The Demographic Transition and Human Capital, 1700-1870

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Introduction

In 1700 four features characterized all European societies: high fertility, modest levels of education, the dominance of physical over human capital, and low rates of economic growth. By 1870 in much of Europe modern economic growth was underway, fertility levels had begun their decline to modern levels, education levels were rising, and human capital was becoming an important a source of income. These conjunctions suggest there must be a connection between the onset of modern economic growth, the decline of fertility, and the rise of human capital. The nature of that connection remains very much in dispute. What triggered the switch to the modern demographic regime with few children despite high incomes? In particular was this another independent innovation, as significant as the Industrial Revolution? Or was this just a delayed echo of the earlier Industrial Revolution? The Industrial Revolution and the Demographic Transition are the two great forces that explain the upward march of modern incomes. So far they have stood as independent phenomena, the Industrial Revolution not leading in Europe to any decline in fertility till over 100 years later. Our instincts suggest that there is some underlying connection between these events. The difficulty is to connect them in a way also reconciles the differences in

fertility behavior in cross section in the pre-industrial world, the transition period, and the modern world.

I. The Pre-Industrial Demographic Regime

All European societies had high fertility rates in 1700, but matched by high mortality rates so that net rates of population growth remained modest. Thus the average growth rate of population in Europe in the years 1700-1750 was 0.3%, with a range between 0% (the Netherlands) and 0.9% (Russia).[1] Figure 1 shows, for example, shows two measures of fertility for England, 1540-2000. The first is the gross reproduction rate, *GRR*, the average number of daughters born per woman who lived through the full reproductive span, by decade. Such a woman would have given birth to nearly 5 children all the way from the 1540s to the 1890s. Since in England 10-20 percent of each female cohort remained celibate, for married women the average number of births was close to 6.

The *demographic transition* to modern fertility rates began only in the 1870s in England, as in most of Europe, and then progressed rapidly. By 2000 English women gave birth on average to less than 2 children. This transition in England was similar in timing to that across a whole range of European countries at the end of the nineteenth century.

The second measure of fertility is the Net Reproduction Rate, *NRR*, the average number of daughters that would be born though their lifetime by the average female born in each decade. If the *NRR* is one, then each female born just replaces herself over the course of a lifetime. Net reproduction rates fell much less.

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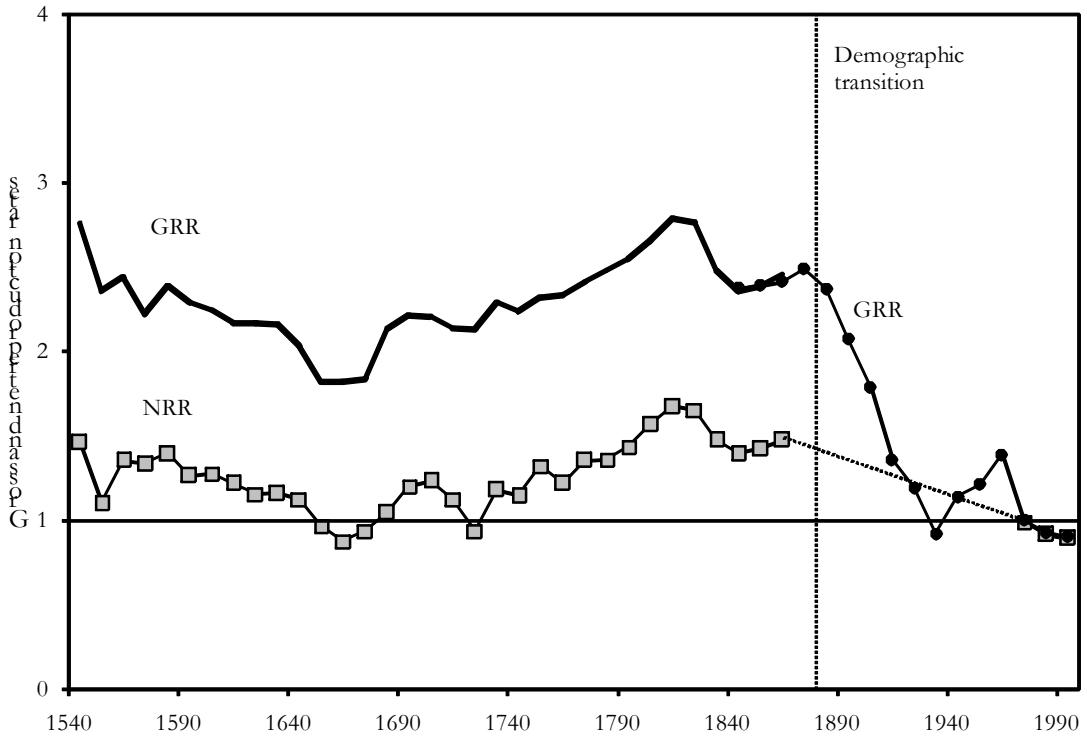
[1] Livi Bacci (2000), p. 8.

Figure 1: The Fertility History of England, 1540-2000



The mechanism we believe that kept population growth rates low, and in line with resources, before the Industrial Revolution was the Malthusian Trap. This depends on just three assumptions:

1. The *birth rate*, the number of births per year per thousand people, is constant or rising in real incomes. The birth rate at a given income varies across societies depending on social conventions on reproduction.
2. The *death rate***,** the number of deaths per year per thousand persons, declines as material living standards increase. Again, the death rate will differ across societies depending on climate and lifestyles.
3. *Material living standards* decline as population increases.

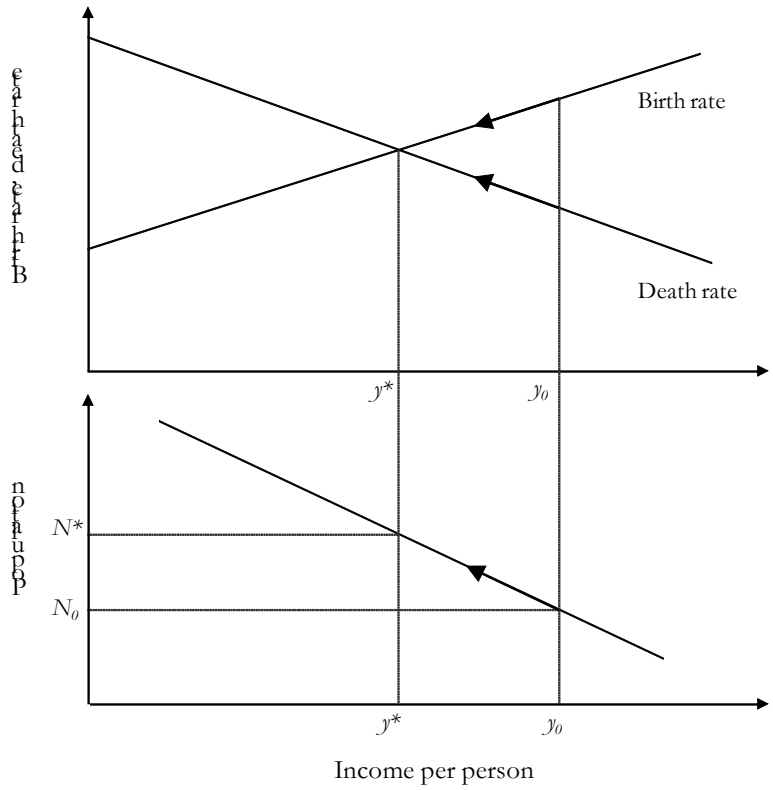
Figure 2 shows these assumptions. In the upper panel birth and death rates are plotted on the vertical axis, material income per capita on the horizontal axis. The first two

assumptions of the simple Malthusian model imply that there is only one level of real incomes at which the birth rate equals the death rate, denoted as y^*. And this constitutes a stable equilibrium. Thus y^* is called the 'subsistence income' of the society: it is the income at which the population barely subsists, in the sense of just reproducing itself. This subsistence income is determined without any reference to the production technology. It depends only on the factors which determine birth and death rates. Once we know these factors we can determine the subsistence income.

An implication of the Malthusian model is that in the pre-industrial world high fertility rates will produce high death rates, low life expectancies, and low incomes. A society can raise incomes and life expectancy only through reducing the birth rate at any given income level. A second implication is that, unlike the modern world, high income groups within a society will tend to have higher net fertilities. Thus the demographic transition may have involved very little change in fertility behavior by the poor, but a very substantial change by the rich.

The bottom panel of Figure 2 illustrates the third assumption. The panel has on the vertical axis the population, N, and on the horizontal axis the material income. As population increased material income per person by assumption declined. Figure 2 also

Figure 2: The Malthusian Regime



shows how an equilibrium birth rate, death rate, population level and real income were arrived at in the long run in a pre-industrial economy. Suppose we start at an arbitrary initial population N_0 in the diagram, greater than N^*. This generates an income y_0, above the subsistence income. At this income the birth rate exceeds the death rate, so population grows until income falls to y^* and population equals N^*.

Since the time of Malthus's second edition of the *Essay on a Principle of Population* it was believed that Western Europe was a comparatively rich in the eighteenth century, because it had a unique system of fertility limitation for pre-industrial societies, and because economic growth allowed some relief from the Malthusian constraints. From the earliest records fertility rates in north-west Europe were well below the biological possibilities. In England in the 1650s, for example, when fertility was at its pre-industrial minimum, the birth

rate was 27 per 1000, less than half the biological maximum. The average woman in England then gave birth to only 3.6 children.[2]

This north-west European fertility limitation was the product of a social pattern of late marriage by women, combined with a large percentage not ever marrying, known as the *European Marriage Pattern*. This pattern was unique for pre-industrial societies.[3] Indeed Malthus himself argued that the prosperity of north-west Europe was based on its exercise of the *preventive check* on population growth through marriage choices. It was also thought that the fertility limitation of north-west Europe reflected a more individualistic, rational society where men and women realized the costs of high fertility and took steps to avoid it. Europe's eventual experiencing of the Industrial Revolution was thus foreshadowed hundreds of years earlier by its adoption of a modern marital pattern and family structure, a structure emphasizing individual choice and restraint. [4]

More recent research, however, suggests that perhaps most societies before 1800 limited fertility by as much as in north-west Europe, though by very different mechanisms. Eastern Europe was probably more of an exception to the pre-industrial norms than was north-west Europe. It also suggests that the reasons for fertility limitation in north-west Europe had little to do with rational individual calculation, and much more to do with social customs.

Fertility Limitation within Europe

The European Marriage Pattern, which kept fertility in north-west Europe well below the biological possibilities, was a curious mechanism. For there is no sign in these countries before 1800 that contraceptive practices were consciously employed.[5] Fertility levels within marriage were always high. Table 1, for example, shows marital fertility for a variety of countries in north-west Europe before 1790 compared to the Hutterite standard.[6]

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[2]Wrigley et al., 1997, 614.

[3]Hajnal, 1965.

[4]Macfarlane, 1978, 1987.

[5]France just before the French Revolution is a possible exception, though any fertility limitation there in the late eighteenth century was limited.

[6]The Hutterites are communal Anabaptists of German origin, now mainly located in Canada, with good health, but early marriage and no fertility limitation within marriage. They thus provide a reference on the possibilities of unrestricted fertility.

Table 1 Annual birth rate, married women, north-west Europe before 1790[7]

Country or Group	20-4	25-9	30-4	35-9	40-4	All Births (20-44)
Hutterites	.55	.50	.45	.41	.22	10.6
Belgium	.48	.45	.38	.32	.20	9.1
France	.48	.45	.40	.32	.16	9.1
Germany	.45	.43	.37	.30	.16	8.6
Italy	.43	.41	.38	.31	.16	8.5
Switzerland	.45	.38	.34	.22	.16	7.8
Scandinavia	.43	.39	.32	.26	.14	7.7
England	.43	.39	.32	.24	.15	7.6

Sources: Clark (2007), Livi Bacci (2000), table 5.3, p. 110.

Birth rates within marriage were lower than for the Hutterites, but by different amounts across countries. English fertility was the lowest, French the highest. A woman married from ages 20 to 44 had 7.6 children in England in the years before 1790, but 9.1 in Belgium or France. In comparison Hutterite women would have 10.6 children in these 25 years. But these European differences from Hutterite levels mostly stemmed from health and nutrition differences, and adherence to different social practices, without individual targeting of fertility.

Part of the evidence against conscious contraceptive practices is the lack of patterns in fertility that might be found where there was conscious control of fertility. With such control older married women would be more likely to have achieved their target fertility, and be avoiding further births. In this case, absent confounding factors, European marital fertility should have fallen further below the Hutterite standard for older women. As table 1

[7]Flinn, 1981, 86.

shows the relative birth rate in early Europe compared to Hutterite rates is instead independent of age.

Similarly if there were a target number of children, then we might observe that women with many children by a given age would show lower fertility at that age.[8] Or with targets, the death of a child would increase the chances of a birth in the following years, since now the family was falling further behind its target. Such targeting patterns do not occur within European marriages before 1800.

Yet despite the apparent absence of contraceptive practices, the European Marriage Pattern kept the birth rate in most pre industrial north-western European populations low, at only 30-40 births per thousand. This marriage pattern had four features.

1. *A late average age of first marriage for women: typically 24-26.*
2. *High fertility within marriage.*
3. *Many women never married: typically 10-25 percent.*
4. *Low illegitimacy rates: typically 3-4 percent of births.*

The low illegitimacy rates imply large scale abstinence from sex outside marriage, since the majority of women of reproductive age were unmarried. These features avoided more than half of possible births simply from marriage patterns. Delayed marriage avoided nearly a third of possible births. Eschewing marrying avoided 10 to 25 percent of the remaining births. Thus fertility was reduced by a third to a half by the marriage pattern. Also since the years 16 to 25 are those of higher fertility for women, the proportion of births avoided is even higher than this calculation would suggest.

Table 2 shows how the European marriage pattern kept total fertility rates well below the biological possibilities in northwest Europe. Interestingly, as the last column of the table shows, except for France, these total fertility rates were largely unchanged still in

[8]Both these tests unfortunately run into the problem that people would have different targets for family sizes. The ones who want lots of children may then marry earlier and so still have high fertility levels at later ages.

Table 2 Age of marriage of women, marital fertility, and total fertility rates before 1790

Country or Group	Mean Age at First Marriage	Births per married women	Total Fertility Rate	TFR 1870
Belgium	24.9	6.8	6.2	-
France	25.3	6.5	5.8	2.8
Germany	26.6	5.6	5.1	5.3
England	25.2	5.4	4.9	4.9
Netherlands	26.5	5.4	4.9	5.2
Scandinavia	26.1	5.1	4.5	4.6

Sources: Clark (2007), Livi Bacci (2000), p. 136.

1870, long after the onset of the Industrial Revolution. But limitation of fertility in northwest Europe turns out to be not as unique as was once thought. Forager societies have limitations on fertility that are typically just as strong, though the mechanism here is through longer spacings between births. And recent research suggests that fertility limitations in Japan and China in the eighteenth century were just as strong, despite early and universal marriage. The reduction in fertility here again came from longer spacing of births within marriage.

As Hajnal famously observed, the European Marriage Pattern was observed only in Europe to the west of a line draw from St Petersburg to Trieste. To the east marriage before 1800 seems to have been early and universal, with again no constraint on fertility within marriage, so that fertility rates were very high: close to the biological maximum. Table 3

Table 3: Total Fertility Rates in Different Pre-Industrial Societies

Country or Group	Mean Age at First Marriage	% never married	Total Fertility Rate
Northwest Europe	26	12	5.0
Russia	16	1	7.3
China	19	1	5.0
Japan	19	1	5.2
Forager Societies	17	1	4.6

Sources: Clark (2007), Mironov (2000), pp. 57, 67, 73.

shows that it was Eastern Europe more than the northwest that seems to have had an unusual level of fertility for pre-industrial societies.

When we look towards the decline of fertility after 1870 there seem two possible general drivers. The first is the general rise in incomes following the Industrial Revolution, the second a general rise in human capital investments in children leading to a desire for "quality" as opposed to "quantity." But the evidence from the period before 1870 is that in cross section those with the highest incomes, and the greatest investments in the human capital of their children, also had on net the largest numbers of children.

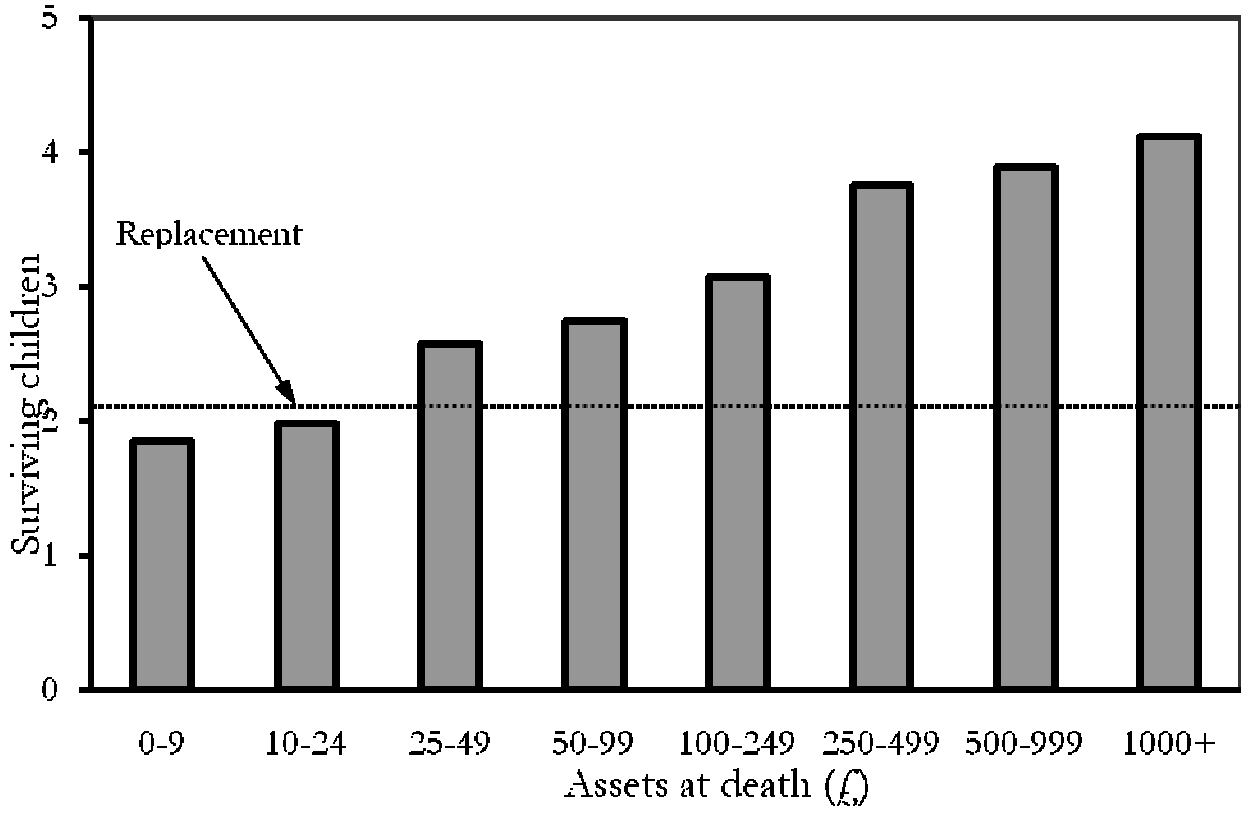
The clearest evidence we get of this is from England in the early seventeenth century. Wills made by men within a few years of their deaths reveal both the numbers of surviving children at the time of their death, and the assets of the testator. Figure 3 shows the numbers of surviving children per male of each of eight bequest classes - £0-9, £10-24, £25-49, £50-99, £100-199, £200-499, £500-999, £1000+ - revealed by the wills. There is a very powerful connection between assets and surviving children. A man with less than £25 in bequests would typically have fewer than two children, while someone with £1000 or more, more than four children. Since wealthier men on average were more likely to be literate than poorer men, greater net fertility was positively (though weakly) associated with

the father's literacy. Thus those likely to be investing more in children's human capital were also those having on net more children.[9]

Evidence from rural Sweden in the mid-nineteenth century, and for eighteenth century France, suggests a similar pattern of greater reproductive success by the more prosperous. Mironov, however, gives data for Russia in the 1840s and 1850s that suggests that net fertility varied little by social class in Russia, with birth rates high for all social classes – landed nobility to peasants – and similar mortality rates.[10]

This suggests that at least in the areas dominated by the European Marriage Pattern there was a positive association between net fertility, income and education which somehow after 1870 became translated into a negative connection.

Figure 3: Wealth and surviving Children, England 1585-1640.



[9]Clark and Hamilton (2006).

[10]Mironov (2000), pp. 81-2.

b. Income, Human Capital, and Fertility
c. Eastern Europe and the Hajnal Line

II. The Malthusian Regime in Disequilibrium

a. Effectiveness of Malthusian adjustments

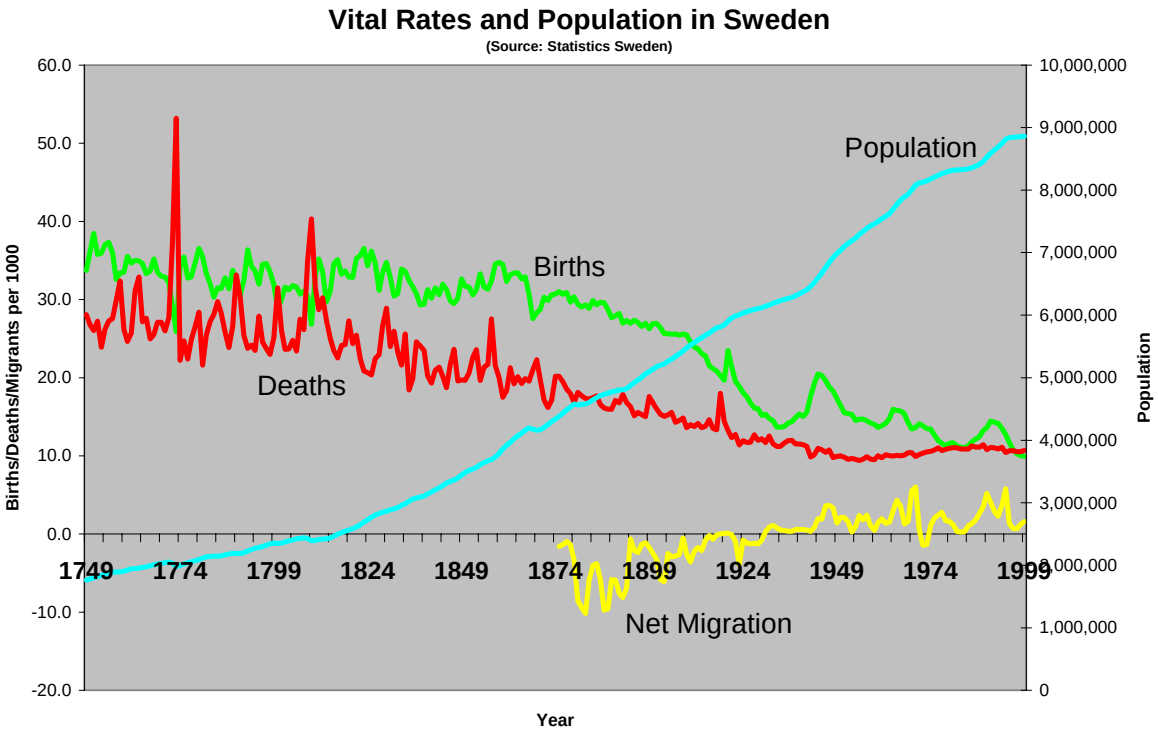
By the nineteenth century, Europe had entered an unprecedented period of population growth. This was not the first time that the population had increased, but nineteenth-century population growth differed in two ways: the size of the European population reached unprecedented heights, and population increases were not reversed by the return of catastrophic mortality. As Table 4 shows, population growth occurred everywhere in Europe. Annual rates of growth were between 4 and 13 per thousand with two important exceptions (France and Ireland). Consequently, the population of Europe more than doubled between 1800 and 1900, compared to increases of 32 percent in the sixteenth century, 13 percent in the seventeenth century, and 56 percent in the eighteenth century (Livi Bacci 2000). Rates of growth were not associated with economic development in any clear way. The fastest growth was in England, the industrial leader, but Belgium, which also industrialized early, grew more slowly than predominantly rural areas in Scandinavia and Eastern Europe. The similarity in growth rates across the continent actually conceals a variety of demographic regimes in Northwestern, Eastern and Mediterranean Europe.

Table 4.
Rate of growth and rate of natural increase, selected countries, 1700-1900
(Sorted by rate of growth 1800-1850)

Country	Rate of growth (Persons per thousand per year) 1750-1800	1800-1850	1850-1900	Rate of natural increase 1850-1900
England	7.9	13.2	12.1	12.8
Norway	6.4	9.4	9.3	13.9
Finland		8.9	9.4	10.1
Russia	8.9	8.6	12.1	
Denmark		8.6	10.5	12.2
Rumania		8.1	9.3	
Sweden	5.6	7.9	7.8	11.5
Europe	5.8	7.8	7.6	
Netherlands	2.0	7.8	10.0	13.0
Belgium		7.6	8.5	9.0
Greece		7.4	11.1	7.5
Germany	7.3	7.4	9.3	11.3
Spain	4.2	6.7	4.6	6.0
Serbia		6.6	13.8	
Switzerland		6.3	6.5	7.2
Austria-Hungary		6.1	7.4	8.1
Italy	2.9	6.0	6.3	8.9
Ireland	10.1	4.4	-7.7	6.9
France	3.5	4.3	2.2	2.0
Bulgaria		4.1	6.5	
Portugal		4.1	7.1	9.6

Sources: Livi Bacci (2000), Table 1.1; Sundbärg (1968), Table 11; Rothenbacher (2002), CD-ROM Table 8.

Figure4

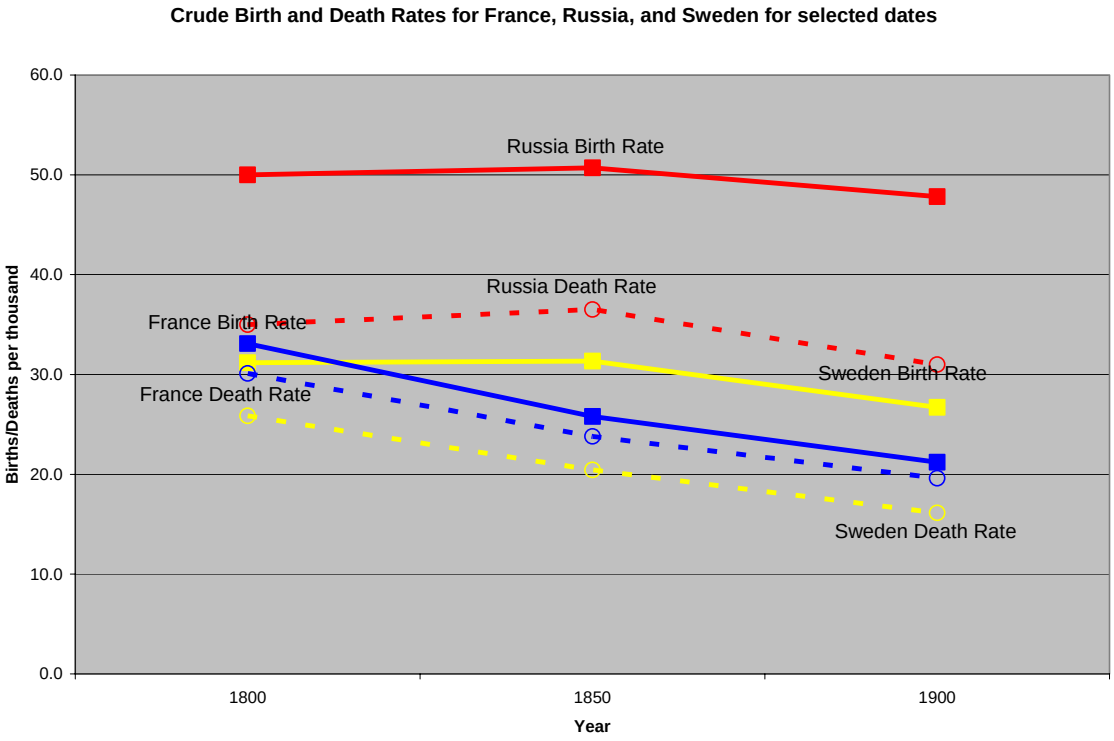


Source: Statistics Sweden.

In Northwestern Europe nineteenth-century population growth followed a classic trajectory known as the Demographic Transition, which is illustrated for Sweden in Figure 4. The Crude Death Rate (deaths per thousand persons) began to decrease in the mid-eighteenth century, although severe epidemics are evident in 1773 and 1809. The Crude Birth Rate (births per thousand persons), however, remained nearly constant until the 1870s. As the gap between birth and death rates (known as the Rate of Natural Increase) widened, the Swedish population grew at an accelerating rate. By the end of the twentieth century, falling birth rates closed the gap between births and deaths, ending population growth. Thus, the primary cause of population growth in Sweden and most of Western Europe was falling death rates.

In the Russian Empire and much of Eastern Europe population growth must be explained in a different way. Mortality, especially for infants, was extremely high in Eastern Europe throughout the nineteenth century. Blum and Troitskaja (1996) estimate that life expectancy at birth in the Moscow region in the mid-nineteenth century was around 24 years, compared to life expectancies around 40 years in Western Europe at the same time. Birth rates in Eastern Europe were also much higher than in the West. In Russia, early marriage resulted in Crude Birth Rates around 50 per thousand (Mironov and Eklof 2000).

Figure 5.



Sources: Livi Bacci (2000) Table 6.3; Statistics Sweden; Mironov and Eklof (2000: 80-94).

Three different demographic patterns are illustrated in Figure 5, which gives estimates of Crude Birth and Death Rates for Sweden, Russia, and France around 1800, 1850, and 1900. As we have seen, death rates were already falling by 1800 in Sweden, but the birth rate did not begin to fall until the 1870s. The estimated birth and death rates for Russia are much

higher than those for either Sweden or France, but there were signs of decline in both by 1900. The French case is unique. In France birth control became widespread at the end of the eighteenth century, resulting in an early turning point in the birth rate. Since decreasing fertility paralleled decreasing mortality, France did not experience the high rates of population growth common in other parts of Europe. While the population of Europe more than doubled between 1800 and 1900, France grew by 65 percent from 29 to 41 million. In the same period England and Wales grew from under 9 to over 30 million, and Germany grew from about 25 to 56 million.

This new demographic regime did not involve an abandonment of Malthusian behavior. Ages at marriage in Northwestern Europe remained high in comparison to most other societies, and in some cases, notably Ireland, they rose even higher. There was even some movement toward later marriage in parts of Southern and Eastern Europe. Changes in nuptiality, however, were not enough to offset the effects of lower mortality on population growth. Growing populations increasingly responded in non-Malthusian ways, first with migration and later with birth control.

b. Mortality decline

In an influential 1962 article and later book, Thomas McKeown (McKeown 1976, McKeown and Record 1962) argued that better nutrition, and by implication rising incomes due to economic development, were the main cause of mortality decline in the first three quarters of the nineteenth century. Subsequent research has challenged McKeown's reasoning and his conclusions, and it is difficult to attribute mortality decline to one predominant explanation. Lower death rates were achieved in a number of different ways, and poorer countries in Southern and Eastern Europe were increasingly effective in reducing mortality. Instead of McKeown's emphasis on the direct impact of rising incomes through

better nutrition, we can see a number of indirect connections between economic development and mortality, which flowed from advances in knowledge, greater government effectiveness, and the growing integration of markets for goods and information.

1. **Reduced frequency and severity of epidemics.** The major cycles of population growth and decline in Europe from the thirteenth to the eighteenth century were heavily influenced by the occurrence of severe epidemics, especially bubonic plague. Plague had such a devastating effect, because it had a very high case fatality rate – over two thirds of those who contracted the disease would die from it (Livi Bacci 2000). Plague usually disappeared from Europe completely between epidemics and was reintroduced by trade with places in Asia where plague was endemic among animal populations.

A wide variety of explanations have been offered for the disappearance of plague including viral mutations, competition between species of rats, and new building materials. Recent authors highlight the increasing effectiveness of government interventions and communication (Bourdelais 2006, Livi Bacci 2000). By 1720, when the last epidemic of plague broke out in Marseilles, the French government was able to impose a more effective cordon sanitaire on land and quarantines on shipping were more rigorously enforced. The military success of the Hapsburg Empire in Eastern Europe may also have reduced the risk of plague in Europe by sealing trade routes through Ottoman Turkey.

Epidemics in pre-industrial Europe were often triggered by other events, such as war and famine. In times of distress, migrants often carried infections to new areas. For example, epidemics of typhus followed Napoleon's defeat at Waterloo. Improvements in transportation reduced the incidence of epidemics by creating broader markets that were less affected by local crop failures.

Vaccination against smallpox, which was preceded by effective but more dangerous forms of inoculation, removed another major epidemic disease. In the eighteenth century, smallpox returned approximately every seven years in rural areas, and the disease was endemic in larger cities. Vaccination campaigns dramatically reduced the incidence of smallpox in the early nineteenth century, but there were scattered outbreaks until the duration of immunity from vaccination was understood.

2. **Nutrition.** McKeown's thesis that mortality decline in the nineteenth century was primarily due to improvements in nutrition has been the subject of considerable controversy. Arguing against McKeown, Livi Bacci (1991, Livi Bacci 2000) points to research suggesting that mortality only rises when malnutrition is severe. Since severe malnutrition was uncommon except in famines, he argues that improvements in diet had little effect on long-term trends mortality. Robert Fogel (1986, Fogel 1991, Fogel 1997), on the other hand, estimates that a significant percentage of the population of pre-industrial Europe suffered chronic malnutrition, severe enough to have an impact on mortality, especially among children. Fogel, however, refers to nutritional status, which is an outcome of both diet (food intake) and the burdens placed on the body by disease and labor. Since diseases affecting nutritional status, particularly diarrheal diseases in early childhood, (cf. Alter 2004).

Simon Szreter (1988) re-examined the evidence presented by McKeown and arrived at the contrary conclusion that public health measures rather than a rising standard of living were most responsible for decreasing mortality in the mid-nineteenth century. McKeown's argument rested primarily on discrediting other explanations of mortality decline, and he provided little direct evidence linking nutrition or the standard of living to lower mortality. In particular, he argued that decreasing rates of airborne diseases, especially tuberculosis,

cannot be attributed to other explanations. Szreter (1988) reinterprets McKeown's evidence to show that waterborne diseases played a larger role than McKeown acknowledged.

3. **Medical knowledge.** Most accounts of demographic history discount the role of medical science in mortality decline. It is often supposed that medical science had little of value for treating or preventing disease before the acceptance of the germ theory. This view has been challenged by James C. Riley (1986), who argues that eighteenth-century medical ideas drew attention to environmental factors. Since "miasmas" became associated with dead and rotting material, Europeans drained swamps, cleared refuse, and distanced themselves from graveyards, abattoirs, and waste. Riley credits this movement with progress against malaria. These ideas created an interest in clean water, closed sewers, and better ventilation even before the germ theory was established.

Levels and trends in infant mortality, which was the largest component of pre-industrial mortality, varied considerably across Europe, but new ideas about child care had an impact in some places. Infant mortality was particularly high in areas, like Bavaria, that practiced early weaning. Very young infants cannot digest non-human milk, and they receive protection against disease as well as nutrition from breastfeeding. In some places, mothers traditionally withheld colostrum, which is produced in the first few days after delivery and is particularly rich in nutrients and antibodies. By the eighteenth century, medical opinion had shifted in favor of breastfeeding. Rousseau, for example, excoriated mothers who gave their children to wet nurses. In the mid-eighteenth century, Sweden began licensing midwives and training them to promote breastfeeding, and infant mortality began to fall after 1800 (Brändström 1997). Ólöf Garðarsdóttir (2002) describes events on the island of Vestmannaeyjar, where a young physician cut infant mortality in half by teaching mothers to care for the umbilical stump in the late 1840s.

4. **Public health.** The early public health movement owed much to environmental theories of disease, which were common in the early nineteenth century. Riley (2001) refers to these ideas as "filth theory," the belief that epidemic diseases could be created in rotting waste and transmitted through the air. Advocates, like Chadwick in England, promoted waste removal, water and sewage systems, and more light and air in rapidly growing urban slums. Even though the environmentalists were often reluctant to accept the growing evidence for the germ theory of disease, they laid the groundwork for major infrastructure projects that finally ended the "urban penalty." Riley (2001) points out that the European approach to reducing disease was highly capital intensive. Some poor countries today have achieved high life expectancies by teaching their people to use pit latrines and boil their water rather than building enclosed sewers and water treatment plants.

The largest improvements in mortality occurred in the third quarter of the nineteenth century when the implications of the germ theory could be incorporated in urban infrastructure. Evans (2005) tells the story of Hamburg, which resisted measures based on the germ theory promoted by advocates like Robert Koch. In 1892 Hamburg suffered a devastating cholera epidemic, while the neighboring city of Altona, which had installed a more effective water filtration system, was much less affected.

Many of the measures that were successful in Western Europe spread to Eastern Europe. Mirinov (2000) describes an expansion of medical services in Russia and the proliferation of organizations dedicated to reducing infant mortality.

c. Marriage.

The history of nuptiality in nineteenth-century Europe is in many ways a story of the dog that did not bark. Pre-existing marriage patterns continued, in spite of dramatic changes in economic and demographic conditions. The "preventive restraints" of late marriage and

permanent celibacy did not erase the growing gap between births and deaths. Nor did the growing numbers of industrial workers liberate themselves from parental control to marry at younger ages, as many contemporaries feared they would. Differences between marriage patterns in Western and Eastern Europe also persisted.

Table 5.
Index of Proportion Married (I_m) for European countries, 1850-1900

	1850	1860	1870	1880	1890	1900
Yugoslavia-Serbiaonly						0.804
Rumania						0.735
European Russia			0.609			0.684
Hungary				0.688	0.712	0.676
Greece						0.637
Poland						0.634
Spain					0.591	0.573
France	0.533	0.539	0.542	0.550	0.555	0.557
ITALY (Adjusted)		0.551	0.558	0.533	0.530	0.527
Germany (Contemporary boundaries)			0.462	0.498	0.493	0.505
Finland				0.496	0.490	0.487
Heledanmark	0.440	0.474	0.455	0.462	0.475	0.480
England and Wales	0.482	0.499	0.504	0.496	0.471	0.468
Portugal		0.441		0.459	0.462	0.466
Belgium				0.427	0.425	0.464
Luxemburg						0.461
Austria					0.458	0.457
Nederland		0.407	0.440	0.468	0.449	0.454
Switzerland		0.375	0.411	0.444	0.428	0.438
Norway				0.410	0.424	0.425
Sweden				0.419		0.422
Scotland		0.399	0.399	0.400	0.380	0.384
Iceland	0.357	0.385	0.357	0.294	0.332	0.383
Ireland			0.399	0.364	0.330	0.316

Source: European Fertility Project

Table 5 presents I_m, an index of the percentage of women of childbearing age who were married, from the European Fertility Project (Coale and Watkins 1986). A value of .5 means that only 50 percent of women between 15 and 49 were married. Estimates in the table are sorted in descending order by their values in 1900, when most countries were represented.

The results reproduce Hajnal's generalization about East and West. The highest values of I_m were in Eastern Europe, the lowest values were in Northwestern Europe, and Mediterranean countries tended to be in between. The two countries that are most out of place in Table 5 are France and Ireland. We saw earlier (Table 4) that these countries were also outliers in having unusually low rates of growth, and here we find that they earned that distinction in different ways. France falls between Spain and Italy, with the highest proportion of women married of any country in Northwestern Europe. Ireland had the lowest proportion married in all of Europe in 1900, although it was sometimes surpassed by Iceland in previous years. Population growth was slow in France, because of very low marital fertility resulting from the early adoption of birth control. In Ireland, marital fertility remained high, but marriage was extremely late and permanent celibacy was common.

In Eastern Europe marriage remained much earlier than in the West, but there were some initial movements toward later marriage. Mironov (2000) notes that marriage was earlier in areas with more land per capita, and marriage ages were higher in industrial areas (Berelowitch, et al. 1997).

b. Migration

II. Demographic Transition and the Industrial Revolution

a. Human Capital and the Demand for Children

b. Child Survival

c. Child Labor

d. Returns to education

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