

In the early decades of the period 1680-1820 the population of England was almost stationary. By the end the rate of growth had soared to 1.5 per cent a year- the highest rate ever experienced in English history. At this rate a population doubles in less than half a century. Such a transformation must have profound consequences for the economy and society. Why did the rate of growth of England's population accelerate in this way? What was the relative importance of higher fertility and of lower mortality? What were the broader economic and social factors which lay behind these remarkable changes?

In the first of the two articles in this opening issue of ReFRESH Prof. E. A. Wrigley, of the LSE, reports on the answers which the latest research has given to these questions.

Population Growth: England, 1680-1820

Though it has long been agreed that population growth accelerated sharply in the course of the 'long' eighteenth century (1680-1820), there have been sharp differences of view about the reason for the acceleration. The disagreements have extended both to what might be termed demographic mechanics (i. e. the relative parts played by changes in birth and death rates), and to the wider context of the change. In what follows I shall describe the results of recent research which appears to have settled the controversy regarding the immediate demographic mechanics of the remarkable spurt in growth rates. Wider issues, such as the interplay between economic circumstances and the tempo of birth, marriage and death, also merit discussion in the light of the new findings, and are touched on briefly at the end of this essay.

The old argument

If a population is to pass from a stationary state to one of rapid growth, it is evident that either mortality must fall considerably, or fertility must rise substantially, or there must be some combination of the two of a less extreme kind. It might have been expected that differences of interpretation concerning the relative importance of the two factors would have narrowed as the volume of research increased. This has not proved to be the case. In recent years it has been argued at one extreme that the bulk of the acceleration was due to increased fertility (Krause); and, at the other that the sole reason for increasingly rapid population growth lay in falling mortality (McKeown). There have also been, of course, many more shaded views (notable amongst them the judicious writings of Habakkuk). In general the 'pro-mortality' arguments have held the field. McKeown's confident and lucid exposition of the argument that it was unnecessary to look beyond a fall in

mortality for an explanation has been particularly influential.

The lack of progress in resolving an old argument has ; simple explanation. In the 1970s no less than in the 1800s the prime source of empirical information about population movements in the eighteenth century lay in the parish register abstracts collected by John Rickman. The first census was taken in 1801 in the wake of a lively debate about the growth of population in the preceding century. As ; response to this debate, Rickman - who supervised the census operations - not only collected information about those living in 1801, but also approached the incumbent of every parish asking for tabulations of the totals of baptisms burials and marriages registered at intervals over the course of the century since 1700. Unfortunately, the abstracts suffer from defects so serious that Flinn remarked of result: based on them that 'whether in the form of totals of population or of the vital rates' they 'are built on such shifting sand as to make them virtually unacceptable for the purposes of modern scholarship'. It was known from the first that the number of births and deaths greatly exceeded the number of recorded baptisms and burials. But it proved difficult to establish the extent of the shortfall in either case and equally difficult to determine the timing and extent of the deterioration in registration as the century progressed Furthermore Rickman had collected the baptism and burials data only for every tenth year prior to 1780; only for marriages had he requested annual totals from 1752 onwards.

Nor did the problems end with deficiencies in the data Even if registration had been complete, there would still have been major uncertainties in the absence of more sophisticated techniques of analysis. Once again the fundamental difficulty was straightforward. Conventional demographic measures depend upon enumerating

Table 1 The growth of population in England (less Monmouth) during the 'long' eighteenth century.

	Total population (000s)	Compound annual percentage growth rate over preceding decade		Total population (000s)	Compound annual percentage growth rate over preceding decade
1681	4930		1761	6147	0.6
1691	4931	0.0	1771	6448	0.5
1701	5058	0.3	1781	7042	0.9
1711	5230	0.3	1791	7740	0.9
1721	5350	0.2	1801	8664	1.1
1731	5263	-0.2	1811	9886	1.3
1741	5576	0.6	1821	11492	1.5
1751	5772	0.3			

Source: Wrigley and Schofield, *Population history of England*, table A3.1, pp. 528-529.

population at risk (the *stock*, usually obtained from a census); counting the number of events of a particular type (the *flow*, usually taken from vital registration); and then deriving a *rate* to express the incidence of the phenomenon. Thus, calculating a crude birth rate implies knowledge of the total population and of the total flow of births. Again, age-specific mortality rates usually depend on, say, knowing the total of men aged 25-29 and the number of deaths in that age group. But before 1801 there were no censuses, and so without a stock it was hard to employ conventional methods successfully. It seemed doubtful whether even the simplest types of rates could be cajoled out of the kind of evidence available; and if crude birth and death rates could not be estimated with confidence, *a fortiori* more refined measures could not be derived.

New methods and new data

Both the data deficiencies and the technical problems, however, have been largely overcome in recent years and as a result some old conundrums now appear much less

baffling. The technical problems have been solved by two developments. The first, *family reconstitution*, depends upon being able to link together records relating to the individuals comprising a family. It is feasible only where register entries name those whose baptisms, marriages and burials are recorded, and provide sufficient information to identify each individual unambiguously. Though laborious, family reconstruction can provide very detailed and accurate information about the demographic history of individual parishes. The second, *back projection*, in contrast needs only totals of events. But, provided they can be 'anchored' to a census with reliable age data at the end of the data series, the technique will yield estimates of population totals at any desired intervals, as well as details of age structure, crude birth, death and marriage rates and estimates of net migration. It also provides the information needed to calculate two of the most useful general demographic measures: the gross reproduction rate and expectation of life at birth (see Wrigley (1966), and Wrigley and Schofield). These measures are defined in the box below.

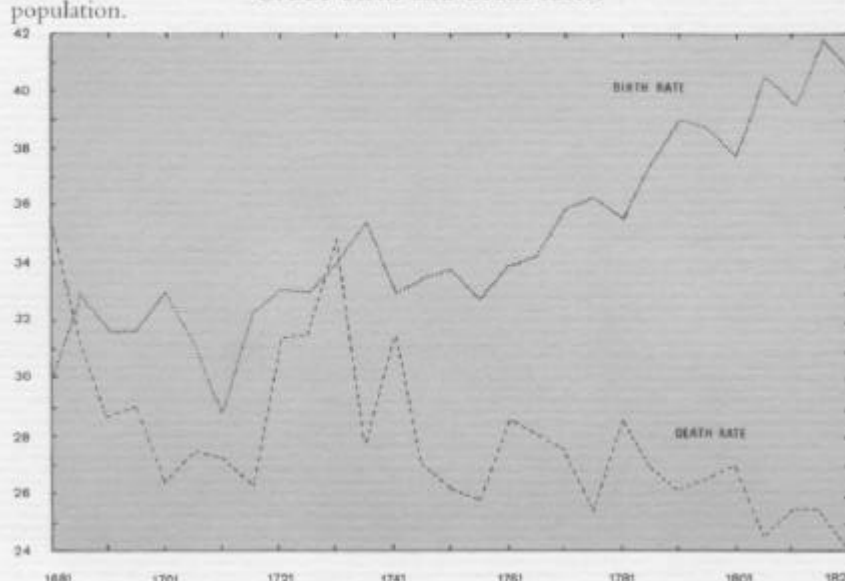
The data problems have been tackled by returning to the source which Rickman tapped. The best quality registers have been used for reconstitution work; and monthly totals of baptisms, burials and marriages have been counted for a

Gross reproduction rate (GRR) measures the number of girl babies which would be born to the average woman at prevailing fertility rates assuming she survived to the end of the child-bearing period. It is therefore a 'pure' measure of fertility.

Expectation of life at birth (eo) is similarly a 'pure' measure of mortality. It expresses the number of years a new-born child will live at prevailing age-specific mortality rates. It is, therefore, unaffected by adventitious factors such as the current age structure of the population.

sample of 400 parish registers over the whole period from the establishment of the parish register system in 1538 to the inception of state vital registration in 1837. Suitably corrected for the several sources of bias, error and deficiency in registration, they can be made to yield estimates of the national totals of births deaths and

Figure 1: Fertility and mortality change. Crude birth and death rates.



marriages from the last years of Henry VIII until the start of Victoria's reign.

Combining new methods with new data the course of change in the 'long' eighteenth century is at last laid bare. Table 1 shows the growth in population occurring in England between 1681 and 1821, and the compound annual growth rates prevailing in each decade. The total population rose by 133 per cent between the two dates, but growth was heavily concentrated in the second half of the 140-year period. There are no surprises, though the slowness of growth in the first 50 years should be emphasised: in 1731 the population was only 7 per cent larger than in 1681, equivalent to a crude birth rate only 1.3 per thousand per annum higher than the crude death rate over the period in question.

Figure 1 conveys a first impression of the background to the great changes of the period by plotting the paths of the crude birth and death rates. The rates relate to 5-year periods centring on the dates shown. This dampens considerably the more hectic movement of the annual rates and makes it easier to identify longer-term trends. Until about 1710 any gap between the two rates was minor, but thereafter they drew further and further apart until by the early nineteenth century the birth rate was about 50 per cent higher than the death rate. The general impression conveyed by the behaviour of the two lines is that rising fertility contributed more than falling mortality to the surge in the growth rate. Crude rates, however, are sometimes a fallible guide to the underlying situation making it desirable to consider more refined measures, in particular the gross reproduction rates and the expectation of life at birth defined above.

These two measures are plotted in figure 2. This shows that the GRR rose by almost 50 per cent from slightly over 2.0 to almost 3.0 in the course of the 'long' eighteenth century, while expectation of life (e_0) rose by little more than 20 per cent from about 32 to 39 years. It should be noted that, in order still further to lessen the impact of short-term influences, the plotted values refer to 15-year periods centring on the years shown.

Although the GRR and e_0 are less familiar measures than the crude birth and death rate, they have valuable analytic properties which serve to determine the question over which so much ink has been spilt since Rickman's day.

Using the data shown in figure 2, it can be demonstrated that two-thirds or more of the acceleration in population growth during the 'long'

eighteenth century was due to the rise in fertility and only one-third or less to improved mortality. It can also be shown that for mortality alone to have accounted for the whole of the acceleration, it would have had to have improved by as great a margin proportionately between 1680 and 1820 as it was to do during the great period of medical advance between 1820 and the end of the second world war. This consideration underscores the implausibility of the more extreme positions adopted at times by the advocates of mortality change as the exclusive key to population growth before the nineteenth century.

Reasons for the rise in fertility

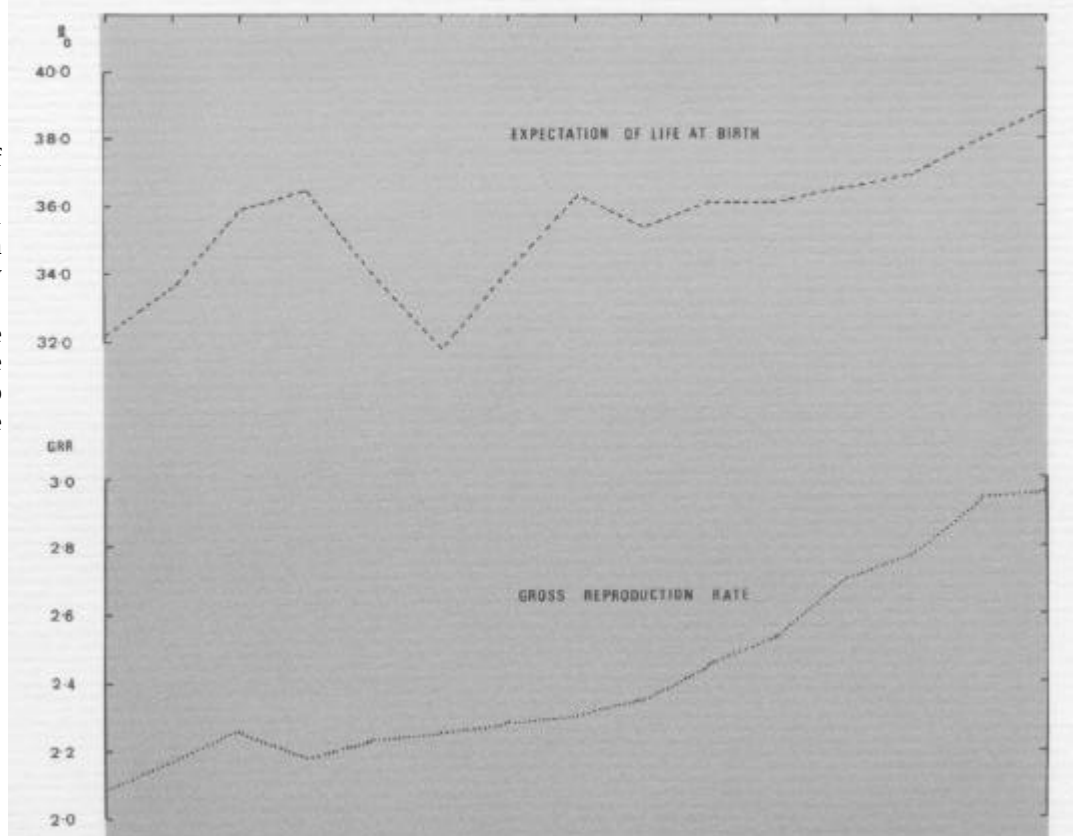
What then caused the very substantial fertility rise which occurred? The data presented so far are all derived from the technique of back projection. To solve this further issue we must turn to family reconstitution which provides an

invaluable insight into the problem. The matter is greatly simplified by the fact that there is no evidence suggesting any change in the level of marital fertility (that is the fertility of women once married) between the reigns of Elizabeth and Victoria. Age-specific marital fertility rates derived from family reconstitution studies do not change over time, nor do they differ from the marital fertility measures inferred from the mid-nineteenth century data collected in the early decades of civil registration. It follows that the increase in fertility must have been principally due to change in nuptiality : in the age at which women married and in the proportion who were never married.

'The empirical evidence confirms the logical inference. Age at first marriage for women fell by about three years in the course of the 'long' eighteenth century: from about 26.5 to about 23.5 years. The proportion never marrying also fell, from perhaps 15 per cent in each cohort in the late seventeenth century to only about 7 per cent by the later eighteenth century. These changes, given an unchanging level of marital fertility, would have sufficed to raise the C;RR by almost the full amount shown in figure 2. The balance is accounted for by the rise in the proportion of all births which were illegitimate, but this made only a small contribution to the overall rise in fertility. Changes in marriage patterns, in short, prove to have been the main reason for the move from a stationary population to a peak rate of growth.

Space does not permit more than a cursory survey of the implications of the knowledge recently gained, but two further comments may serve to suggest the considerations that are likely to figure prominently as research takes new directions.

Figure 2: Fertility and mortality change.
Expectation of life at birth and gross reproduction rate.



Marriage, living standards and economic growth

First, the discovery that marriage was the key variable whose fluctuations largely governed growth trends suggests that attention should be devoted to those social and economic circumstances that influenced marriage decisions. In all societies, marriage is a highly deliberate act attracting the earnest attention not simply of the principals to the marriage, but also of their parents, of a wider network of kin, and of society *en large*. In western Europe, however, apparently uniquely, its timing was not effectively determined by a biological trigger. Elsewhere, marriage for women was closely associated with the attainment of sexual maturity. Shame and disgrace attached to any girl and to her immediate kin if she were to fail to find a husband at this period of life. In consequence marriage was very early and virtually universal, so that only 1 or 2 in 100 women never married, usually because of conspicuous mental or physical handicap. In western Europe, in contrast, marriage close to menarche was very rare and women spent an average of about 10 years sexually adult but unmarried. Moreover, many never married. Characteristically, the average female age at first marriage lay in the range 23 to 27 years and between 5 and 20 per cent never married.

In England there is evidence that marriage was sensitive, both in the short term and in the long, to economic circumstances. Not only were years of high prices years when fewer couples came to the church porch, but a secular improvement or deterioration in real incomes was mirrored by rises or falls in nuptiality. Such trends often covered many successive decades. In consequence there was greater scope for a successful adjustment between numbers and available resources than in other pre-industrial societies. There is also evidence to suggest that the relatively high standard of living achieved in early modern England may be partly a result of the way in which the 'European' marriage system functioned in an English setting. It is an element which should probably figure in any discussion of the background to the industrial revolution. The general point is straightforward: if marriage behaviour was sensitive to economic circumstances, severe pressure of population resources could be avoided, people could enjoy relatively high real incomes, and there could be a greater opportunity for economic changes of a type likely to foster growth. But the 'European' marriage system also conferred a number of specific advantages. For example, since the age structure of a population is very largely determined by its fertility, the late marriage and associated low fertility found in England resulted in a favourable dependency ratio, with proportionately many fewer children to support than in countries like India or China. Again, the fact that women spent many of their most vigorous years in the labour force without the distraction of marriage and dependent children probably produced patterns of earnings, savings and expenditure unlike those in societies with a different marriage system.

Dynamics of a 'low-pressure' demography

Second, there is a related topic representing an intriguing paradox about the population history of England over the whole early modern period. Her population almost quadrupled between 1550 and 1820 (from 3.0 to 11.5 millions), while the populations of other European countries grew much more modestly. France, Germany, Italy and

(Wrigley, 1983). The contrast is striking. It began a process which by 1900 had resulted in England joining France, Italy and Germany as the 'big four' of western Europe with roughly similar populations, whereas in contrast in the mid-sixteenth century the populations of the other three were between four and six times the English total. Yet England had a 'low-pressure' demography with both fertility and mortality at modest levels compared with all extra-European areas, and even compared with many other parts of western Europe.

It is easy to show that, on plausible assumptions about pre-industrial economies, a 'low-pressure' demography in societies where it is difficult to secure a rapid growth in total output will result (other things being equal) in a higher equilibrium level of real incomes than in the 'high-pressure' case with both birth and death rates at a high level. People are less numerous but more prosperous. English history, however, suggests that the *dynamics* of population and economy under 'low-pressure' conditions may be such that a more rapid growth in both output and population is attainable than would be possible where 'high-pressure' prevailed. Relatively high real incomes may bring benefits through their impact on the structure of demand, savings and capital investment that facilitate economic growth, allowing numbers to rise without simultaneously depressing living standards. The same characteristics which imply a low population *at a given point in time* may permit relatively rapid growth *over time*.

In a brief compass, simplifications which entail a failure to do justice to the complexity of historical change are hard to avoid. Both in sketching the course and manner of population growth in eighteenth-century England in the light of new knowledge, and in outlining the implications of the new situation, this problem has no doubt been exemplified. The price of brevity is partial distortion. If there is a countervailing benefit, it may lie in the ease with which salient points can be picked out. English population history has shed some long-standing uncertainties and acquired striking new attributes in recent years. Perhaps it serves a useful purpose to recount them rather starkly so that what is novel is more readily distinguished.

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