113.3
1820-9	59.81	70.6	9.9	82.5
1830-9	56.73	67.0	9.1	75.8
1840-9	55.92	66.0	8.7	72.5
1850-9	53.32	62.9	8.5	70.8
1860-9	51.70	61.0	8.4	70.0
1870-9	51.33	60.6	7.9	65.8
1880-9	36.99	43.7	6.5	54.2
1890-9	28.74	33.9	5.6	46.7
1900-9	29.43	34.7	5.5	45.8
1910-9	49.74	58.7	7.4	61.7

* Imperial quarter = 8 bushels = 64 gallons

Source: B.R. Mitchell and Phyllis Deane, *Abstract of British Historical Statistics* (Cambridge, 1962), pp. 488-9; 498

Table 2.

BRITISH AGRICULTURAL STATISTICS**Indices of Output, Prices, and Incomes, 1860 - 1910****Mean of 1860 = 100**

Year	Agricultural Output	Agricultural Prices	Agricultural Population	Agri. Real Incomes
1860	100	100	100	100
1870	105	102	89	116
1880	100	91	79	120
1890	106	76	75	130
1900	97	73	69	127
1910	103	83	72	136

Table 3. Percentage Changes in Total Factor Productivity:**Average Annual Rates**

From 1790 to 1815	+0.2% per annum growth
From 1816 to 1846	+0.3% per annum growth
From 1847 to 1870	+0.5% per annum growth

.....

Table 4. Value of Agricultural Output as a Share of the British GNP

1860	20% of GNP
1914	7% of GNP

Table 5. Shares of British Agricultural Output by Products

	1870 - 76	1904 - 10
Wheat	13.6%	5.4%
All Grains	25.5%	13.0%
All Arable Crops	41.4%	28.5%
Animal Products	58.6%	71.5%
Total Agricultural Output	100.0%	100.0%

Table 6. Output of Principal Grain Crops of Selected European Countries, in millions of quintals, in decennial averages, 1871-90 to 1905-14

Decade	Great Britain	France	Germany	Russia
1781-90	35.0	85.3		
1800-13	43.0	94.5		268.6
1815-24	49.5	104.0		n.a.
1825-34	n.a.	116.3		n.a.
1835-44	n.a.	131.4		310.1
1845-54	64.0	146.6	122.6	363.3
1855-64	68.0	158.5	153.7	381.2
1865-74	70.0	160.1	204.8	410.1
1875-84	n.a.	161.8	248.4	451.0
1885-94	56.9	160.1	304.6	515.4
1895-1904	52.5	172.1	391.0	479.3
1905-14	51.7	171.9	457.9	543.1

1 quintal = 100 kilograms = 0.10 metric ton = 220.46 lb.

Source: Carlo Cipolla, ed., *Fontana Economic History of Europe*, Vol. IV:2, pp. 752-53.

Table 7. Crop Yields in France, Great Britain, and Germany, 1906-10
Kilograms of Output per Hectare of Land: Five-Year Means
 (1 hectare = 2.47 acres)

Crop	France	Britain	Germany
Wheat	135	221	201
Rye	106	182	170
Barley	130	196	196
Oats	126	189	197
Potatoes	86	138	136

Source: J.A. Perkins, 'The Agricultural Revolution in Germany, 1850-1914,' *Journal of European Economic History*, 10 (Spring 1981), p. 115.

Table 8. Wheat-tons per Labour-unit in Agriculture in Selected Countries: France, Britain, Germany, and U.S . in 1880 and 1930

Country	1880	1930
France	7.4	13.2
Great Britain	16.2	20.1
Germany	7.9	16.0
United States	13.0	22.5

Table 9.

Indices of European and American Agricultural Productivity

from 1810 to 1910

**Annual net output per agricultural worker (male)
measured in million of calories**

COUNTRY	1810	1840	1860	1880	1900	1910
Britain	14.0	17.5	20.0	23.5	22.5	23.5
France	7.0	11.5	14.5	14.0	15.5	17.0
Germany		7.5	10.5	14.5	22.0	25.0
Russia		7.0	7.5	7.0	9.0	11.0
U.S.A		21.5	22.5	29.0	31.0	42.0

Source: Paul Bairoch, 'Niveaux de développement économique de 1810 à 1910,' *Annales: Économies, sociétés, civilisations*, 20 (1965), 1096, Table 1.

Table 10.

**Wheat Imports into the United Kingdom by Exporting Nations, 1831-40 to 1901-1914
in percentages of total imports**

Decade	Germany	France	Russia	Canada	U.S.	Argentina	India	Australia NZ	Denmark
1831-40	32.0	11.8	13.3	4.5	1.9	n.a.	n.a	n.a.	3.9
1841-50	40.3	9.8	15.1	1.8	4.2	n.a.	0.0	0.4	3.5
1851-60	26.1	8.9	18.4	1.6	15.5	n.a..	0.0	n.a	6.2
1861-70	20.5	3.2	26.9	5.5	27.2	n.a.	0.0	0.4	2.0
1871-80	7.4	1.6	20.4	6.8	47.8	n.a.	3.9	3.3	0.7
1881-90	3.5	n.a.	20.2	3.7	43.3	2.1	16.2	4.8	0.1
1891-00	1.2	n.a.	16.8	5.9	45.8	11.5	9.7	3.2	0.0
1901-14	n.a.	n.a.	14.5	15.1	23.8	17.5	16.4	9.5	0.0

Source:

Mette Enrnæs, Karl Gunnar Persson, and Søren Rich, 'Feeding the British: Convergence and Market Efficiency in the Nineteenth-Century Grain Trade', *The Economic History Review*, 2nd ser., 61: No. S1 (August 2008): *Special Issue: Feeding the Masses*, ed. Steve Hindle and Jane Humphries, pp. 140-71.

Table 11.

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1831-40	8.2	1.4
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1861-70	42.8	10.5
1871-80	60.0	16.6
1881-90	70.0	21.9
1891-00	76.5	26.7
1901-14	83.4	32.9

Source:

Mette Enrnæs, Karl Gunnar Persson, and Søren Rich, 'Feeding the British: Convergence and Market Efficiency in the Nineteenth-Century Grain Trade', *The Economic History Review*, 2nd ser., 61: No. S1 (August 2008): *Special Issue: Feeding the Masses*, ed. Steve Hindle and Jane Humphries, pp. 140-71.

Table 12. 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 (1972), pp. 747-48.