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ECONOMICS 303Y1

The Economic History of Modern Europe to 1914

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Lecture Topic No. 4

II. GREAT BRITAIN AS THE HOMELAND OF THE INDUSTRIAL REVOLUTION, 1750-1815

D. Population Growth and Expansion of the Market: the Demographic and Industrial Revolutions

II. GREAT BRITAIN AS THE HOMELAND OF THE INDUSTRIAL REVOLUTION, 1750-1815

D. Population Growth and the Expansion of the Market in Great Britain from 1760: t h e Demographic and Industrial Revolutions

1. Introduction: to this set of lectures – and for the rest of the course

a) The Basic Organization of lectures for this course: on modern European economic history

i) The basic theme, as enunciated in my first lecture:

(1) **the urban industrialization of modern Europe**, from about 1750 to World War I (1914):

(2) in the context of the modern Industrial Revolutions in four countries:

- in Great Britain, as the homeland of the modern Industrial Revolution;
- and the spread of that Industrial Revolution to and on the continent: France, Germany, Russia

ii) The division of the course in two semesters:

(1) **The first term (but with a spill-over to the second term):** the Industrial Revolution in Great Britain itself (England, Wales, and Scotland)

(2) **In the second term – the spread of industrialization to the European continent, from West to East:** to France, Germany, and Russia, from the end of the Napoleonic Wars

- i.e., from 1815 to 1914: to the eve of World War I (1914-1918)

iii) **Near the end of the course, we return to Great Britain**, the Homeland of the Modern Industrialization, to see how the British economy, having enjoyed supremacy (economic hegemony) for almost a century, fared after 1870, in the face of new foreign competition, especially from Germany (and the U.S.)

b) for each of these four European countries, beginning with Great Britain, we begin with the organization and development of the domestic market:

i) **and for the continental countries that means**, initially, the political and economic unification of the domestic market.

ii) **But England and Wales had, for many centuries, enjoyed political and economic unification** – one of this country's major economic advantages

iii) **and that process, for Great Britain**, was completed with Scotland's agreement (by Parliamentary vote) to join England in the Act of Union in 1707

c) Instead, for Great Britain's and the development of its domestic market, we begin with the role of the Demographic Revolution:

i) **the role of population change in radically expanding the domestic market:**

- doubling the size of the British domestic market from 1760 to 1810 (from about 6 to 12 million)
 - and then tripling it again from 1810 to 1914: from about 12 to 36 million
- ii) **Demographic changes:** provide the single most important topic in this course (for reasons affecting both supply and demand).
- d) **Thereafter, for each country undergoing modern industrialization, we examine specific changes in each of the four major sectors of the economy and their interactions:**
- i) **first in agriculture**, then in commerce, finance, and finally manufacturing industry itself.
- ii) **The role of demography or population changes:** for the continental countries, population change will be considered both as
- (1) a consequence of these economic changes – especially in agriculture – and
- (2) then and also as causal forces for further economic changes.

2. **Population and the British Industrial Revolution:**¹

- a) **A very major and unresolved question in this course, and the subject of an A-list essay topic (the most popular in the course) is this:**
- i) **Was population growth, in the form known as the Demographic Revolution,** a cause or a consequence of the modern British Industrial Revolution from the 1760s? Or both?
- ii) **If most of Europe also experienced population growth from the 1760s,** what were the unique and most prominent features of the British population growth: of its Demographic Revolution?
- b) **Once again we are seeking answers to these vital questions for this course:**
- i) Why was Great Britain the homeland of the modern Industrial Revolution?
- ii) And why did it take place there from the 1760s?
- iii) And did that Industrial Revolution follow from or precede the Demographic Revolution?
- c) **For population growth itself,** we must ask another vital question: was its role principally in terms of demand factors, or supply factors – or equally both?

3. **Demand and Supply in the British Industrial Revolution:**

- a) **Most traditional explanations of the British Industrial Revolution, until recent times, have been**

¹ For the most recent survey of demographic changes and modern industrialization, but including all of Europe, and not just Great Britain, see: George Alter and Gregory Clark, 'The Demographic Transition and Human Capital', in Stephen Broadberry and Kevin O'Rourke, eds., *The Cambridge Economic History of Modern Europe*, 2 vols. (Cambridge and New York: Cambridge University Press, 2010), pp. 43-69.

demand-oriented, and thus market-oriented, especially amongst historians:

i) **most historians have argued that a massive increase in market demand**, both abroad and at home (foreign and domestic trade) was chiefly responsible for ‘causing’ the Industrial Revolution. ii) **For example**, consider this statement in David Landes’s book *The Unbound Prometheus* (p. 77):

To sum up, it was in large measure the pressure of demand on the mode of production that called forth the new techniques in Britain, and the abundant, responsive supply of the factors [of production, including labour] that made possible their rapid exploitation and diffusion. The point will bear stressing, the more so as economists, particularly theorists, are inclined to concentrate almost exclusively on the supply side.

b) **Adam Smith**: as the founder of modern Classical Economics may be called upon as well to offer support for this demand-oriented model.

i) **In his famous and pivotal book**, *The Wealth of Nations* (of the revolutionary year of 1776), provided the following heading for his third chapter:

‘That the division of labour is limited by the extent of the market’

ii) **Or, conversely:**

(1) That specialization – as the key to economic growth – depends on the numbers employed in the enterprise, which number in turn is determined by the extent of demand: the market

(2) that industrial scale, and related processes of economic growth and industrialization of the Industrial Revolution era, were really determined by the capacity of aggregate demand and thus of the market to grow.

(3) and thus by the expansion in effective demand: in both the size or numbers of the market and by its collective purchasing power (i.e., living standards of the mass of society).

c) **But amongst economists such demand-oriented views are no longer so popular:**

i) **certainly not amongst the current generation of economic historians**, such as Deirdre (formerly Donald) McCloskey, Joel Mokyr, and Nick Crafts, and others who began as trained economists and who are much more supply-oriented.

ii) **Let me here and now quote from N.C.R. Crafts**, in his introductory chapter to the first version of *Economic History of Britain Since 1700* (1981, 1st edn., 2 vols., edited by Floud and McCloskey), concerning the role of demand in the Industrial Revolution:

[This] notion raises two important issues. The first is one of controversy between different schools of economists. One school maintains that for the economy as a whole there can be no independent role for demand; that in the long run *supply creates its own demand*, and an

examination of the supply side of the economy is sufficient for an understanding of economic growth at the aggregate level... The rival school (of 'Keynesians') disputes this claim, maintaining that in the short run supply does not automatically create its own demand and that level of output depends on the level of aggregate demand, which may not be that which achieves full employment. Levels of demand that push the economy towards full employment in the short run might elicit greater investment and productivity increase, thereby enhancing the growth rate of the productive potential.... The majority of recent English economic historians of the eighteenth century have (possibly unconsciously) written in this vein. Which view gives the greater insight into the period remains unclear.

iii) **Say's Law:** the French economist

(1) from Jean-Baptiste Say (1767 - 1832): a French economist, and younger contemporary of Adam Smith:

(2) Say's Law can be found in his seminal work: *A Treatise on Political Economy* (1803), in which he advanced his law of markets, which claims that supply creates its own demand.

d) **Whether demand or supply factors predominated is a major debate:**

i) **whether the Industrial Revolution was essentially a demand-induced or supply-induced phenomenon,** is not a question that I shall answer for you;

ii) **but I shall leave you to ponder and answer this problem,** possibly to answer as a final examination question.

e) **even if you were to conclude, however, that supply-oriented factors were the more important,** you would hardly ignore the role of demand factors.

i) **Let us therefore begin our study of economic changes in the industrial revolution era:** with a consideration of demand factors in terms of the market, both domestic and foreign.

ii) **That produces another interesting question: In terms of aggregate demand for industrial goods,** which was the more important for the Industrial Revolution: the domestic market or the foreign market?

iii) **I will argue, in sum, the following about the market and industrialisation:**

(1) that in the initial stages of the Industrial Revolution, the domestic market was the more important – more important than foreign market;

(2) A major reason for that was population growth: the Demographic Revolution, which was not experienced in the same fashion and to the same degree elsewhere in Europe

(3) but, that by the 1820s, the foreign market was beginning to supersede the domestic market in importance.

(4) And indeed subsequently the foreign market would become pre-eminent:

(5) for, in particular, only through foreign trade could the British achieve the following goals

- to feed themselves and obtain necessary raw materials
- to permit a trebling of its population from about 12 to 36 million
- and to do so with rising, and not falling real incomes, as the Malthusian model would predict
- hence again the truly global significance of the modern Industrial Revolutions

iv) **For both domestic and foreign markets**, aggregate size and thus population or demographic changes must be our starting point; and thus the next topic is:

4. **Population Growth and the Industrial Revolution**; in historic perspective, 1500 - 1820

a) **The modern British Industrial Revolution was accompanied by a veritable Demographic Revolution**: which must be seen in proper historical perspective:

i) **In 1750, on the eve of the Industrial Revolution**, England and Wales together had a population of just over 6 million (6.342 million in 1751, to be more exact):

ii) **That population had been growing very slowly from about the 1730s**, after having experienced some decline from about the middle of the 17th century.

iii) **As the graph and tables on the screen indicate**, for England in the early-modern era, i.e., for the 250 years preceding the Industrial Revolution era we find the following:

(1) from about 1500, following the horrible demographic catastrophes of the late-medieval Black Death and subsequent plagues (whether or not they were actually bubonic), England's population rapidly recovered and then more than doubled over the next century and a half:

- from about 2.25 million in the 1520s (when it can first be measured)
- to reach a peak of 5.684 million in 1651

(2) From the 1650s, English population ceased to grow, and in fact declined to about 5.4 million by the early 1690s (to 5.445 million in 1691):

- with higher death rates, especially with a revival of plague and other killer diseases,
- and with a related fall in birth rates, and also some emigration to the North American colonies.

(3) Many historians argue that this demographic crisis in the 17th century was a Malthusian response to English overpopulation during the later 16th and early 17th century:

- that overpopulation led to rising food prices, to rising living costs in general;
- and that growing impoverishment reduced resistance to diseases amongst the lower classes.

(4) but that view is still hotly disputed, and forms part of the debate about the 'General Crisis' of the 17th century (a B-list topic, this year).

(5) From the 1690s, English population growth resumed, though very slowly,

- but with another dip in the 1730s, as an era of very high mortalities, as the graph indicates;
- and these high mortalities in the 1720s and 1730s were a European wide phenomenon, not yet fully understood.

b) The ‘Vital’ or Demographic Revolution: accompanying the Industrial Revolution:

i) **As you can see from the graph and table, England’s population once more began to grow rapidly,** as I said from the 1730s, somewhat more rapidly from the 1750s, and then very rapidly indeed from the 1780s, to achieve a peak in the growth rates during the 1820s.

ii) **in the space of just 70 years, from 1751 to 1821,** England's population had almost doubled from 6.342 to 12.269 million people.

iii) **That was surely a veritable demographic revolution,** unprecedented in either English or European history, and one that accompanied the Industrial Revolution.

iv) **As I said earlier, in the first lecture, the most significant aspect of the Industrial Revolution was to break forever any negative Malthusian-style connection between population growth and economic growth,**

(1) any supposed Malthusian aspects, to permit unprecedented growth rates both in population and in per capita output.

(2) Consider again the significance of the Lindert graph (on the screen).

v) **The English population growth continued throughout the 19th century,** if at a somewhat slower pace, tripling again, to reach 36.136 million by 1911: again, a tripling from 1820.

vi) **That figure is for both England and Wales:**

(1) let me note that Scotland’s population was growing equally rapidly,

(2) though not Ireland’s, which suffered a net decline after the horrifying potato famine of the 1840s.

vii) **At the same time, from about the 1740s, European population in general was also growing,** though the continental demographic growth rates never equalled the English growth rates.

viii) **Compare the following statistics for England, France, and the Netherlands for the period 1681 to 1821:**

English and French Population, 1681 - 1821

Year	England and Wales	England only	France	England as % of France
1681	5.28	4.93	22.4	22%

1821	12.31	11.49	30.2	38%
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Growth Rates of English, French, and Dutch Populations from 1681 to 1821 (% per annum)

Country	% per annum	Overall % growth
England	0.95%	133%
France	0.28%	39%
Netherlands	0.06%	8%

ix) **Finally, from the graph on the screen, comparing birth and death rates in France and England, note the following:**

(1) The French birth rate, which was very high by the 1740s (over 40/1000), then falls from the 1750s (except for the 1780s) and falls very rapidly from about 1800.

(2) The English birth rate, which was much lower than the French in the mid 18th century, was steadily rising from the 1740s to the 1820s (when it peaks at a remarkable 40.8/1000), moderately declining thereafter.

(3) The English birthrate surpassed the French rate in the 1780s, and despite the subsequent decline always thereafter remained considerably higher than the French birth rates (up to World War I).

(4) Turning to the death rates, we find more irregularity, but a general downward trend for both countries from the mid 18th century.

(5) The French death rates:

- while showing a much steeper decline overall than the English,
- nevertheless always remained higher than the English death rates
- though with very small differences by the 1850s.

(6) Note again from Table 2 on the screen that:

- the French population growth rate from 1681 to 1821 was less than a third of the English (29% as much),
- while the Dutch growth rate was only 6% of the English.

(7) Overall, the English or British population growth rates were about double the European from the mid 16th to early 19th centuries (1550 - 1820: 0.55% per annum vs. 0.24%).

5. **The Causes of the Demographic Revolution: Rising Birth Rates or Falling Death Rates?**

a) **Falling Death Rates:**

i) **This had long been the traditional explanation:** i.e., that the death rate was the more significant variable (especially because it fluctuates so much more widely than the birth rate).

ii) **Prof. Karl Helleiner**, my predecessor at this University, had argued in the *Cambridge Economic History of Europe*, Vol. 3 (1966) that the single most important variable in European demographic history was the disappearance of bubonic plague from western Europe from the 1730s.²

iii) **In England, plague had ended forever**, even earlier, with the London Plague of 1665;

iv) **and in western Europe**, it ended with the Sicilian plague (Messina) of 1733.

v) **But in eastern Europe**, in the Russian and Turkish empires, for a strong demographic contrast between east and west, plague (whether or not bubonic, again) did not finally disappear until as late as the 1830s.³

b) **Rising Birth Rates combined with falling death rates:**

i) **Subsequently, Phyllis Deane and W. Cole**, in their path-breaking book *British Economic Growth 1688 - 1959* (2nd edn. 1969), contended that a rising birth rate was now the strategic factor.

ii) **that in the crucial period before the Industrial Revolution**, from ca. 1740 to ca. 1780s, the rise in the birth rate was more important than death rate changes;

iii) **indeed from the 1770s to 1790s:** the British death rate was rising again [see Appendices, Table 2 and the graphs on the screen].

iv) **Thereafter, however, from the 1790s to the 1820s**, Deane and Cole admitted that falling death rates -- i.e., a *resumption* of declining death rates -- had about an equal impact with continually rising birth rates (whose rise, to repeat, peaked in the 1820s).

c) **Nuptiality (Marriage) and Rising Birth Rates:**

i) **Subsequently**, in 1983, E. A. Wrigley provided an even greater emphasis to the crucial role of the birth rate in the context of changing marriage patterns.⁴

² Karl Helleiner, 'The Population of Europe, from the Black Death to the Eve of the Vital Revolution', in E.E. Rich and Charles Wilson, eds., *Cambridge Economic History*, Vol. IV: *The Economy of Expanding Europe in the 16th and 17th Centuries* (Cambridge: University Press, 1967), pp. 58-95. The traditional literature, to this day, however, wrongly states that plague came to an end in Western Europe with the Marseilles outbreak, in 1719-20, ignoring the Sicilian plague of 1733.

³ For the medieval Black Death and subsequent Bubonic Plagues, see my two lectures on demography in ECO 301Y: nos. 2 (first term) and 14 (second term), at this web site for ECO 301Y: <http://www.economics.utoronto.ca/munro5/lecnot301.htm>

⁴ E. A. Wrigley, 'The Growth of Population in Eighteenth-Century England: A Conundrum Resolved', *Past & Present*, no. 98 (1983), 121-50.

ii) **In essence, he offers the following explanation for England's demographic revolution of the 18th century:** 'The great acceleration in population growth during the 'long' eighteenth century [1680-1820] was due principally to earlier and more universal marriage.'⁵

iii) **to repeat with emphasis:**

(1) He contends that the most important factor was not fertility per se but nuptiality:

(2) that is, earlier and more universal marriage for women during the course of the 18th century.

iv) **His views were subsequently expounded at much greater length,** with vastly greater evidence in book that he wrote with Roger Schofield in 1989: *The Population History of England, 1541 - 1871: A Reconstitution*, which has recently been reissued in a revised form:⁶

v) **Wrigley, Schofield, and their Cambridge School of Population Studies,** in dramatically revising English demographic statistics, also argued that the demographic growth had begun earlier than previous studies had suggested: from the end of the 17th century, despite a possible dip, in the 1730s.

vi) **They estimate an average annual rate of population growth:**

(1) of about 0.30% from 1700 to 1740 (vs. almost no growth in prior estimates);

(2) and then, for the period 1740 to 1800, a rate of growth that had more than doubled to 0.72% per annum.⁷

vii) **So there is general agreement:** amongst all current economic historians that British population growth was much greater after 1740.

viii) **Overall, Wrigley attributes about 70% of the population growth to rising birth rates,** and thus the

⁵ A subsequent explanation of this phenomenon may be found in: E. A. Wrigley, 'Explaining the Rise in Marital Fertility in England in the 'Long' Eighteenth Century', *The Economic History Review*, 2nd ser., 51:3 (August 1998), 435-64, in which he contends that the major factor may have been a decline in stillbirths: '*ceteris paribus* a fall in the number of conceptions which end in a stillbirth will cause a comparable rise in the number of live births': i.e., the fall in stillbirths usually reduces the birth-intervals (time between births).. Implicitly, that lends support to those arguing that a fall in mortality was the key. Subsequently, he also emphasized the importance of the fall in maternal mortality. For his most recent views on English demography, see E. Anthony Wrigley, 'British Population during the "Long" Eighteenth Century, 1680 - 1840', in Roderick Floud and Paul Johnson, eds., *Cambridge Economic History of Modern Britain*, 3 vols. (Cambridge and New York: Cambridge University Press, 2004), Vol I: *Industrialization, 1700 - 1860*, pp. 67-95.

⁶ E. A. Wrigley, R.S. Davies, J.E. Oeppen, and R. S. Schofield, *English Population History from Family Reconstitution*, Cambridge Studies in Population, Economy and Society in Past Time no. 32 (Cambridge and New York: Cambridge University Press, 1997).

⁷ See M. L. Lee and R. S. Schofield in Roderick Floud and Donald McCloskey, eds., *The Economic History of Britain since 1700* (Cambridge, 1981); and R. S. Schofield, 'British Population Change, 1700-1871', in Floud and McCloskey, eds., *The Economic History of Britain since 1700*, the 2nd revised edn (Cambridge, 1994).

remaining 30% to falling death rate.

ix) **Schofield (1994), using the same demographic data**, provides a graph to demonstrate:

(1) the relatively greater impact of a rising Gross Reproduction Rate (number of female children born per women in fertility-specific age brackets) and

(2) of a falling death-rate (expressed as Expectation of Life at birth, also a rising curve, but rising less swiftly than the GRR curve).

x) **From the graph and Table 2**, note that the birth rate, according to his calculations (those of the Cambridge School for Population Studies)

- rose from 26.8/1000 in 1660 to the peak of 40.8/1000 in 1820,
- then dropped and stabilized around 36.0/1000 to the 1870s,
- when it began to fall more steeply, to just 21.8/1000 in 1910.
- The death rate overall in England fell from 35.0/1000 to 14.5/1000 in 1910.

xi) **For an explanation of these changes, we turn to what is called the ‘European Marriage Pattern’**, whose basic principles can be found implicitly in Malthus’ *Principles of Population* (1799)

6. The European Marriage Pattern and the English Demographic Revolution ⁸

a) **John Hajnal’s Concept of the ‘European Marriage Pattern’ in early-modern Europe.**

i) **the German-born British sociologist John Hajnal (1924-2008):**⁹ was the first, in 1965, to formulate and advance this concept of the social institution that most clearly distinguishes

(1) early modern western Europe from not only earlier eras in European history,

(2) but also from the rest of the world, until more modern times.¹⁰

ii) **To quote Hajnal directly:**

⁸ This concept, and its importance in European economic history from the later medieval era is discussed and analysed in much greater depth and detail in my two lectures on demography in ECO 301Y (still posted online): lectures 2 and 14. While nobody knows for certain when and where the EMP pattern emerged, I speculate on its origins and those questions in these two lectures: demonstrating fully that it was not present in 15th-century Italy (Florence) but may have been in 15th-century England. For the most recent survey, see Alter and Gregory, ‘The Demographic Transition’, in n. 1: esp. pp. 37-56.

⁹ Born in Darmstadt, Germany, in November 1924, to Hungarian born parents, John Hajnal-Kónyi and his family emigrated first to the Netherlands and then to England in 1936, to escape Nazi persecution (as Jews). In 1956, he received an appointment at the London School of Economics.

¹⁰ John Hajnal, ‘European Marriage Patterns in Perspective’, in D.V. Glass and D.E.C. Eversely, eds., *Population in History: Essays in Historical Demography* (London, 1965), pp. 101-46.

The marriage pattern of most of Europe [except the south-east and Slavic east] as it existed for at least two centuries up to 1940 was, so far as we can tell, unique... There is no known example of a population of non-European civilization which has had a similar pattern.

iii) **Key significance: that this social institution**, along with modern industrialization, allowed western Europe to escape from the true Malthusian trap that has plagued so many developing (or Third World) nations during even the 20th century (and into the 21st century??)

iv) **The European Marriage Pattern** is also crucial for:

(1) the Wrigley-Schofield thesis: on how the English demographic revolution actually took place in the 18th century, with such a rapid rise in the birth rate (nuptiality and fertility):

(2) indeed, as I shall try to show, that demographic revolution simply could not have occurred without the European Marriage Pattern.

v) **Hajnal thus contends that, from about the 16th or 17th century**,

(1) Western European society (from a line drawn roughly from St. Petersburg, Russia, down to Trieste, Italy) and its demographic history have differed radically from all other societies, past and present -- or up to the 1940s,

(2) by a unique marriage pattern, with four fundamental characteristics that had allowed European society to control its population numbers: now known as the European Marriage Pattern.

b) **These four variables are as follows:** with a fifth then to be considered as well

i) **late nuptiality: a relatively late average age of first marriage for women** (as well as for men): in the mid to late 20s, as opposed to the late teens.

ii) **high degree of celibacy:** non-marriage

(1) a significant proportion of women who never marry at all (obviously related to late marriages),

(2) as opposed to almost universal marriage for women (by their late teens or very early 20s) in all other societies.

iii) **Single-family or nuclear households:**

(1) i.e., mother + father + their own children --

(2) as opposed to extended families of three generations plus uncles, aunts, cousins; or joint-households with two or more married couples.

(3) See below for the Universal Marriage Pattern in which a fundamental feature was the Extended Family system

iv) **The effect of real incomes and acquired wealth:**

(1) in determining or influencing these three prior variables:

(2) i.e., that a couple do not marry and set up a nuclear household until either or both partners acquire

inherited property, or other wealth,

(3) and have sufficient income to maintain that household.

c) **The Role of Servants in the European Marriage pattern:** a fifth factor of great importance.

i) **In a subsequent paper, of 1983,** Hajnal stressed the importance of yet another factor to be found in early-modern west European households, from a recently published book by Anne Kussmaul:¹¹

(1) unmarried servants, especially agricultural servants-in-husbandry, hired on annual contracts,

(2) working with the family and living with the family, receiving room and board,

(3) on the obvious condition that they not marry and not produce any children

(4) Crucial importance: such hired ‘servants in husbandry’ supplied the necessary labour that would have been found and furnished in an Extended Family system.

(5) Especially when you consider, how in the pre-modern, pre-industrial age, the household was such a basic and fundamental unit of production in the economy – the so-called ‘domestic economy’

ii) **typically these servants were young women from lower-middle class strata,** perhaps more so than males;

iii) **they would work in such households (and in urban as well as rural households):** from about their mid-teens to the late 20s.

iv) **Hence this institution was a powerful force in three demographic respects**

(1) in delaying the mean age of first marriage for *women* (much more important factor than for men)

(2) *and* thus in curbing the birth rate,

(3) and the mean size of completed families;

v) **The decline of this institution during the early Industrial Revolution era:** was thus equally significant in lowering the mean age of first marriage for women and in stimulating fertility.

d) **The Historical Alternative: the Universal Marriage Pattern**

i) **In earlier west European societies (medieval),** in eastern European societies, and elsewhere in the world – in Asia, Africa, and at last Latin America – the traditional and typical marriage pattern was quite the opposite:

ii) **characteristics of the (alternative) universal marriage pattern:** ‘high pressure’ system

(1) the average age of first marriage for women was typically in the late teens, and no later than 20

¹¹ John Hajnal, ‘Two Kinds of Pre-Industrial Household Formation Systems’, in Richard Wall, Jean Robin, and Peter Laslett, eds., *Family Forms in Historic Europe*, Cambridge Group for the History of Population and Social Structure (London, 1983), pp. 65-104. His views were very strongly influenced by a Ph.D. dissertation produced at this University and subsequently published by Cambridge University Press: Ann Kussmaul, *Servants in Husbandry in Early Modern England* (Cambridge, 1981).

(2) virtually all women were married

(3) this is known as a 'high pressure' system, while the European Marriage Pattern (EMP) is called a 'low-pressure' system, in which fertility is the predominant factor.

iii) **The difference between 'high pressure' and 'low pressure' demographic regimes**

(1) *high pressure regimes*: associated with the universal marriage patterns.

- a society with very high death and birth rates,
- in which demographic changes are largely determined by mortality factors,
- because death rates fluctuate much more than do birth rates (from 30/1000 to 400/1000): as was the case with the late-medieval Black Death.
- and, furthermore, the birth rates are often near their biological maximum (about 35 to 40/1000)
- Thus such 'high pressure' regimes are those with the universal (non-European) marriage pattern

(2) *low pressure regimes*: associated, conversely, with the European Marriage Pattern

- a society in which demographic changes are determined largely by nuptiality and fertility, with far lower death and birth rates;
- but, in contrast with 'high pressure' regimes, the 'low pressure' regimes have birth rates that fluctuate much more widely (normally) than do the death rates.
- Thus 'low pressure' regimes are those with the European Marriage Pattern

iv) **demographic consequences of universal marriage pattern**

(1) the birth rate is at its maximum, at about 40/1000: and it could not really be increased, feasibly, except for following:

(2) the only variable affecting the birth rate would have been questions of nutrition and disease,

- in so far as they would negatively affect fertility, especially in inducing amenorrhea, a disruption of the female menstrual cycle.
- or negatively affect the number of live births (especially in inducing natural abortions, or disrupted pregnancies – very common consequence of malnutrition and disease
- note: an increase in the number of stillbirths (children born dead) usually increases the birth interval (time between pregnancies and births), and thus net fertility rates

(3) **Mortality is therefore the dynamic or more dynamic variable**: with the Universal Marriage Pattern system

- for obviously, while the birth rate has a biological maximum of about 40/1000, and hovered in the high 20 to high 30/1000 range in the Universal Marriage Pattern system
- conversely, the death rate had no such biological maximum

- indeed, as observed earlier, the death or mortality rate at the time of the medieval Black Death, in the mid 14th century, rose to at least 400/1000: ten times as much!

v) **The Vital Revolution revisited:** consequently there could not have been a demographic revolution, such as the one that 18th century England experienced,

(1) simply because, once the Black Death (bubonic plagues) had been eliminated, as it was in England after 1664-65, and in western Europe, after 1733, there could be no further dramatic reductions in death rates (though Razzell disputes this).

(2) and conversely, simply because this system would **not** have allowed the dramatic increase in fertility and birth rates that did occur under the European Marriage Pattern,

(3) for reasons to be explored more fully later, in developing this topic

vi) **For comparisons, between the early-modern High Pressure Demographic systems, and the later and now current Low Pressure Demographic systems, note that in Canada today¹²:** according to the following table:

Demographic Data for Some Contemporary Countries: 2007

Country	Population in millions	Birth Rate per 1000	Death Rate per 1000	Infant Mortality	Life Expectancy Total	Life Expectancy Males	Life Expectancy Females
Canada	32.90	11	7	5.30	80	78	83
U. S. A.	302.20	14	8	6.50	78	75	80
Argentina	39.40	19	8	14.40	75	71	79
Cuba	11.20	11	8	6.20	77	75	79
U.K.	61.00	12	10	4.90	79	77	81
Belgium	10.60	11	10	4.40	79	76	82
Netherlands	16.40	11	8	4.40	80	78	82
France	61.70	13	9	3.70	81	77	84
Germany	82.30	8	10	3.80	79	76	82
Switzerland	7.50	10	8	4.20	81	79	84

¹² See Table 1, below in the Appendix, with data from *2007 World Population Data Sheet* (Population Reference Bureau): <http://www.prb.org/>

Country	Population in millions	Birth Rate per 1000	Death Rate per 1000	Infant Mortality	Life Expectancy Total	Life Expectancy Males	Life Expectancy Females
Norway	4.70	13	9	3.20	80	78	83
Sweden	9.10	12	10	2.80	81	79	83
Italy	59.30	10	9	3.70	81	78	84
Spain	45.30	11	8	3.80	80	77	83
Russia	141.7	10	15	10.00	65	59	72
Japan	127.7	9	9	2.80	82	79	86
China	1318	12	7?	27.00	72	71	74
Taiwan	22.9	9	6	5.00	77	74	80
Australia	21	13	6	5.00	81	79	83

Source: *2007 World Population Data Sheet* (Population Reference Bureau): <http://www.prb.org/>

(1) the birth rate is 11/1000: compare that with, say, a BR of 39.8/1000 in England in 1541

(2) and the death rate is only 7/1000: compare that, with say, a DR of 32.9/1000 in England in 1561, or 35.4/1000 in 1681

(3) with an overall life expectancy of 80: i.e., 78 for men, and 83 for women (women almost always live longer than men): compare that with an English life expectancy of just 33.9 in 1541

(4) the major reason for low life expectancies in medieval and early-modern High Pressure systems was a very high level of infant mortality:

- so consider the significance of Canada's current low infant mortality rate of only 5.3 per 1000 live births

- this infant mortality rate, note, is lower than the current U.S. rate, but still higher than that for many other countries: Scandinavian countries, in particular

(5) **The demographic consequence of a sharp fall in infant mortality:** on the birth rate: i.e., we can anticipate a corresponding fall in the birth rate, since the pressing need to replace dead infants with new babies has disappeared.

vii) **The Goldstone critique of this contrast between High and Low Pressure demographic systems:**¹³

(1) While the Universal Marriage Pattern did indeed prevail within China, according to the model just described, nevertheless

(2) fertility was controlled within marriage itself, especially by frequent or chronic absences of the husband from the household

(3) and that the population of China does not appear to have grown any faster than that of western Europe from the 16th to 18th centuries.

(4) he does not, however, take account of the other variable: increased mortality as a method of checking population growth

(5) furthermore, the evidence for all his contentions is very thin, and certainly not well documented, for the whole of China in the early-modern period.

(6) and we really do not have reliable statistics on China's aggregate population (as opposed, say to estimates of that for the Yangtze delta).

(7) In the footnote, you will find some recent critiques of this view:¹⁴

e) **More recent views on the EMP and English demographic growth from 1740s:**

i) **Wrigley and Schofield**, in arguing for the vital role of 'nuptiality' (marriage) as the dynamic demographic factor.

(1) contend that rising real incomes and improved employment opportunities from the early 18th century led to a fall in the average age of first marriages and

(2) thus to a fall as well in the proportion of women never marrying (celibacy).

ii) **Subsequently, however, David Weir**, then a younger American economist, has argued that in early modern England:

(1) celibacy, i.e. the proportion of women never marrying, was the more powerful factor in determining and depressing the birth rate up to about 1700 – i.e., more so than the marriage age.

¹³ Based on work of other historians. in particular His views were heavily influenced by: Kenneth Pomeranz, *The Great Divergence: Europe, China, and the Making of the Modern World Economy* (Princeton: Princeton University Press, 2000), referred to in note 6 of the previous lecture. In July 2003, I served as a referee and appraiser for Harvard University Press, for his manuscript submitted for publication, as a monograph entitled: Jack Goldstone, *The Happy Chance: the Rise of the West in Global Context, 1500 - 1850*, also influenced by the Pomeranz school.

¹⁴ Ricardo Duchesne, 'Review Essay: Malthus and the Demographic Systems of Modern Europe and Imperial China: a Critique of Lee and Feng', *Review of Radical Political Economics*, 35:4 (Fall 2003), 534-52; Ricardo Duchesne, 'On the Rise of the West: Researching Kenneth Pomeranz's *Great Divergence*', *Review of Radical Political Economics*, 36:1 (Winter 2004), 52-81.

(2) but that after 1700, the average age of first marriage (nuptiality) then became the more powerful factor that led to a rise in the birth rate.

f) How did the average age of first marriage affect birth rates?

i) **first, because in an age of low life expectancies**, the later the age of first marriage, the less time there remained for procreation.

ii) **But even more important, fertility and especially female fertility (or fecundity)**, after having reached a peak in the early to mid-20s, then declines, and later declines sharply.

iii) **According to a recent study for 17th century England: Jan de Vries**, 'Population', *Handbook of European History* (1994), also borne out by recent Canadian studies:

- from age 20-24 to 35-39, the birth rate falls by 39.4% : from 409 per thousand to 248
- for the age group 40-44, the birth rate is 69.1% lower than in the 20-24 cohort

iv) **For England, during both the early-modern and Industrial Revolution eras, consider this table produced by Wrigley (with Schofield):**

**Age Specific Marital Fertility Rates per 1,000 women-years lived
and Total Marital Fertility Rates in England**

Periods/Ages	1680-1729	1730-1779	1780-1829
15-19	315	430	532
20-24	410	418	429
25-29	366	364	390
30-34	315	314	312
35-39	240	254	255
40-44	111	134	148
45-49	22	22	23

Periods/Ages	1680-1729	1730-1779	1780-1829
TMF 20-49	7.32	7.53	7.79
TMF 15-49	8.9	9.68	10.45

Source: E. Anthony Wrigley, 'British Population during the "Long" Eighteenth Century, 1680 - 1840', in Roderick Floud and Paul Johnson, eds., *Cambridge Economic History of Modern Britain*, 3 vols. (Cambridge and New York: Cambridge University Press, 2004), Vol I: *Industrialization, 1700 - 1860*, Table 3.2, p. 70.

v) **Furthermore, according to another current Canadian study**, the miscarriage rate amongst fertile women is 50% higher in their mid-30s than in their mid-20s

vi) **Conclusions on the role of the European Marriage in Fertility Changes:**

(1) Clearly, as all these data show, and Wrigley's table in particular, a rise in the average age of first marriage for women above the mid-20s, when women are biologically less fertile, will likely result in lower reproduction rates (i.e., lower fertility, and fewer live births)

(2) Conversely, if the average age of first marriage for women subsequently falls back below the mid-20s range, fertility and net reproduction rates will rise

(3) For Wrigley in particular: this was the paramount factor

(4) But he also admitted that changes in celibacy – the proportion of women never marrying – could have had an equally powerful effect.

g) **Malthus and the European Marriage Pattern:**

i) **John Hajnal did not, let me note**, claim any originality for this hypothesis, readily admitting that it had already been set forth or certainly implied by Malthus himself.¹⁵

ii) **Malthus indeed believed that**, before overpopulation would produce a genuine subsistence crisis, the population would be checked or controlled by what he called Prudential and Providential checks.

iii) **The Prudential checks in essence were:**

(1) a combination of late age of marriage and abstinence, and

(2) thus in essence the European Marriage Pattern itself;

(3) and these were the more important set of the two.

¹⁵ Thomas R. Malthus, *An Essay on the Principle of Population*, 1st edn. (London, 1798); 6th edn., 2 vols. (London, 1826). The first edition of 1798 has been edited with an introduction by Antony Flew (Penguin Books, London, 1970).

iv) **The alternative Providential or Positive checks:** were those disasters that produced very high mortalities: i.e., war, famines, plagues, and other diseases

v) **but Malthus clearly felt that, in West European societies at least,** the Prudential checks would operate before the Positive checks became necessary to control population.

vi) **Certainly it may well be argued,** without appearing to be racist, that one reason for western Europe's ultimate economic growth and industrial supremacy was its ability to control its rate of population growth better than other areas of the world.

h) the Wrigley Model on Population Growth during the Demographic and Industrial Revolutions from ca. 1750

i) **Remember Wrigley's basic thesis:** ¹⁶

(1) that 70% of the population growth experienced in England and Wales from the 1740s or 1750s was due to a steep rise in the birth rate (fertility), and

(2) thus only about 30%, the remainder, was due to a continuing fall in the death rate (mortality)

ii) **Explanations for the Rise of the Birth Rate:** the operation of the European Marriage Pattern, in reverse, as some combination of:

(1) **Nuptiality:** a fall in the average age of first marriages for women: FMF, which can be documented, as follows

- note from the following table, that for England as a whole, the average age of first marriage for females (FMF) fell from 26.2 in 1670-79 to 23.1 in 1830-39:

**Mean Age of First Marriage, i.e., in Bachelor-Spinsters Marriages
in England (various counties, over time), in ten-year intervals**

DECADE	MALES	FEMALES
1590 - 99	29.3	25.6
1600 - 09	28.3	25.7
1610 - 19	27.5	25.6
1620 - 29	27.6	25.2
1630 - 39	27.3	25.2
1640 - 49	27.4	25.7

¹⁶ See notes 3 - 4, above.

DECADE	MALES	FEMALES
1650 - 59	27.5	25.6
1660 - 69	27.4	25.9
1670 - 79	28.0	26.2
1680 - 89	27.7	25.8
1690 - 99	27.1	25.9
1700 - 09	27.4	26.0
1710 - 19	27.3	26.3
1720 - 29	27.0	25.9
1730 - 39	26.9	25.5
1740 - 49	26.5	24.8
1750 - 59	26.1	25.0
1760 - 69	25.9	24.5
1770 - 79	26.1	24.3
1780 - 89	25.9	24.0
1790 - 99	25.3	24.0
1800 - 09	25.3	24.0
1810 - 19	25.1	23.6
1820 - 29	25.2	23.8
1830 - 39	24.9	23.1

Source: E.A. Wrigley, R.S. Davies, J.E. Oeppen, and R.S. Schofield, *English Population History from Family Reconstitution, 1580- 1837* (Cambridge and New York: Cambridge University Press, 1997), pp. 130- 34.

- taking means for all 39 counties in England, for each decade, has the undesired effect of smoothing out differences
- if we look at just one country, Devonshire, for example, we find more dramatic differences: a fall in the average age of FMF from a mean of 30.7 in 1710-19 to one of 23.3 in 1825-37.¹⁷

¹⁷ See Table 6 below.

(2) **Celibacy:** a presumed (undocumented) contraction or reduction in the proportion of women who did not marry, who remained single (spinsters)

iii) **Economic and Social Explanations of these changes in Nuptiality and Celibacy:**

(1) **Economic growth, increased employment, leading to rising real incomes:**

- obviously that would allow or promote earlier marriages for both males and females
- and it may have as well increased marriage rates to reduce celibacy, on average

(2) **The socio-economic effects of increased urbanization:**

- note the cities or large towns, with growing populations, are more likely to have a closer ratio of males to females, better allowing each to find marriage partners
- conversely small rural settlements – and 18th century England was still far more rural than urban – would tend more to have unbalanced populations, with excess numbers of males or females, so that more of the other sex (gender) would remain unmarried

(3) **the decline of the institution of ‘Service in Husbandry’:**

- i.e., as increased industrialization, and increased employment in commerce, finance, transport, government, etc. offered far better opportunities and higher incomes to young women, those who had taken service in husbandry,
- more and more such women left service-in-husbandry at an earlier age, or not enter this institution at all.
- does seem to be strong evidence that Service-in-Husbandry was dying out in England in the early 19th century (though there are some disputes about this).¹⁸

(4) Conclusion: do these propositions then indicate that the Demographic Revolution was more a consequence than a cause of the Industrial Revolution: that is still debatable.

(i) **the European Marriage Pattern and the Demographic Revolution** in historical perspective

i) **to repeat the key point:** the English demographic revolution of the 18th century could not have occurred without the institution of the European Marriage Pattern.

¹⁸ See Ann Kussmaul, *Servants in Husbandry in Early Modern England* (Cambridge, 1981); Maw Lin Lee and David Loschky, “Interdependency between Fertility and Real Wages in England, 1541 - 1871,” *The Journal of European Economic History*, 27:1 (Spring 1998), 107-31; Jona Schellkens, ‘Nuptiality during the First Industrial Revolution in England: Explanations,’ *Journal of Interdisciplinary History*, 27:4 (Spring 1997), 637-54; Pamela Sharpe, ‘The Female Labour Market in English Agriculture during the Industrial Revolution: Expansion or Contraction?’, *Agricultural History Review*, 47:2 (1999), 161-81; Donald Woodward, ‘Early Modern Servants in Husbandry Revisited’, *Agricultural History Review*, 48:ii (2000), 141-50; A.J. Gritt, ‘The Census and the Servant: A Reassessment of the Decline and Distribution of Farm Service in Early Nineteenth-Century England’, *The Economic History Review*, 2nd ser., 53:1 (February 2000), 84-106; Nicola Verdon, ‘The Employment of Women and Children in Agriculture: a Reassessment of Agricultural Gangs in Nineteenth-Century Norfolk’, *Agricultural History Review*, 49:i (2001), 41-55.

ii) **If we agree that the birth rate and fertility was the primary force**, in physically causing that demographic revolution (recall Wrigley's view: that the BR was responsible for 70% of the growth);

(1) then we can also see that only the European Marriage Pattern had the elasticity (as a 'low pressure system') to permit such a rapid growth in birth rates; and in the fertility associated with those birth rates.

(2) Since the universal marriage pattern meant that almost all women married, and married before they were 20, the birth rate was thus *already at its maximum and could not really rise further*.

iii) **But how important were both nuptiality (average age of first marriage) and celibacy (proportion of women marrying):** what about sex outside of marriage?

(1) surprisingly, demographic studies show that rates of illegitimacy (bastardy) were both:

- very low in all these periods before the Industrial Revolution
- and statistically not related to the average of first marriage or celibacy: i.e., bastardy still remained low despite changes in these variables

(2) With social opposition to bastardy, we find that most young people producing a bastard did so only once: were thus forced to marry

(3) But equally or more surprising is the fact that illegitimacy rates rose with industrialization, and with the fall in the average of first marriages for women, in the early 19th century.

iv) **we also have to consider the widespread evidence for both artificial contraception, abortion, and infanticide:**

(1) that if sex did take place before or outside marriage, that did not really affect changes in the birth rates, because of these three factors:

(2) contraception in three forms, two of which come from indeed ancient and not just medieval times:

- *coitus interruptus* or 'Onanism': i.e., withdrawal before ejaculation.¹⁹
- *sodomy or buggery*: anal intercourse, possibly even more widespread in medieval Italy.²⁰

¹⁹ Onan was a person condemned, in the Old Testament, for 'having spilled his seed on the ground' while engaging in sexual intercourse.

²⁰ See David Herlihy and Christiane Klapisch-Zuber, in their *Tuscans and Their Families: A Study of the Florentine Catasto of 1427* (New Haven, 1985). The word 'bugger' is derived from 'Bulgarian', in the following fashion: In the late 12th and early 13th centuries, a new Christian sect appeared and developed in Provence, in southern France, especially in the town of Albi: and hence their name 'Albigensians', also known as Cathars. Their origins were thought to be in the 'East', or the Byzantine Empire, entering Europe via then Christian Slavic kingdom of Bulgaria, where they were known as Bogomiles.. The actual origins were third century (CE) followers of the Persian teacher Mani, who were thus known as Manicheans. The Manicheans and Albigensians believed that life on earth was a constant struggle between the forces for good (the spirit) and evil (matter, including the body). Many were rigidly ascetic,

- from certainly the 16th or 17th century, the introduction of condoms in the form of sheathes produced from very thin sheep's membranes

iv) **Finally, consider also the demographic revolution in historical perspective:**

- (1) that it was preceded by a century of demographic stagnation with some decline,
- (2) for which the European Marriage Pattern had been partly responsible.

v) **Thus England was able to experience such a demographic revolution**, free from most economic and social constraints or difficulties, because it had been underpopulated with relatively high living standards.

vi) **The European Marriage Pattern:** was also at least partly responsible for permitting England (Britain) to enjoy higher living standards and to experience this demographic revolution without falling into the Malthusian trap of overpopulation, diminishing returns, and growing misery.

vii) **If the European Marriage Pattern** came to prevail, in western Europe, from a line west of that drawn from St. Petersburg in Russia to Trieste in Italy, it seems to have commenced earlier and become more widely diffused in England (more so than Scotland).

7. The Opposing View on The Primacy of Mortality (Death Rates): Razzell's Revisionism

a) **More recently, in December 1993**, Peter Razzell has sought to restore the primacy of the older view that had emphasized the crucial role of falling mortality.²¹

i) **It should be noted that in the more distant past**, Peter Razzell had written several articles and a book defending the traditional view on the primacy of mortality factors in demographic change.

ii) **In the first part of the article, which you will have to read for yourself [part of the reading package for this A-List essay topic],**

(1) he severely criticizes the statistical techniques of Wrigley and Schofield, and their use of demographic records,

(2) and thus he attempts to undermine all their views on both nuptiality and birth rates.²²

condemning marriage, procreation, and even food. Their fearful Christian neighbours came to believe rumours that, if they abstained from regular sexual intercourse, they engaged instead in anal intercourse; and hence the term 'bugger'. After the pope and the Inquisition condemned their religion as a vile heresy, most of them were slaughtered by French cavalry during the so-called Albigensian Crusade (1209-1255: ending that year when Quéribus, the last Cahar fortress, finally fell to the 'Crusaders').

²¹ Peter Razzell, 'The Growth of Population in Eighteenth-Century England: A Critical Reappraisal', *The Journal of Economic History*, 53 (Dec. 1993), 743-72.

²² Even harsher criticisms of Wrigley-Schofield's statistics and methods may be found in David Levine, 'Sampling History: The English Population', *Journal of Interdisciplinary History*, 28:4 (Spring

(3) In essence he does not find any significant changes in the average age of first marriages before the late 18th century,

(4) and thus no real changes in birth rates.

(5) But see Wrigley and Schofield's tables and graphs, which show a distinct and sharp fall in the average age of first female marriages.

iii) **Instead, he finds -- as he had found before**, that from the early 18th century, and throughout that century into the 19th century:

(1) that English mortality had experienced a sharp fall, one that fundamentally explains the rapid growth in English population, especially after the 1740s.

(2) Such evidence, he contends, comes from new sources of statistics, free from the biases and charges levied against Wrigley-Schofield –

iv) **In previous articles, he had argued that better medical techniques**, and especially the widespread use of inoculation methods against small-pox had been the prime determinant in the post-1750 fall in mortality.

b) But subsequently he was forced to find other explanations for the period 1700 - 1750:

i) because he came to believe that the fall in mortality had commenced as early as 1700, despite a temporary rise in the 1730s,

ii) and because these smallpox inoculation techniques date only from the mid-18th century

iii) **He dismisses purely economic arguments**, i.e., rises in living standards, better nutrition, etc., on the grounds that the mortality fall was so general throughout the population

c) His explanation: improved hygiene standards through reconstruction of family dwellings.

i) **For reasons that you will have to read for yourself**, he contends that late 17th- and early 18th- century England experienced a boom in reconstruction of family dwellings that especially improved hygiene.

ii) **by building solid foundations and floors with brick**, stone, or cement to replace the former standard dirt floors that had been breeding grounds for disease (since people had so commonly urinated and defecated on their dirt floors).

iii) **His view of the cause:** a wave of fires that struck many English towns in this era, necessitating rebuilding, but in this new form.

iv) **But** does this thesis apply to the upper class housing – since he is seeking universal factors for all social classes;

1998), 605-32. A review article based on: E.A. Wrigley, R.S. Davies, J.E. Oeppen, and R.S. Schofield, *English Population History from Family Reconstruction, 1580 - 1837* (Cambridge and New York: Cambridge University Press, 1997).

v) How many English towns experienced this phenomenon?

vi) and is not such a thesis still fundamentally economic in nature?

d) Mortality: Wrigley's subsequent views

i) **Subsequently**, Wrigley became more willing to consider the importance of changes in mortality, while generally insisting that they had to be linked to nuptiality and fertility

ii) **the question of still-births**: i.e., the effect of having children die at birth

(1) The importance here is the link to what is known as the birth-interval: i.e., the duration of time between pregnancy and births (calculated on average for all women of the same age cohort)

(2) Wrigley's evidence indicates that a fall in the rate of still-births tends to be linked to a shorter duration for the birth-interval

iii) **maternal mortality**: i.e., the death of women in giving birth (or dying shortly after).

(1) Consider also this table on Maternal Mortality Rates constructed by Wrigley and Schofield:

**Maternal Mortality Rates in England
per 1,000 birth events**

Periods: in half centuries	maternal mortality rates per 1,000 births
1650 - 99	16.3
1700 - 49	12.9
1750 - 99	9.3
1800 - 37	5.8

Source: E. Anthony Wrigley, 'British Population during the "Long" Eighteenth Century, 1680 - 1840', in Roderick Floud and Paul Johnson, eds., *Cambridge Economic History of Modern Britain*, 3 vols. (Cambridge and New York: Cambridge University Press, 2004), Vol I: *Industrialization, 1700 - 1860*, Table 3.8, p. 83

(2) The drop in maternal mortality rates is very striking and also very important for the question of fertility and the birth rates: since obviously the more mothers that survive childbirth and continue to produce children, the higher will be the net reproduction rate.

e) Diseases, Water Purification, and Falling Mortality Rates:

i) **The predominance of the Miasma theory of diseases:**

(1) **Before the late 19th century, most people had believed, for centuries, in the *miasma* theory of diseases:**

(2) that they were caused by noxious vapours in the atmosphere.²³

ii) **Not until the researches of the German scientist Robert Koch (1843-1910), and Louis Pasteur (1822 - 1895) did society come to learn that bacteria were responsible for the transmission of many diseases:**²⁴

iii) **Koch was the first, in 1876:** and for that he won the Nobel prize in 1905.

iv) **With the equally important and obvious discovery that most such bacterial diseases were water-born,** then followed, in North American and Western Europe, urban systems of water-purification

v) **That quickly led to a dramatic fall in mortality, from the later 19th century:** and I believe this to be the most important single factor in the fall of mortality in Europe and North America.²⁵

f) **The ‘Demographic Transition:** the subsequent fall in fertility

i) **As Table 3 indicates, for England and Wales,** the rise in the crude birth rate had peaked at 40.22 per

²³ Answers.com: *miasma*: n., pl. -mas or -ma-ta (-mə-tə). 1. A noxious atmosphere or influence: “The family affection, the family expectations, seemed to permeate the atmosphere . . . like a coiling miasma” (Louis Auchincloss). 2. (a). A poisonous atmosphere formerly thought to rise from swamps and putrid matter and cause disease; (b) A thick vaporous atmosphere or emanation: wreathed in a miasma of cigarette smoke. [Greek, pollution, stain, from *miainein*, to pollute.]

²⁴ Pasteur’s 1878 paper on micro-organisms in various beverages led to the ‘pasteurization’ process of heating milk to kill harmful bacteria in milk. See the website for Louis Pasteur et l’Institut Pasteur: <http://www.pasteur.fr/pasteur/histoire/histoireUS/index.html>. In 1876, Robert Koch had demonstrated that the bacterium *Bacillus anthracis* causes anthrax, a disease of animals also transmissible to humans. He subsequently discovered the two bacteria that cause tuberculosis and then cholera. In 1905, he won the Nobel prize in medicine. The other agent transmitting disease is of course the virus. For this, see *Answers.com*, on the internet: ‘The existence of submicroscopic infectious agents was suspected by the end of the 19th cent.; in 1892 the Russian botanist Dimitri Iwanowski showed that the sap from tobacco plants infected with mosaic disease, even after being passed through a porcelain filter known to retain all bacteria, contained an agent that could infect other tobacco plants. In 1900 a similarly filterable agent was reported for foot-and-mouth disease of cattle. In 1935 the American virologist W. M. Stanley crystallized tobacco mosaic virus; for that work Stanley shared the 1946 Nobel Prize in Chemistry with J. H. Northrup and J. B. Sumner’.

²⁵ Louis P. Cain and Elcye J. Rotella, ‘Epidemics, Demonstration Effects, and Investment in Sanitation Capital by U.S. Cities in the Early Twentieth Century’, in Joshua L. Rosenbloom, ed., *Quantitative Economic History: the Good of Counting*, Routledge Explorations in Economic History, vol. 40 (London and New York: Routledge, 2008), pp. 34-53; Louis P. Cain and Elcye J. Rotella, ‘Death and Spending: Urban Mortality and Municipal Expenditure on Sanitation’, *Annales de démographie historique*, 101:1 (2001), 139-54; and also Michael Haines, ‘The Urban Mortality Transition in the United States, 1800-1940’, *Annales de démographie historique*, 101:1 (2001), 33-64; Joseph P. Ferrie and Werner Troesken, ‘Water and Chicago’s Mortality Transition, 1850 - 1925’, *Explorations in Economic History*, 45:1 (January 2008), 1-16.

thousand in 1821, but thereafter still remained at a high level of 35 to 36 per thousand, far higher than in most of western European countries

ii) **From the late 1870s, however, the birth rate began a steady decline:** falling from 35.00 per thousand in 1871 to 24.30 per thousand in 1911.

iii) **This is known as the ‘Demographic Transition’**, a fall in the birth rate, which had begun first in France (next term), and occurred later in Britain than in other west European countries.²⁶

iv) **Possible explanations for this decline in fertility:**

(1) The sharp decline in infant mortality: so that families no longer felt the same pressures for reproduction to replace dead children and maintain family size

(2) urban industrialization (and labour legislation for employing women and children): so that the family was no longer the chief unit of the labour force – i.e., so that families did not have to provide extra labour for agriculture and industry (though the decline began first with the upper classes)

(3) The effect of rising real incomes on consumer choices: to prefer other consumer durables over children (which are also ‘consumer durables’.)

(4) The spread of education (though again note that the decline began first with the upper classes)

(5) The increasing use of artificial methods of birth control: for which the French proved to be pioneers.

8. Population Growth and the Industrial Revolutions: Causes and Effects

a) **Was Population Growth a Cause or an Effect of the Industrial Revolution?** That is almost a chicken and egg type question.

i) **As I have indicated and strongly stressed**, all the current evidence indicates that the demographic upswing preceded the initial phase of the Industrial Revolution (if we can agree that the latter began roughly in the 1760s, in both the cotton and iron industries).

ii) **most economic historians would agree that part of that demographic upswing seems to be related**, directly or indirectly,

(1) to improved living standards from the early 18th century: and

(2) in general perhaps to general economic growth.

(3) I am certainly prepared to argue, or at least suggest, that rising population and thus an expanding market and increasing demand was a contributory factor for the Industrial Revolution.

iii) **But the most rapid growth in population occurred certainly just after and thus during most of the**

²⁶ See Alter and Gregory, ‘The Demographic Transition’: in note 1.

first major phase of the Industrial Revolution: from the 1780s to the 1820s (and thus many historians have attributed falling real incomes in this period directly to that rapid population growth).

iv) **Furthermore, the regions that experienced the most rapid population growth (and the most intense urbanization) were also the major focal points of the new industrialism:** namely the Midlands, Lancashire, Yorkshire, South Wales, and London itself.

(1) The available evidence strongly suggests that this uneven population growth and, in effect, this population redistribution were due more to natural demographic increase in these industrial areas than to long-distance migration;

(2) but in these industrial areas, there was undoubtedly considerable migration from rural to immediately adjacent urban areas just the same).

v) **Thus population growth can certainly be attributed to the very forces of the Industrial Revolution:** especially in that expanded industrial employment, more full-time and better paying industrial employment encouraged both earlier marriages and larger families.

vi) **Larger Families:**

(1) Some historians indeed have seen this aspect of population growth as a response to the increased demand for labour,

(2) especially since in this era children were viewed as highly employable economic assets (who could contribute a net gain from the age of 5), who not only augmented family incomes but provided old-age security.

(3) Remember also that in traditional, pre-industrial European societies the whole family worked, and the family itself rather than the father was regarded as the unit of labour, especially in rural society.

(4) If you regard this argument absurd, as some of my former students have vociferously informed me, please consider or keep in mind the long historical pedigree of this argument.

- For Thomas Malthus himself, in the first major study of English population [in 1798], and then most economists in the ensuing Classical School of Economics argued or assumed that the demand for labour was the prime determinant of birth rates,

- and thus more generally of population growth, i.e., of population growth in the absence of either prudential or preventive checks to population growth in times of subsistence crises.

vi) **In these senses, therefore,** the Industrial Revolution certainly helped to provide its own labour force.

b) **How did Population Growth contribute to the Industrial Revolution? Demand and Supply Factors:**

i) **DEMAND: in Increasing Aggregate Demand to Produce Larger and More Efficient Markets:** in several important respects

- (1) population growth would increase aggregate demand through the sheer increase in numbers,
- provided always, of course, that this extra demand was monetized within a market economy:
 - i.e., that the extra number of people had monetary incomes to spend on goods and services within the market.
- (2) Population growth can provide larger, more concentrated, and thus more efficient markets,
- especially through more rapid urbanization, especially if, as, and when the populations of towns grew more rapidly than population as whole, as they most certainly did during the Industrial Revolution era and the 19th century as a whole.
 - That was, in fact, the most important striking feature of this demographic revolution, both in England and in continental Europe: to repeat: a rapid population growth that manifested itself in a more than proportional growth in urbanization -- i.e., in the number and size of towns.
- (3) **Scale economies in marketing:**
- here the important economic point is that such larger, more concentrated urban markets growth can produce significant economies of scale in marketing.
 - this can be seen especially in the case of London, which became by far Europe's largest city:

Estimates of the Population of London

1500 (estimate)	50,000 (or more)
1600	200,000
1650	350,000
1750	550,000
1801 (census)	1,088,000
1851 (census)	2,491,000

- But the importance of urbanization for industrialization is also evident in this table, also produced by Wrigley: comparing England, France and the Netherlands:

**Percentages of Total Population Living in Towns
with 5,000 or more inhabitants, 1600 - 1850**

Year	ENGLAND	FRANCE	NETHERLANDS
1600	8	9	29
1700	17	11	39
1750	21	10	35

Year	ENGLAND	FRANCE	NETHERLANDS
1800	28	11	35
1850	45	19	39

Source:

E. Anthony Wrigley, 'British Population during the "Long" Eighteenth Century, 1680 - 1840', in Roderick Floud and Paul Johnson, eds., *Cambridge Economic History of Modern Britain*, 3 vols. (Cambridge and New York: Cambridge University Press, 2004), Vol I: *Industrialization, 1700 - 1860*, Table 3.11, p. 88.

(4) **The Transactions Sector** -- the commercial, marketing, and transport sector -- of the economy is perhaps the chief beneficiary from such larger markets.

- This sector is usually viewed in terms of what economists now call transaction costs: all those costs involved in transferring goods and services from the seller to the buyer -- from the final producer to the consumer.
- The application of this theory in economic history won Douglass North the Nobel Prize in Economics (with Robert Fogel, in 1993).²⁷
- That means not only direct transport and marketing costs, but also the costs of negotiating contracts, market privileges, property rights -- 'protection' costs.
- These all involved very high fixed costs, high fixed costs no matter what volume of commerce.
- Thus the transactions sector was and is subject to very large scale-economies, so that an increase in the market and sales volume could lead to a disproportionate fall in those costs.

ii) **SUPPLY: By relieving labour scarcities:**

(1) First, keep in mind, please, that population growth or demographic change is purely relative:

- that population growth does not necessarily result in the cruel law of diminishing returns, so favoured

²⁷ Douglass North and Robert Thomas, *The Rise of the Western World: A New Economic History* (Cambridge, 1973), pp. 71-96, 134-38; Douglass North, *Structure and Change in Economic History* (New York, 1981), chapters 1-5; Douglass North, 'Government and the Cost of Exchange in History', *Journal of Economic History*, 44 (1984), 255-64; Douglass North, 'Transaction Costs in History', *Journal of European Economic History*, 14 (1985), 557-76. See Cliometric Society, ed., *Two Pioneers of Cliometrics: Robert W. Fogel and Douglass C. North, Nobel Laureates of 1993* (Oxford, Ohio: Miami University, 1994). His co-winner, furthermore, Robert Fogel, receiving his prize essentially for his work in promoting econometrics or 'cliometrics', arguably formulated his major econometric contributions in terms of institutions as well, those governing transportation networks and slavery in particular. See also a seminal essay by one of his former students: Clyde G. Reed, 'Transactions Costs and Differential Growth in Seventeenth Century Western Europe', *Journal of Economic History*, 33 (March 1973), 177 - 90, especially pp. 180-86.

by all economic theorists,

- if the area or region under consideration is *underpopulated* to begin with, and if technology, transportation, market structures, etc. do undergo often dramatic changes.

(2) Note also that the Law of Eventually Diminishing Returns presupposes a prior condition of increasing returns when labour is scarce relative to land and capital [graph].

(3) England during the later 17th and early 18th centuries probably was underpopulated, with a stagnant population, declining slightly in some decades; and there are several signs of labour scarcity.

(4) Unquestionably, this post-1740s Demographic Revolution alleviated those scarcities and provided the necessarily abundant and cheap labour force, made the labour supply elastic, at a time when most industry remained highly labour intensive.

c) OTHER SUPPLY ASPECTS: Population Growth and Inducements to Increased Scale and Technological Changes. Consider three related effects:

i) If aggregate demand rises faster than supply, especially in terms of such rapid urbanization,

(1) then population growth may provide incentives to increase the scale of production, requiring larger capital investments and an improved technology,

(2) thus achieving improved efficiency through economies of larger scale production [as well as economies of larger scale marketing].

ii) Population growth, through diminishing returns, may induce or bring about *relative* price changes:

(1) for example, to increase the price of wheat and wood (wood fuels and lumber) more than the prices for linen textiles and leather shoes.

(2) Such growth may thus have increased the real costs of certain factors of production more than proportionately, more than other costs or prices;

(3) and those rising relative costs may have provided further incentives for cost-cutting technological changes,

(4) which in turn may have led to increased scales of production, with even greater efficiencies.

iii) Indeed one may well argue that the single the most important consequence of population growth ultimately was the pressure that it placed on supply: on relatively scarce and inelastic supplies of land and natural resources; i.e., with ultimately diminishing returns.

iv) That was crucially important (combined with other factors):

(1) in providing the necessary challenge whose response was various forms of technological and entrepreneurial changes,

(2) as England (Britain) became the first country to find the new means of economizing on scarce resources, especially on agricultural land and fuel supplies. [Hence my examples of wheat and wood]

v) **Some examples of impact of population growth on various sectors:**

(1) **Agriculture:** the Enclosure Movement and new cultivation techniques to rationalize, economize the use of land, to increase output per acre.

(2) **Industry:** population growth forced a shift from the old traditional wood-and-water technology to new technologies based on coal, the essential ingredient of the Industrial Revolution: coal-fired steam power to replace water power; coke, as distilled coal, to replace wood-charcoal fuels.

vi) **Finally, population growth can be seen as a factor forcing Britain ultimately to industrialize:**

(1) and become a manufacturing exporter as the cheaper, more efficient solution to her demographic and food-supply problems,

(2) as Britain's population tripled from 12 million in 1820 to 36 million by 1910.

vii) **In economics jargon,** Britain was forced to obey the Law of Comparative Advantage

- by exporting manufactured goods (and commercial-financial services) in order to import cheaper foodstuffs (and raw materials):
- much cheaper process than trying to produce them domestically.
- By 1910, that process had in fact reduced the agricultural sector to about 7% of the total economy (and population).
- while Great Britain was then importing almost 85% of its food supplies by the early 20th century.²⁸

d) **Was Britain so unique?** After all, other countries were also experiencing population growth in this era:

i) **Consider those earlier statistics:** demonstrating how much more rapid and intense was demographic growth in Britain than elsewhere.

ii) **Note also that the famous land:**labour ratio in the law of diminishing returns is a purely relative concept: i.e., the relationship between population and resources and technology.

iii) **Relative to the continent,** England had experienced more acute problems, with greater pressure on forests, arable lands, fuels, and mineral supplies, etc. than elsewhere, certainly at a much earlier period.

iv) **But England (Britain) also possessed the crucial resources of coal, iron, and arable lands,** resources that could be more efficiently utilized.

v) **All that population growth can do, however,** is provide the challenge:

(1) not the technological or entrepreneurial responses, which depend upon a whole host of other factors,

²⁸ In 1901-14, an average of 83.1% of the population were dependent on their food supplies from foreign imports. See 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.

(2) some of which we necessarily examined in the immediately preceding topic (if you were here to listen to that lecture).

vi) **Finally, for perspective**, and comparison with the plight of many Third World economies today, note that:

(1) while British population growth was so much more rapid than other European rates, it was on the order of about 1.2% - 1.6% per year:

(2) compared to per annum growth rates of 2% - 3% or more in Third World countries.

vii) **Thus the difference between a stimulating and surmountable challenge on the one hand**, and a crippling challenge that remains a barrier, on the other.

Table 1: Demographic Data for Contemporary Countries in Europe, North and South America, and Eastern Asia-Pacific: for 2007

Country	Population in millions	Birth Rate per 1000	Death Rate per 1000	Infant Mortality	Life Expectancy Total	Life Expectancy Males	Life Expectancy Females
Canada	32.90	11	7	5.30	80	78	83
U. S. A.	302.20	14	8	6.50	78	75	80
Argentina	39.40	19	8	14.40	75	71	79
Cuba	11.20	11	8	6.20	77	75	79
U.K.	61.00	12	10	4.90	79	77	81
Belgium	10.60	11	10	4.40	79	76	82
Netherlands	16.40	11	8	4.40	80	78	82
France	61.70	13	9	3.70	81	77	84
Germany	82.30	8	10	3.80	79	76	82
Switzerland	7.50	10	8	4.20	81	79	84
Norway	4.70	13	9	3.20	80	78	83
Sweden	9.10	12	10	2.80	81	79	83
Italy	59.30	10	9	3.70	81	78	84
Spain	45.30	11	8	3.80	80	77	83
Russia	141.7	10	15	10.00	65	59	72
Japan	127.7	9	9	2.80	82	79	86
China	1318	12	7?	27.00	72	71	74
Taiwan	22.9	9	6	5.00	77	74	80
Australia	21	13	6	5.00	81	79	83

Source: 2007 World Population Data Sheet (Population Reference Bureau):
<http://www.prb.org/>

Table 2. The Populations of Europe, by Regions, 1500 - 1800**in millions**

Region	1500	1550	1600	1650	1700	1750	1800
North West	7.6	9.5	11	14.25	15.1	17.4	25.3
NW %	12.5%	13.6%	14.1%	19.2%	18.1%	17.9%	20.7%
Central	29	33.75	36.9	33.5	38.2	43.8	53.5
Cent %	47.6%	48.3%	47.4%	45.0%	45.7%	45.1%	43.8%
Mediterranean	18.3	20	22.3	19.6	22.8	26.5	31.2
Med %	30.0%	28.6%	28.6%	26.3%	27.3%	27.3%	25.5%
Eastern	6	6.6	7.7	7.1	7.4	9.4	12.2
East %	9.9%	9.5%	9.9%	9.5%	8.9%	9.7%	10.0%
TOTAL	60.9	69.85	77.9	74.45	83.5	97.1	122.2

Source: Jan De Vries, 'Population', in *Handbook of European History, 1400-1600: Late Middle Ages, Renaissance, and Reformation*, Vol. I: *Structures and Assertions*, ed. Thomas Brady, Heiko Oberman and James Tracy (Leiden and New York, 1994), adapted from Table 1, p. 13.

Table 3:

Estimated Populations of England and Wales in Millions, and Crude Birth and Death Rates per 1000: according to Wrigley-Schofield (1541 - 1871)

THE POPULATION OF ENGLAND (with WALES)						
Quinquennial Demographic Data from Generalised Inverse Projection, 1541 - 1871						
Year	England: Population in millions	with Wales Population in millions	England: Life Expectancy at Birth	Intrinsic Growth Rate	Crude Birth Rate/1000 England only	Crude Death Rate/1000 England only
1541	2.830	3.031	33.94	0.92	37.17	30.34
1546	2.908	3.115	38.82	1.42	37.88	25.98
1551	3.065	3.282	39.59	1.31	35.62	24.82
1556	3.213	3.440	22.38	-1.17	30.24	40.16
1561	3.036	3.251	36.66	0.97	37.06	26.70
1566	3.174	3.398	39.67	0.91	34.16	24.21
1571	3.310	3.545	41.06	0.77	32.37	22.73
1576	3.448	3.692	41.56	1.02	34.20	22.43
1581	3.631	3.889	42.70	1.27	34.12	21.56
1586	3.841	4.113	37.05	0.75	32.09	25.70
1591	3.938	4.217	38.05	0.81	32.12	24.75
1596	4.057	4.344	37.82	0.63	31.50	24.95
1601	4.162	4.457	38.53	0.75	33.24	24.77
1606	4.310	4.616	39.59	0.76	33.05	24.07
1611	4.476	4.793	36.79	0.41	31.60	26.14
1616	4.568	4.892	40.31	0.81	32.30	23.37
1621	4.745	5.081	33.39	0.11	30.91	28.85
1626	4.762	5.099	39.69	0.74	31.81	23.68
1631	4.926	5.275	39.72	0.71	31.66	23.80
1636	5.090	5.450	34.03	0.18	31.47	28.59
1641	5.130	5.494	36.32	0.43	31.97	26.79
1646	5.231	5.602	39.74	0.29	27.79	23.63
1651	5.308	5.684	39.14	0.31	28.55	24.22

THE POPULATION OF ENGLAND (with WALES)						
Quinquennial Demographic Data from Generalised Inverse Projection, 1541 - 1871						
Year	England: Population in millions	with Wales Population in millions	England: Life Expectancy at Birth	Intrinsic Growth Rate	Crude Birth Rate/1000 England only	Crude Death Rate/1000 England only
1656	5.391	5.773	33.04	-0.60	25.74	28.68
1661	5.280	5.654	33.27	-0.38	28.22	28.92
1666	5.229	5.600	32.48	-0.47	28.53	30.03
1671	5.159	5.524	37.41	-0.04	28.40	26.25
1676	5.185	5.552	32.40	-0.39	28.91	30.75
1681	5.109	5.471	31.27	-0.26	30.32	32.14
1686	5.036	5.393	35.93	0.47	31.87	28.56
1691	5.094	5.455	36.35	0.42	30.05	28.06
1696	5.118	5.481	38.06	0.71	31.25	26.67
1701	5.211	5.580	38.47	0.83	32.06	26.39
1706	5.334	5.712	38.50	0.45	28.48	25.67
1711	5.382	5.764	36.89	0.34	29.47	26.77
1716	5.428	5.813	35.75	0.38	31.65	27.91
1721	5.503	5.893	35.49	0.39	32.80	28.21
1726	5.602	5.999	25.34	-0.95	31.16	36.99
1731	5.414	5.798	36.34	0.58	35.13	27.46
1736	5.599	5.996	35.26	0.46	33.79	28.47
1741	5.723	6.129	34.27	0.24	31.71	28.78
1746	5.782	6.191	36.47	0.62	32.68	27.02
1751	5.922	6.342	39.77	0.99	32.97	24.61
1756	6.149	6.584	38.12	0.75	31.87	25.82
1761	6.310	6.757	35.37	0.61	33.48	28.29
1766	6.449	6.906	36.19	0.68	33.88	27.69
1771	6.623	7.093	39.09	1.01	34.90	25.47
1776	6.913	7.403	37.74	0.99	35.76	26.57
1781	7.206	7.717	35.81	0.76	34.86	27.81
1786	7.434	7.960	38.97	1.25	36.89	25.23
1791	7.846	8.402	37.92	1.22	37.17	26.07

THE POPULATION OF ENGLAND (with WALES)						
Quinquennial Demographic Data from Generalised Inverse Projection, 1541 - 1871						
Year	England: Population in millions	with Wales Population in millions	England: Life Expectancy at Birth	Intrinsic Growth Rate	Crude Birth Rate/1000 England only	Crude Death Rate/1000 England only
1796	8.256	8.841	38.93	1.15	35.51	24.82
1801	8.671	9.286	40.02	1.43	37.60	24.08
1806	9.232	9.887	40.58	1.52	37.90	23.68
1811	9.864	10.563	41.25	1.69	39.18	23.25
1816	10.628	11.381	40.84	1.70	39.48	23.54
1821	11.457	12.269	40.47	1.75	40.22	23.73
1826	12.374	13.250	41.43	1.56	37.30	22.40
1831	13.254	14.193	40.89	1.36	36.03	22.43
1836	14.100	15.099	40.56	1.19	35.27	22.47
1841	14.937	15.995	41.71	1.23	35.61	21.61
1846	15.910	17.037	38.99	0.92	35.06	23.71
1851	16.732	17.918	40.46	1.11	35.98	22.65
1856	17.781	19.040	41.53	1.22	35.89	21.92
1861	18.976	20.320	40.62	1.24	36.30	22.71
1866	20.222	21.655	41.47	1.31	35.95	22.06
1871	21.501	23.024			35.00	22.60
1881		26.046			33.90	18.90
1891		29.086			31.40	20.20
1901		32.612			28.50	16.90
1911		36.136			24.30	14.60

Source:

E. A. Wrigley, R.S. Davies, J.E. Oeppen, and R. S. Schofield, *English Population History from Family Reconstitution*, Cambridge Studies in Population, Economy and Society in Past Time no. 32 (Cambridge and New York: Cambridge University Press, 1997), pp. 613-17. See also: E.A. Wrigley and R.S. Schofield, *The Population History of England, 1541 - 1871: A Reconstruction* (Cambridge, 1980), pp. 528 - 29, for the years 1541 - 1871. The figures they present are for England alone, less the now Welsh country of Monmouthshire. To present the figures in the usual form, for

England and Wales together, I have divided their annual data by 0.93383 (as indicated on p. 557, note to Table A5.3).

Table 4. Other Estimates of English Population Growth, 1880 - 1910

Year	Population in Millions	Birth Rates per 1000	Death Rates per 1000
1880	26.000	32.9	19.2
1890	29.000	30.0	18.3
1900	32.500	27.6	15.9
1910	36.100	21.8	14.5

Sources: B. R. Mitchell and Phyllis Deane, eds., *Abstract of British Historical Statistics* (Cambridge, 1962), pp. 29 - 37 for 1880-1910.

Table 5. Changing Demography of Colyton, Devonshire (England)**Average (Mean) Age of First Marriage, 1560-1837**

Period	Men	Women
1560 - 99	28.1 years	27.0 years
1600 - 29	27.4	27.3
1630 - 46	25.8	26.5
1647 - 59	26.9	30.0
1660 - 99	27.6	28.8
1700 - 19	28.1	30.7
1720 - 49	26.2	27.2
1750 - 69	25.0	26.3
1770 - 99	27.6	26.4
1800 - 24	25.6	24.9
1825 - 37	25.9	23.3

Table 7. Demographic Profile of Colyton, 1560 - 1837

Period	Average Age of First Marriage for:		Completed Family Size of Women who married under 30	Period	Life Expectancy of Both Sexes at Birth
	Males	Females			
1560-1646	27	27	6.4	1538-1624	43 years
1647-1719	28	30	4.2	1625-1699	37
1720-1769	26	27	4.4	1700-1774	42
1770-1837	27	25	5.9		

Sources: E.A. Wrigley, 'Family Limitation in Pre-Industrial England', *Economic History Review*, 2nd ser. 19 (1966), 82-109.

E.A. Wrigley, *Population and History* (1969), p. 87.

Table 8. Mean Age of First Marriage, i.e., in Bachelor-Spinster Marriages in England (various counties, over time), in ten-year intervals

DECADE	MALES	FEMALES
1590 - 99	29.3	25.6
1600 - 09	28.3	25.7
1610 - 19	27.5	25.6
1620 - 29	27.6	25.2
1630 - 39	27.3	25.2
1640 - 49	27.4	25.7
1650 - 59	27.5	25.6
1660 - 69	27.4	25.9
1670 - 79	28	26.2
1680 - 89	27.7	25.8
1690 - 99	27.1	25.9
1700 - 09	27.4	26.0
1710 - 19	27.3	26.3
1720 - 29	27	25.9
1730 - 39	26.9	25.5
1740 - 49	26.5	24.8
1750 - 59	26.1	25.0
1760 - 69	25.9	24.5
1770 - 79	26.1	24.3
1780 - 89	25.9	24.0
1790 - 99	25.3	24.0
1800 - 09	25.3	24.0
1810 - 19	25.1	23.6

DECADE	MALES	FEMALES
1820 - 29	25.2	23.8
1830 - 39	24.9	23.1

Source: E.A. Wrigley, R.S. Davies, J.E. Oeppen, and R.S. Schofield, *English Population History from Family Reconstitution, 1580- 1837* (Cambridge and New York: Cambridge University Press, 1997), pp. 130- 34.

**Table 9. Age Specific Marital Fertility Rates per 1,000 women-years lived
and Total Marital Fertility Rates in England**

Periods/Ages	1680-1729	1730-1779	1780-1829
15-19	315	430	532
20-24	410	418	429
25-29	366	364	390
30-34	315	314	312
35-39	240	254	255
40-44	111	134	148
45-49	22	22	23
TMF 20-49	7.32	7.53	7.79
TMF 15-49	8.9	9.68	10.45

Source:

E. Anthony Wrigley, 'British Population during the "Long" Eighteenth Century, 1680 - 1840', in Roderick Floud and Paul Johnson, eds., *Cambridge Economic History of Modern Britain*, 3 vols. (Cambridge and New York: Cambridge University Press, 2004), Vol I: *Industrialization, 1700 - 1860*, Table 3.2, p. 70.

Table 10. Maternal Mortality Rates in England
per 1,000 birth events

Periods: in half centuries	maternal mortality rates per 1,000 births
1650 - 99	16.3
1700 - 49	12.9
1750 - 99	9.3
1800 - 37	5.8

Source: E. Anthony Wrigley, 'British Population during the "Long" Eighteenth Century, 1680 - 1840', in Roderick Floud and Paul Johnson, eds., *Cambridge Economic History of Modern Britain*, 3 vols. (Cambridge and New York: Cambridge University Press, 2004), Vol I: *Industrialization, 1700 - 1860*, Table 3.8, p. 83

**Table 11. Percentages of Total Population Living in Towns
with 5,000 or more inhabitants, 1600 - 1850**

Year	ENGLAND	FRANCE	NETHERLANDS
1600	8	9	29
1700	17	11	39
1750	21	10	35
1800	28	11	35
1850	45	19	39

Source:

E. Anthony Wrigley, 'British Population during the "Long" Eighteenth Century, 1680 - 1840', in Roderick Floud and Paul Johnson, eds., *Cambridge Economic History of Modern Britain*, 3 vols. (Cambridge and New York: Cambridge University Press, 2004), Vol I: *Industrialization, 1700 - 1860*, Table 3.11, p. 88.

Table 3.11, p. 88

Table 12.**Estimates of the Population of London**

1500 (estimate)	50,000 (or more)
1600	200,000
1650	350,000
1750	550,000
1801 (census)	1,088,000
1851 (census)	2,491,000

Table 13: English and French Population, 1681 - 1821

Year	England and Wales	England only	France	England as % of France
1681	5.28	4.93	22.4	22%
1821	12.31	11.49	30.2	38%

Table 14: Growth Rates of English, French, and Dutch Populations from 1681 to 1821 (% per annum)

Country	% per annum	Overall % growth
England	0.95%	133%
France	0.28%	39%
Netherlands	0.06%	8%

Table 15. Estimated Population Totals and Percentage Growth Rates*

Population Totals (millions)

	1550	1680	1820	1900
England	3.0	4.9	11.5	30.5
France	17.0	21.9	30.5	38.5
Netherlands	1.2	1.9	2.0	5.1
Spain	9.0	8.5	14.0	18.6
Italy	11.0	12.0	18.4	32.5
Germany	12.0	12.0	18.1	43.6
Western Europe	61.1	71.9	116.5	201.4
England as % Western Europe	4.91%	6.82%	9.87%	15.14%

	Percentage Growth Rates (Overall: for periods designated)		
	1550-1680	1680-1820	1820-1900
England	64	133	166
France	29	39	26
Netherlands	58	8	149
Spain	-6	64	33
Italy	9	53	77
Germany	0	51	142
Western Europe	18	62	73

*** Notes and sources:**

From the authors: ‘The totals shown become progressively more accurate. Some of those for 1550 and 1680 are subject to very wide margins of error. In many cases the figures used are based on estimates for dates close to the year heading each column rather than for the year itself. The estimates refer to the present territories of the countries shown. The English data exclude Wales and Monmouthshire. For 1820 and 1900 all totals are taken from or estimated from B.R. Mitchell, *European Historical Statistics*, 2nd edn. (Cambridge, 1981), table BI, except for England in 1820. Otherwise the most important sources used were the following: E.A. Wrigley and R.S. Schofield, *The Population History of England, 1541-1871: A Reconstruction* (London, 1981), table 7.8; B.R. Mitchell and P. Deane, *Abstract of British Historical Statistics* (Cambridge, 1962), chapter I, tables 2, 7; M. Reinhard, A. Arnmengaud and J. Dupaquier, *Histoire générale de la population mondiale*, 3rd edn. (Paris, 1968); J. Dupâquier, *La population française aux XVIIe et XVIIIe siècles* (Paris, 1979); C. McEvedy and R. Jones, *Atlas of World Population History* (London, 1978); M. Flinn, ed., *Scottish Population History from the 17th Century to the 1930s* (Cambridge, 1977); C.M. Cipolla, ‘Four Centuries of Italian Demographic Development’, and K.H. Connell, ‘Land and Population in Ireland, 1780-1845’, both in D.V. Glass and D.E.C. Eversley, eds., *Population in History* (London, 1965); J.A. Faber, H.K. Roessingh, B.H. Slicher van Bath, A.M. Van der Woude and H.J. Van Xanten, ‘Population Changes and Economic Developments in the Netherlands: A Historical Survey’, *A.A.G. Bijdragen*, 12 (1965).’

Table 16. 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

Great Britain: England, Wales, and Scotland

^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* (1972), Vol. IV:2, pp. 747-48.