DEBATES

Some Competing Models of Population Growth during the First Industrial Revolution

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In the debate about the growth of population during the period of the Industrial Revolution contending critics could be said to agree on one single point: that population growth began around 1750 and continued unabated for more than a century afterwards. Michael Drake has summarized the argument concerning the shift in the rate of growth most concisely suggesting that "The population of England and Wales appears to have grown by 0.2 per cent per annum in the first half of the eighteenth century, by 0.9 per cent per annum in the second half and by 1.4 per cent per annum in the first half of the nineteenth century".[1] While the precise figures Drake offers may be the subject of dispute, no one questions the overall impression that there was a fundamental break with the past in the third quarter of the eighteenth century.[2] However there has been a great deal of argument regarding the causes of this discontinuity. The initial increase has been seen as a "compensatory fluctuation" in response to a period of high mortality in the first half of the eighteenth century,[3] but the

[1] MICHAEL DRAKE, "Editor's Introduction", in *Population in Industrialization* (London: Methuen, University Paperbacks, 1969), p. 1.

[2] See, for example, J. T. KRAUSE's aggregative statistics for 200 English parishes which show that "the quinquennium 1745-9 was the beginning of the steady rise". ("Some Aspects of Population Change, 1690-1790", in E. L. JONES and G. E. MINGAY, (eds.), *Land, Labour and Population in the Industrial Revolution*. (London: Edward Arnold, 1967), pp. 194-195).

[3] G. S. L. TUCKER has been the foremost proponent of this argument. ("English Pre-Industrial Population Trends", *Economic History Review*, 2nd ser., XVI, 2 (1963), pp. 205-218). J. D. CHAMBERS has declared himself to be "an unrepentent disciple of the Tucker thesis of compensatory cycles". ("Some Aspects of E. A. WRIGLEY's *Population*

continuation of this population growth, it has been argued, was due to the disappearance of epidemic diseases which had previously been a positive check to sustained population increase. Although some credit has been given to the improvement of living conditions brought about by the Industrial Revolution, most proponents of this explanation contend that unchecked population growth after 1750 occurred independent of contemporaneous economic changes. Indeed, it is often argued that population growth played an important role in promoting economic change. In opposition to this school of thought is the argument of those who see the acceleration of economic growth after 1750 breaking down social controls which had kept population size roughly in line with resources. Whereas a late age at marriage and restriction of fertility within marriage had previously been effective methods of regulation, the transformation of peasants and craftsmen into agricultural and industrial proletarians resulted in the estrangement of growing sections of the population from these controls.

It is generally believed that before 1750 the population experienced frequent periods of high mortality. Moreover it is further claimed that not only was mortality lower in the second half of the eighteenth century but that this decline in mortality played a significant role in the population increase after 1750.[4] There have been three major explanations for the reduction in mortality levels: improvements in medical practices; the changing incidence of epidemic diseases; and improvements in living conditions.

In 1955 the argument that advances in medical practices led to widespread reduction in mortality was seriously questioned by two medical

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and History", Local Population Studies, 3 (1969), p. 28). Chamber's own work has evinced his devotion to this explanation. (See, for example, *The Vale of Trent*. (Cambridge: Cambridge University Press, Economic History Review Supplement 3, 1957). A summary of Chamber's views, which have been very influential, can be found in his posthumous book *Population, Economy and Society in Pre-Industrial England*. (Oxford: Oxford University Press, Oxford University Paperback Series, 1972). H. J. HABAKKUK, another heavy contributor to the debate, has also made use of this argument. (See, for instance, the latest statement of his position, *Population Growth and Economic Development*. (Leicester: Leicester University Press, 1971), pp. 26-29). However, the relevance of the model of compensatory fluctuations to eighteenth-century England has been questioned by M. W. Flinn who has noted that not only is there no consensus about when the period of high mortality ended, but silence about when it began. Furthermore, Flinn argues that proponents of this model assume "a period of high mortality of too long duration to justify the chain-reaction explanation". (*British Population Growth 1700-1850*. (London: Macmilan, Studies in Economic History, 1970), pp. 34-35).

[4] Colin Clark claims to have created a model showing falling mortality after 1750 could have been responsible for the whole of the increase in population. He assumes that not only were changes in English mortality similar to known changes in Swedish mortality for that period but nuptiality and fertility rates in 1850 were also applicable for the period after 1750. As I will report briefly at the end of this paper such assumptions do not appear to be borne out by the evidence being generated by family reconstitution studies. ("General Discussion", in F. BECHHOFER, (ed.), *Population Growth and the Brain Drain*. (Edinburgh: Edinburgh University Press, 1969), pp. 235-236).

historians, Thomas McKeown and R.G. Brown.[5] They did, however, exempt one form of treatment from their almost total indictment: "Only in the case of vaccination against smallpox is there any clear evidence that specific therapy had a substantial effect on the prevention of cure of disease earlier than the twentieth century".[6] However, P. E. Razzell has claimed that historians have seriously underestimated the importance of innoculation against smallpox which became widespread early in the second half of the eighteenth century.[7] He argues that prior to inoculation "recurrent severe smallpox epidemics were the only cause of sharp rises in mortality rates. This would indicate that the sharp peaks in mortality found in many local studies were due to smallpox...".[8] Razzell contends that from the 1750s there was a large-scale increase in inoculation as "the overseers of the poor began to pay the cost of inoculation for the poor within the parish; this usually took place as a response to the threat of smallpox epidemic which provoked mass inoculation among all members of the parish".[9] Insofar as smallpox mortality before inoculation may have been as high as thirty-one per cent of pre-1750 deaths whereas it accounted for less than two per cent of deaths among those born during 1838-40, Razzell believes that inoculation against smallpox could theoretically explain the whole increase in population from 1750 to 1850.[10]

Razzell's explanation rests on three assumptions all of which are open to doubt. He believes that inoculation activity had seriously weakened the impact of smallpox mortality as early as 1780.[11] For this to have been accomplished inoculation must have been widespread and made substantial penetration into the major cities which were the centres of epidemic mortality spreading infection throughout the surrounding countryside. Wigston Magna is only three miles from Leicester yet in 1789 "the parson marked the burial register with the letters S.P. at frequent intervals, telling us that no fewer than twenty of the forty-nine deaths in that year were due to smallpox".[12] Furthermore, for seven of the previous nine years in the 1780s Wigston had suffered from excessive mortality, fifty per cent above normal. If it was a common response of parish officials to pay for inoculation of the

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5 "Medical Evidence Related to English Population Changes in the Eighteenth Century", in D. V. Glass and D. E. C. Eversley, (eds.), *Population in History*. (London: Edward Arnold, 1965), pp. 285-307).

6 McKeown and Brown, "Medical Evidence", p. 305.

7 "Population Change in Eighteenth-Century England: A Re-Interpretation", in M. Drake, (ed.), *Population in Industrialization*. (London: Methuen, University Paperbacks, 1969), pp. 128-156).

8 Razzell, "Population Change", p. 153.

9 Razzell, "Population Change", pp. 135-136.

10 Razzell, "Population Change", pp. 151-154.

11 Razzell, "Population Change", p. 152.

12 W. G. Hoskins, "The Population of an English Village, 1086-1801", in *Provincial England* (London: Macmillan, 1963), p. 203).

poor during smallpox epidemics, why was this not done in Wigston where it would seem that the disease was endemic?[13] While the example of Wigston does not, by itself, seriously damage Razzell's whole argument it does question the comprehensiveness of inoculation. Razzell's second assumption is that the introduction of inoculation reduced infant mortality which had constituted a preponderant share of all deaths from smallpox. But among London Quakers, who were early experimenters with inoculation, infant mortality was extremely high. This "suggests that dealing with smallpox is not likely to have been a major factor in getting down infant mortality whatever it may have done for adults".[14] The burial registers of Risely, Bedfordshire, give the cause of death of 656 people buried between 1690-1742. Only twenty-seven smallpox deaths were noted (four per cent). However, 144 burials were described merely as "infant".[15] Finally, Razzell apparently believes that not only was there no change in the virulence of smallpox but also that there was just one strain of the virus. But in eighteenth-century Germany, for example, there were four different strains of smallpox, each having its own pattern of virulence and age-incidence. The likelihood that several strains of smallpox virus were present in eighteenth-century England severely damages Razzell's argument inasmuch as "the effects of inoculation or vaccination would depend entirely on the strain present".[16] Indeed, it may have been the case that the reduction of smallpox mortality to less than two per cent of all born 1838-40 was the result of a drastic change in the virulence of the disease rather than in the method of treatment. Or, perhaps, the more virulent strains became less important and were replaced by less deadly forms of the disease such as that which attacked the population of Godmanchester, Huntingdonshire in 1729 when just two of two hundred victims died and they committed suicide.[17]

Viewing the Vital Revolution in the context of western European demographic history since the Middle Ages, K. F. Helleiner concluded that "it was the peaks rather than the plateau of mortality that was lowered". In other words, it was not so much a reduction of mortality in "normal" years that produced the secular downward trend of the death rate, but an

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[13] In eighteenth-century Bedfordshire it was believed that inoculation could actually spread the disease to those who had not already had it. It was also widely believed that inoculation could not in any way guarantee future immunity. (N. L. TRANTER, "Demographic Change in Bedfordshire from 1670-1800"", Ph. D. Dissertation, Nottingham University, 1966, pp. 341-342).

[14] D. E. C. EVERSLEY, "General Discussion", in F. C. Bechhofer, (ed.), *Population Growth and the Brain Drain.* (Edinburgh: Edinburgh Universitp Press, 1969, p. 230).

[15] TRANTER, "Demographic Change", pp. 229-230.

[16] EVERSLEY, "General Discussion", pp. 229-230.

[17] At Eaton Socon, Bedfordshire, only sixteen of the 100 smallpox victims died during the outbreak of October 1712 - September 1714. In the 1722 epidemic in Bedford just 18.4 per cent of the cases proved fatal. (TRANTER, "Demographic Change", p. 338).

unmistakeable abatement of "great crises". Epidemic disease ceased to be a great killer. Helleiner's hypothesis has received strong support from the local studies of J. D. Chambers who believes that after 1750 "The forces of demographic growth were now on the move, mainly as a result of the changing incidence of epidemic disease".[18]

The unmistakeable abatement of great crises has been considered to have been the result of bacteriological changes in the virulence of epidemic diseases that were endemic among the pre-industrial population. It is difficult to criticize this argument directly insofar as one is obviously unable to engage in a comparative study of the assorted viruses. However it is possible to question the underlying assumption that there was no causal relationship between economic conditions and the incidence of epidemics.[19] It may be likely that one role of crisis mortality was to warn fast-growing populations pressing down their standards of living that significant demographic adjustments had to be made if disaster was to be made if disaster was to be averted. Thus, epidemic mortality may also have been a warning mechanism rather than just the instrument of control. If one looks at the Hopkins and Phelps-Brown of real wages, 1380-1510 and 1630-1760 were both periods of rising real wages concurrent with slow population growth.[20] Both these times of high mortality followed periods of explosive population growth and falling real wages.[21] Granted that epidemics were instrumental in aiding pre-industrial populations to maintain, or regain, an acceptable man-land ratio, it is nonetheless hard to credit their occurrence to factors wholly unconnected with prevailing economic conditions. It is significant that in most countries "the disappearance of pre-industrial conditions was signalled by the elimination of the sudden surges of mortality which had kept population totals within

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[18] "The Vital Revolution Reconsidered", in D. V. Glass and D. E. C. Eversley, (eds.), *Population in History*. (London: Edward Arnold, 1965), 85. J. D. Chambers argues that in Nottinghamshire, after 1670, epidemics occurred independently of economic conditions: a bad harvest not necessarily being accompanied by an outbreak of disease. (*The Vale of Trent*, p. 33).

[19] E. A. Wrigley, *Population and History* (London: World University Library, 1969), pp. 129-131.

[20] S. V. Hopkins and E. H. Phelps-Brown, "Seven Centuries of the Prices of Consumables Compared with Builders' Wage-Rates", *Economica*, new ser., 23 (1956), pp. 296-314.

[21] M. M. Postan has discussed the relationship between high mortality and demography in the fifteenth century. ("Some Evidence of the Declining Population in the Later Middle Ages", *Economic History Review*, 2nd ser., II, 3, 1950, pp. 221-246). J. Z. Titow has shown how a rising population in the late thirteenth and early fourteenth centuries forced down real wages. ("Some Evidence of the Population Increase", *Economic History Review*, 2nd ser., XIV, 2, 1961, pp. 218-223). For data on population growth and real wages in the 1500-1640 period see P. J. Bowden, "Agricultural Prices, Farm Profits, and Rents", in J. Thirsk, (ed.), *The Agrarian History of England and Wales 1500-1640*. (Cambridge Cambridge University Press, 1967), pp. 593-617.

bounds in earlier centuries".[22] Following this line of reasoning, then, one could argue that the non-recurrence of widespread killer diseases in England after 1750 resulted from the fact that sustained economic growth was maintaining, if not improving, the basic standard of living. Industrialization meant that rapid population growth was no longer necessarily accompanied by conditions favourable to the emergence of epidemic mortality.[23]

If the relative stability of real wages during the Industrial Revolution staved off the conditions increasing the likelihood of demographic crises, did economic change create improvements in the environment capable of reducing the "normal" schedule of mortality? Economic change resulted in a considerable increase in the proportion of the population living in cities and non-agricultural villages. In these settlements housing conditions may have been better and the food supply more regular, but the water supply was less healthy as sanitary arrangements were often incapable of meeting the demands placed on them by the higher densities of population. Moreover, the higher concentration of population, particularly in urban slums, increased the chance of contracting an infectious disease. Urbanization created new health hazards whose impact was most severe among the poor, especially poor children: "Even in 1898 infant mortality in the poorest areas (of York) at 247 per 1,000 live births was two and one-half times the level among those wealthy enough to employ servants (94 per 1,000)".[24] These figures considerably reduce the relevance of Razzell's contention that because there was surprisingly little variation in adult male mortality between different occupational groups, during the middle of the nineteenth century, "income factors were not important in determining rates of mortality".[25] Insofar as urban sanitary conditions did not begin to improve before the 1860s, it is difficult to believe that industrialization initially created a markedly better environment for the general population.

In arguing that there was a widespread improvement in the expectation of life during the eighteenth century one can rely upon only two empirically sound family reconstitution studies.[26] Both these works show that after 1750 expectation of life at birth was considerably higher than it had been

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[22] WRIGLEY, *Population and History*, p. 165.

[23] J. D. CHAMBERS, "Population Change in a Provincial Town: Nottingham 1700-1800", in D. V. GLASS and D. E. C. EVERSLEY, (eds.), *Population in History* (London: Edward Arnold, 1965), p. 336.

[24] Cited by WRIGLEY, *Population and History*, p. 173.

[25] P. E. RAZZELL, "Population Growth and Economic Change in Eighteenth and Early Nineteenth Century England and Ireland", in E. L. JONES and G. E. MINGAY, (eds.), *Land, Labour and Population in the Industrial Revolution*. (London: Edward Arnold, 1967), p. 265.

[26] T. H. HOLLINGSWARTH, "A Demographic Study of the British Ducal Families", in D. V. GLASS and D. E. C. EVERSLEY, (eds.), *Population in History*. (London: Edward Arnold, 1965), pp. 354-378 and E. A. WRIGLEY, "Mortality in Pre-Industrial England: The Example of Colyton, Devon, Over Three Centuries", *Daedalus*, 97 (1968), pp. 246-280.

before 1700. However, in Hollingsworth's data on British ducal families the increase in the expectation of life at birth between 1680-1729 and 1730-79 represents a unique occurrence while in Wrigley's study on Colyton "the pattern of change in adult death rates, as with rates for children, suggests a substantially lower expectation of life at birth in the second half of the seventeenth century than in Elizabethan times or in Georgian England".[27] What Hollingsworth claims to have been an exceptional eighteenth century experience may have no more than a return to a pre-existing pattern. Even after the mid-eighteenth century life expectation at birth continued to rise. However, infant mortality did not experience another significant reduction before the late nineteenth century.[28] Indeed, in industrial Worcestershire "at the time of greatest population increase, between 1810 and 1830, improvements in child and infant mortality can hardly have made any contribution to the increase, and in fact a deterioration probably set in".[29] In later eighteenth-century Nottingham a similar situation existed: an increase in infant mortality concurrent with rapid population growth.[30] Industrialization and urbanization were probably responsible for the maintenance of relatively high levels of infant mortality. It would appear, therefore, that any increase in the expectation of life at birth experienced during the Industrial Revolution resulted from changes in the pattern of adult mortality. But without significant changes in infant mortality levels any post-1750 decline in overall mortality does not, by itself, adequately explain the fact that for a remarkably long time after 1750 the rate of population growth rose.

In the preceding section it has been argued that the decline in mortality exerted a necessary though, by itself, not a sufficient role in increasing the rate of population growth after 1750. Therefore, a very significant part of this increase must have been played by changes in the patterns of fertility and nuptiality. In this section the explanation relating the impact of economic growth to changes in fertility and nuptiality will be considered.

If we refer to Wrigley's and Hollingsworth's family reconstitution studies it is apparent that age-specific fertility rates changed substantially during the eighteenth century.[31] For the aristocrats, generational reproduction rates for the periods 1730-79 and 1780-1829 were almost twice as

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[27] WRIGLEY, "Mortality", p. 562.

[28] WRIGLEY, *Population and History*, pp. 164, 169.

[29] D. E. C. EVERSLEY, "A Survey of Population in an Area of Worcestershire from 1660 to 1850 on the Basis of Parish Registers", in D. V. GLASS and D. E. C. EVERSLEY, (eds.), *Population in History* (London: Edward Arnold, 1965), p. 411.

[30] CHAMBERS, "Nottingham, 1700-1800", pp. 346, 349,350.

[31] E. A. WRIGLEY, "Family Limitation in Pre-Industrial England", in M. DRAKE, (eds.), *Population in History*. (London: Edward Arnold, 1965), p. 411.
p. 166. HOLLINGSWORTH, "Ducal Families", p. 373.

high as those rates for the period 1680-1729 (1.51 and 1.52 as against 0.80).[32] The maintenance of the high level of generational reproduction in the 1780-1829 period confirms that fertility was rising and that declining mortality was not a sufficient reason for these high rates. Moreover, in Colyton the periods after 1720 witnessed a continuous decline in the women's age at marriage.[33] This latter phenomenon had profound importance for the increase in Colyton's birth rate in the eighteenth century since "The most extreme female mean ages at first marriage found at Colyton (30.7 in 1700-19 and 23.3 in 1825-37) can easily result in average completed family sizes differing from each other by a factor of two".[34]

In Colyton rational economic considerations had played an important role in promoting family limitation during the later seventeenth and early eighteenth centuries when the population "behaved demographically in such a way as to make possible an increase and even a steady growth in real income".[35] Similarly, in Moreton Say, Shropshire, farmers and labourers controlled their marital fertility in order to maximize their economic and social security. In response to changing conditions "the rate of population growth was based firmly on the rate of agrarian change".[36] Following the implications of this argument would lead one to believe that the increase in population after 1750 was a response to rising per capita incomes. Yet the Hopkins and Phelps-Brown index shows that real wages fell after 1760, not beginning to rise again until after 1815.[37] It is therefore more likely that the economic transformation of peasants and craftsmen into agricultural and industrial proletarians undermined those social controls with which pre-industrial populations had secured optimum rather than maximum numbers. The result (as will be discussed below) was a lowering of the age at marriage and the growing importance of those groups which had high rates of marital fertility.

Industrialization and its accompanying social dislocation occasioned a fall in the age at marriage in three ways: old habits were weakened; demand for labour was increased; and those groups who married early became proportionately more important while late-marrying groups became less important. Before discussing these factors it will be instructive to consider the implications for fertility of changes in the age at marriage.

In Scotland in 1911 the result of one year's delay in a woman's

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[32] HOLLINGSWORTH, "Ducal Families:, p. 367.

[33] WRIGLEY, "Family Limitation", p. 164.

[34] WRIGLEY, "Family Limitation", p. 165.

[35] WRIGLEY, "Family Limitation", p. 191.

[36] R. E. JONES, "Population and agrarian change in an eighteenth-century Shropshire parish", *Local Population Studies*, 1 (1968), p. 27.

[37] HOPKINS and PHELPS-BROWN, "Seven Centuries", pp. 296-314.

marriage was to reduce her completed family size by one-third of a child.[38] Similar results were derived from the 1940 Brazilian census,[39] while Wrigley also assumes that eighteenth-century changes in mean age at first marriage could have had comparable effects.[40] Lorimer's Hypothetical Fecundity Model is also based on the assumption that there were 0.36 live births per year per women in a fecund conjugal union.[41] Changes in the age at marriage, therefore, had a significant influence on fertility rates. In addition "the fall in the age at marriage shortens the intervals between generations, so that, even if the same number of children are born per family, more children are born per unit of time".[42] Thus, variations in the age at marriage could explain a large part of the increase in fertility rates experienced after 1750.

It was noted earlier that in pre-industrial Colyton attempts to maintain an optimum population size resulted in a limitation of fertility within marriage abetted by a late age marriage for women. In Colyton before 1770 and also in pre-industrial Norway older brides were apparently sought after because they had a shorter childbearing period and, among cottars in Norway, because their greater experience in farmwork made them economic assets.[43] If rational considerations were of such great importance then it would be unlikely for a couple to marry before they had an independent economic position. The age at marriage was kept high because members of the younger generation often waited until their parents' death before they assumed the family farm or workshop.[44] In

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38 J. C. DUNLOP, "The Fertility of Marriage in Scotland", *Journal of the Royal Statistical Society*, LXXVII (1914), p. 266.

39 HABAKKUK, *Population Growth and Economic Development*, p. 102, n. 24.

40 WRIGLEY, "Family Limitation", p. 165.

41 F. LORIMER, *Culture and Human Fertility* (New York: Unesco, 1954), pp. 51-54. In contrast, McKeown and Brown believe that "an advance in the mean age at marriage of about five years would be needed to reduce the mean number of live births by one". ("Medical Evidence", p. 297). H. J. Habakkuk has voiced doubt about their assertion since they derived their figure (of five years) from post-famine Irish data which would hardly be representative of a normal fertility schedule. Moreover, in that Irish data "the number of children per marriage is only in averages of five years, and this may well obscure the significance of changes in the age at marriage between the ages of twenty and thirty" (*Population Growth and Economic Development*, p. 102, n. 24).

42 H. J. HABAKKUK, "Comments", in F. BECHHOVER, (ed.), *Population Growth and the Brain Drain*. (Edinburgh: Edinburgh University Press, 1969, p. 225).

43 WRIGLEY, "Family Limitation", p. 164. M. DRAKE, *Population and Society in Norway*, 1735-1865. (Cambridge: Cambridge University Press, 1969), pp. 133-149.

44 H. J. HABAKKUK, "Population Problems and European Economic Development in the late Eighteenth and Nineteenth Centuries", *American Economic Review*, LIII, 2 (1963), pp. 607-618. The same author has also considered the relationship between inheritance systems and economic development and suggests that "the single-heir system tended to retard population growth". England is generally considered to be one of those countries in which primogeniture was widely practised. ("Family Structure and Economic Change in Nineteenth Century Europe", *Journal of Economic History*, XV, 1 (1955), pp. 1-12.

the London marriage licences of the late sixteenth and early seventeenth centuries two-thirds of the yeomen had lost their father before marrying.[45]

The second half of the eighteenth century witnessed the acceleration of social changes undermining the influence of pre-industrial institutional controls on marriage. The emergence of a free labour market was accompanied by the weakening of apprenticeship and of the practice of labourers living-in with their masters.[46] Both these traditional customs had been obstacles to early marriage. In the traditional village the erection of new houses was of great interest to the parish officials who were anxious to keep the size of their village in line with its economic resources in order to avoid high poor rates. In a society characterized by the nuclear family unit, marriage was influenced by the elasticity of the supply of housing.[47] In nineteenth-century Leicestershire the parishes which experienced rapid growth and high poor rates were just those parishes which possessed a weak village government.[48]

The high levels of underemployment present in the relatively stagnant pre-industrial economy made it necessary for labourers to adopt a prudent approach to marriage if they were to maintain their conventional standard of living. The increasing importance of the national market combined with the stupendous growth in the international market for English manufacturing goods after 1780 meant that the demand for industrial labour was not only growing but becoming less subject to seasonal fluctuations. For agricultural labourers, the increase in farm size and the new requirements for labour accompanying the Parliamentary enclosure movement (for example: hedging, ditching, draining and fencing) resulted in a

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[45] This information was reported by Ms Vivian Brodsky to a seminar on the history of population and social structure held in Cambridge on August 3, 1972.

[46] J. D. CHAMBERS has argued that in the early eighteenth century "agricultural labourers, on the average, may have married later than workers in industry because of the large proportion who lived in with their masters". (*The Vale of Trent*, 51). In a paper delivered to another Cambridge seminar (on February 15, 1974) Ms Ann Kussmaul Cooper presented evidence showing that in pre-industrial England service was an important institution enabling people to amass sufficient capital to buy and stock a peasant holding. The transformation to a capitalist system of farming, based on the use of wage-labour rather than servants' labour, had important socio-demographic implications. Wage-labourers, never having the prospect of owning land, had no incentive to postpone marriage. In 1851 there was a distinct correlation between agricultural wage-labour and early marriage as opposed to agricultural service and later marriage. More recently, M. Anderson has utilized the 1861 Census report to analyze marriage patterns in the 630 registration districts into which the country was divided. His findings support Kussmaul Cooper's argument. ("Marriage Patterns in Victorian Britain: An Analysis Based on Registration Data for England and Wales 1861", *Journal of Family History*, 1 (1976), pp. 55-78).

[47] EVERSLEY, "Population in Worcestershire", p. 407.

[48] The relationship between landownership and social control is discussed by Dennis Mills. "Landownership and Rural Population" (Ph. D. Dissertation, Leicester University, 1963).

considerable increase in the year-round demand for their labour.[49] For this period when employment was becoming more regular the Hopkins and Phelps-Brown index, based on daily wage-rates, may be a less reliable guide; its decline in real wages for the period 1760-1815 may be a considerable over-statement of the true situation. Nevertheless, since it is unlikely that per capita incomes actually rose in the later eighteenth century, one must agree with those contemporary writers who believed that labourers took advantage of the better opportunities for steady employment by marrying earlier.[50] Arthur Young, the inveterate traveller, believed that « It is employment that creates population: marriages are early and numerous in proportion to the amount of employment ».[51] Since contemporaneous economic and social changes were enlarging the proportion of labourers in the population, the advent of more regular demand for labour could have had repercussions in overall marriage rates. Furthermore, these economic changes were enlarging those groups with a relatively low age at marriage. Because they reached their prime earning capacity at an earlier age, men engaged in industry married younger and married younger brides than peasants or craftsmen. Indeed, in areas where women also found employment in industry they married at an even earlier age.[52] In the early eighteenth century in Nottinghamshire framework knitters married earlier than any other group, and they married younger brides than yeomen, husbandmen, labourers, tailors, weavers, clothiers of cordwainers.[53] Textile workers in Buckfastleigh, Devon in the early eighteenth century showed « precocious nuptiality ».[54] Similarly, in Flanders and Switzerland, workers in domestic industry married earlier than agriculturalists.[55] If industrial workers did, in fact, marry younger brides than any other occupational

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[49] J. D. CHAMBERS, "Enclosure and the Labour Supply", in D. V. GLASS and D. E. C. EVERSLEY, (eds.), *Population in History* (London: Edward Arnold, 1965), pp. 308-327.

[50] HABAKKUK, *Population Growth and Economic Development*, pp. 39-40.

[51] Young went on to say "Provide new employment and new hands will inevitably follow". (*A Six Months Tour Trough the North of England*, IV, 1770, pp. 561-565). Throughout the previous century the prevailing mercantilist view of demography was that the prudential check was of the utmost importance in limiting population size. (R. P. KUCZYNSKI, "British Demographers' Opinions on fertility, 1660-1760", in L. HOGBEN, (ed.), *Political Arithmetic*. (London: Allen and Unwin, 1938, pp. 278-322). Seen in context, then, the emphasis on this aspect of the demographic equation placed by both Adam Smith and Parson Malthus was by no means novel.

[52] WILLIAM OGLE, "On Marriage-Rates and Marriage-Ages, with Special Reference to the Growth of Population", *Journal of the Royal Statistical Society*, LIII (1890), p. 268.

[53] CHAMBERS, *The Vale of Trent*, p. 52.

[54] KRAUSE, "Population Change, 1690-1790", pp. 202-203.

[55] For Flanders, see F. MENDELS, "Industrialization and Population Pressure in Eighteenth Century Flanders". (Ph. D. Dissertation, University of Wisconsin, 1970), particularly 244-248. For Switzerland, see R. BRAUN, "The Impact of Cottage Industry on an Agricultural Population", in D. S. LANDES, (ed.), *The Rise of Capitalism*. (New York, Macmillan, 1965), pp. 53-64.

group then migration of single men and women from agricultural parishes to industrial areas would have been another factor lowering the age at marriage.[56] Furthermore, it has often been claimed that changes in the system of granting poor-law allowances reduced the force of the incentives to postpone marriage thereby making it probable that agricultural labourers would marry earlier than previously.[57] By 1750 the peasantry, both owner-occupiers and small tenants, were outnumbered by wage-labourers in the English countryside while industrial labourers were the fastest growing occupational group.[58] Inasmuch as these classes married earlier than the more traditional peasantry and village artisans, it is not improbable that their increasing importance produced changes in the average marriage age of real significance for population growth.[59]

Apart from weakening the customary relationship between economic independence and marriage, it is assumed that economic changes also had important implications for fertility within marriage. In a study of the connection between income and family size it has been suggested that there was a positive correlation between poverty and completed family size.[60] Following the logic of this argument, it would be expected that rates of marital fertility rose continuously after 1760 (when real wages began to fall) and only began to decline after 1815 (when real wages began improving). Moreover, the enlargement of the poorer, wage-labouring

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56 W. KOELLMAN argues that "The low proportion of migrants in the under sixteen group suggests that to an overwhelming extent single people migrated, not families with children". ("The Population of Barmen Before and During the Period of Industrialization", in D. V. GLASS and D. E. C. EVERSLEY, (eds.), *Population in History*. (London: Edward Arnold, 1965, p. 600).

57 J. T. KRAUSE, "English Population Movements between 1700 and 1850", in M. DRAKE, (ed.), *Population in Industrialization*. (London: Methuen, University Paperbacks, 1969, p. 126).

58 J. SAVILLE, "Primitive Accumulation and Early Industrialization in Britain", in *The Socialsit Register*, 1969. (New York: Monthly Review Press, 1969), pp. 247-271. Non-marxists, such as H. J. Habakkuk and G. E. Mingay, agree that the predominance of wage-labour was the distinguishing feature of the English countryside by 1750. (For HABAKKUK see, *"La Disparition du Paysan Anglais", Annales*, E.S.C., XX, 4, (1965), pp. 649-663. For MINGAY, *Enclosure and the Small Farmer in the Age of the Industrial Revolution*. (London: Macmillan, Studies in Economic History, 1968).

59 H. J. HABAKKUK, "The Economic History of Modern Britain", in D. V. GLASS and D. C. E. EVERSLEY, (*eds.*), *Population in History*. (London: Edward Arnold, 1965), p. 154.

60 D. F. KRIER and D. J. LOSCHKY, "Income and Family Size in three XVIIIth Century Lancashire Parishes", *Journal of Economic History*, XXIX, 3 (1969), pp. 429-448. A quite contrary view is expressed by J. P. Huzel who argues that there was no difference in the fertility rates of Speenhamland and non-Speenhamland parishes and that, furthermore, there was a decline in fertility even before the poor law changed in 1834 ("Malthus, the Poor Law, and Population in Early Nineteenth Century England", *Economic History Review*, 2nd ser., XVII, 3 1969, pp. 430-452). My own view, as will be expressed later, is against Huzel.

classes should have further intensified a rise in marital fertility after 1760. It has been argued that the influence of the Speenhamland system of poor-law allowances on agricultural labourers and the availability of employment for the children of industrial labourers also exacerbated differences in marital fertility. The fact that industrial areas supplied their own labour forces suggests that fertility in those areas must have been very high in order to counteract the depressing effect of infant mortality among the poor.

While the argument which relates fertility and nuptiality to contemporaneous economic and social changes appears to be convincing it has not been based on much factual information. There have been no studies analyzing the impact of industrialization upon family structure. Only two family reconstitution studies have been published which examine the variations of fertility and nuptiality between different occupations and these two sets of results are fundamentally incompatible. Krier and Loschky found that family size correlated positively with poverty, but in Moreton Say just the opposite occurred.[61] Thus, we have no clear idea of the extent to which rational, calculating considerations influenced people's demographic behaviour during the Industrial Revolution. Information dealing with age at marriage in these studies is hardly less equivocal. In the three Lancashire parishes there was « no relationship between income and the age at marriage of the type to be expected from the hypothesis that men with higher incomes married the younger women ».[62] But in Moreton Say, farmers did marry younger brides than their labourers.[63] So far, then, published studies relating fertility and nuptiality to occupation and income have yielded completely inconclusive results.

It is not surprizing that these two reconstitution studies have produced contradictory results since neither has looked at those groups most likely to have had exceptional demographic characteristics. The existence of a resident class of employers in Moreton Say makes it probable that their labourers were subjected to close economic and social control thereby perpetuating the balance between population size and resources in the village. Similarly, the Lancashire parishes were also well-integrated villages. Neither study dealt with villages whose social and economic structures has been substantially altered by those transformations associated with the socio-economic modernization of England. If a village's social and economic structure had important implications for its demographic development then the results of any family reconstitution study will depend on the way in which that study has been delimited. It will only be possible to discover the demographic significance of socio-economic change by isolating the relevant factors.

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61 KRIER and LOSCHKY, "Income and Family Size", pp. 446-447. JONES, "Population and agrarian change", pp. 16, 22-24, 26-27.

62 KRIER and LOSCHKY, "Income and Family Size", p. 445.

63 JONES, "Population and agrarian change", p. 16.

In order to study the demographic effects of industrialization or the disappearance of the peasantry and their replacement with wage-labourers one must bear in mind the social situation in which such groups lived. In nineteenth-century Leicestershire it has been found that there were significant relationships between forms of landownership and settlement patterns, village social structure, administration of the poor law, progress of enclosure and the organization of agricultural production. Furthermore, landownership was a critical factor influencing the location of industry and dissenting religious congregations.[64]

For too long the study of historical demography has been conducted on a level of generality that yields more heat than light. Leaving aside the difficulties concerning the reliability of the various series of aggregated figures on which a great deal of the controversy has been founded, the great problem with this method of inquiry has been that vital rates derived from aggregated totals do not distinguish between the various components of fertility and mortality. Family reconstitution provides a solution to this problem by specifying the mechanisms of population growth through the study of families reassembled from the entries of baptisms, burials and marriages recorded in the parish register. Since 1966 when E. A. Wrigley reported the results of his initial study of family reconstitution using the parish records of Colyton, Devon, there has been a considerable amount of activity in this field. Little has been reported so that the growing consensus about the shape and characteristics of the pre-industrial population's demographic profile has not yet gained wide currency. Instead, the example of Colyton has been held up as a paradigm to which other communities were expected to conform. Such has not been the case. Indeed, the example of Colyton has proved to be something of a red-herring in that this village seems to be quite exceptional in its experience. This has been unfortunate not least because it has deflected attention away from the contribution which this new knowledge would make to the debate about population growth during the period of the first Industrial Revolution. Rather than describing the statistics of demographic behaviour which have been uncovered in a number of local studies, in the remainder of this essay I want to abstract from these results and consider the adequacy of the competing explanations which I have described. In the course of this discussion reference will be made to studies which have already been described elsewhere.[65]

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[64] MILLS, "Landownership and Rural Population", passim.

[65] Further information concerning the reconstitution studies of Bottesford, Shepshed and Terling can be found in my monograph, *Family formation in an age of nascent capitalism*. (New York: Academic Press, Studies in Social Discontinuity,, 1977). The example of Hawkshead, Lancashire, which will be quoted later, is provided by the characteristic generosity of Miss K. O. Oosterveen and the SSRC Cambridge Group for the History of Population and Social Structure.

Perhaps the most significant finding to emerge from the study of English village communities has been that, compared to the implicit assumptions one so often encounters, the death rate was comparatively low. In most of the populations studied it has been found that about one child in six died during its first year of life. Of the five survivors, another one did not survive until the average age at marriage. So, two-thirds of all children survived until they would be likely to marry. These mortality figures describe the long-term experience of villagers and it is a valid point to note that it was not so much the "background mortality" as the great crises which held the pre-industrial population in check. This assumption that the preventive check of mortality was instrumental in controlling pre-industrial population seems to me to be basically controverted by the findings of the various family reconstitution studies. Let us take the example of Bottesford, Leicestershire where there were twelve years in the 140 before 1740 in which the annual total of burials was more than twice the normal average but after that date only one year in the next century was double the level of background mortality. This community was a clear representative of the falling death rate but even here the critical factor in accounting for rapid population growth after 1800 was a rising birth rate, not the falling death rate. In Bottesford and improvement in life expectation at birth of almost ten years was of minor importance in comparison to earlier marriage and higher fertility.

While the death rate within communities seems to have been relatively stable throughout the pre-industrial epoch, the impact of urbanization and overcrowding cannot be taken lightly. The example of another Leicestershire village, Shepshed, provides an illustration of the deleterious effects of changing environmental conditions. Shepshed, located on the edge of Charnwood Forest, had a rate of infant mortality that was about average — about one child in six died in the first year of life before 1750. But in the century after 1750 Shepshed underwent intensive proto-industrialization and its population quadrupled. Overcrowding became the order of the day and by the second quarter of the nineteenth century the rate of infant mortality had risen to almost one in four. The life expectation at birth fell from forty-nine before 1700 to thirty-seven between 1825 and 1851. In these years Shepshed had become a small-scale version of the urban slum. Its terraced housing had been jerry-built to accommodate the mushrooming proto-industrial population: "mean cottages, low and narrow, badly-lit, fronting on the street, or around common yards, and often built in odd shapes to squeeze into odd pieces of land. They were cheaply built and badly maintained".[66] In this squalid environment inadequate sanitary arrangements made cholera, typhus and other "urban" diseases endemic.

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[66] A. BÉCHERAND, "The Poor and the English Poor Laws in the Loughborough Union of Parishes, 1837-1860". (Mémoire presenté pour l'obtention de la Maîtrise-es-lettres, Université de Nancy, 1972), p. 116.

Bearing these two Leicestershire examples in mind it is possible to construct a rather different version of the course of mortality during the classic Industrial Revolution than is usually provided. Such a revisionist argument would stress the essential continuity of mortality levels on a *national* scale. Improvements in life expectation in the countryside were more or less counterbalanced by the huge change in the residential composition of the population. The abatement of crisis mortality was effectively cancelled out by the rising proportion of the population who became liable to the high death rates which were engendered by urban living conditions that can be likened to the Augean stable. Of secondary importance is the deterioration in parochial registration in urban areas where this rising mortality took place. Thus, a degree of double vision develops if we look at national figures of burials since they very seriously underestimate the magnitude of what was going on in the cities.[67] As is so often the case in historians' controversies the anecdote of the curate's egg is apropos. The death rate was declining, in places. Elsewhere it rose. Only by considering the improving conditions in rural England alongside the dreadful toll that was being exacted by the urban environment can we get a more accurate picture of the national trend in mortality levels. Lastly, it should be pointed out that the national infant mortality rate in the later nineteenth century — about 150 per 1,000 — was only slightly lower than that which family reconstitution studies have discovered for the parish register period.

If the role of mortality in the demographic equation has been overestimated then the question arises how the changes in the birth rate developed which were substantial enough to account for the rise in the rate of population growth. Here, too, the results generated by family reconstitution studies are proving to be of real importance. I will first discuss age at marriage and then consider marital fertility.

Wrigley's study of Colyton described a population in which the age at marriage for women was subject to dramatic swings whereas their husbands married at much the same age for almost three centuries. No other preindustrial village has shown such a marked volatility in the pattern of female nuptiality. Indeed, there appears to be a developing consensus in which women married at about twenty-five and their husbands were a year or two older. After 1750 many villages experienced earlier marriage for both men

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67 J. T. KRAUSE has argued that the proliferation of private burial grounds in urban areas combined with the failure of the Anglican church to come to grips with the mushrooming urban population to render ecclesiastical registration suspect in this period. ("The Changing Adequacy of English Registration", in D. V. GLASS and D. E. C. EVERSLEY, (eds.), *Population in History* (London: Edward Arnold, 1965, pp. 379-393). I have explained the ways I tried to get around this problem in dealing with the semi-urban village of Shepshed: "The Reliability of Parochial Registration and the Representativeness of Family Reconstitution", *Population Studies*, 30, 1 (1976), pp. 107-122.

and women. Some, like Hawkshead in the Lancashire Lake District, did not evince falling ages at marriage in that period. Others, like Terling in Essex, had had ages at marriage for both men and women that were about two years earlier than is suggested by this paradigm. Closer investigation of these two examples proved to be rewarding. In Hawkshead the pattern of rural proletarianization never occurred as that village's rural economy was always based on small-scale pastoral farming. In Hawkshead, peasant farming persisted throughout the transition from subsistence to commercial agriculture. On the other hand, the replacement of traditional, peasant farming with intensive techniques employing gang labour had rather different results — a lowering of the age at marriage and, as I shall argue later, an increase in the birth rate. Terling's experience essentially conforms to this pattern although in this Essex village the transition from an agrarian economy based on a sturdy peasantry to one in which the classic triad of landowner, tenant farmers, and wage-labourers occurred by the 1630s. For the mass of the village population the agrarian crisis of the sixteenth century meant that a proletarianized existence was their lot. They had no likelihood of amassing sufficient capital to improve their position. For them there was no reason to postpone marriage while they undertook the petty capital formation that was necessary to underwrite a peasant's holding. In Terling the incursion of commercial capitalism struck at the roots of family formation strategies. The decline in the age at marriage was not accompanied by any apparent reduction in fertility. More children resulted. But there was no place for them in a comunity in which the squirearchs and their subalterns exercised strict control over settlement. Such people had little alternative but to seek the high road to London.[68]

Capitalist agriculture was not the only agent acting to dissolve the pre-industrial demographic equilibrium. The spread of rural industry was of even greater magnitude. Shepshed was one such centre of domestic manufacturing and in this village the proletarianization of a peasant population was accompanied by a dramatic, five-year decline in the age at marriage. As a greater component was withdrawn from traditional forms of manufacturing based on apprenticeship and guild regulation, to be re-deployed into capitalist modes of production, a compositional change in the manufacturing labour force developed. This compositional change in the deployment of the labour force was a factor of real importance in lowering the age at marriage and thereby promoting a higher birth rate. Early marrying groups became more important and later marrying groups less so. The demographic significance of this change has already been described.

Changes in marital fertility do not appear to have been of a comparable

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68 On this subject of the reciprocal relationship between London and its hinterland see: E. A. WRIGLEY, "A Simple Model of London's Importance in Changing English Society and Economy 1650-1750", *Past and Present*, 37 (1967), pp. 44-70.

importance in promoting population growth to those in the age at marriage. In most communities, to be sure, the level of marital fertility was far below the physiological maximum but this lower rate of fertility does not appear to have been concentrated in the later years of marriage as was the case in later seventeenth-century Colyton. Moreover, in most of the villages that have been studied there is a small but appreciable climb in these rates in the period after 1750. This rise is observable in rural as well as semi-urban populations, such as Shepshed. Why was this the case? I think that a successful explanation of this phenomenon must be related to two quite disparate causes: pauperization and proletarianization. The operation of the poor laws undermined the efficacy of the prudential check. In a village like Terling we can see evidence of this occurrence. There, the age-specific marital fertility rates were higher for all ages after 1775. The reason for increasing fertility in later years of marriage would seem to lie in the ways in which the poor laws altered strategies of family formation. The subsidization of labourers' wages meant that there was no reason to adopt a prudent attitude to fertility in the later years of marriage after ensuring that children would survive to provide a rudimentary form of old-age pension.[69] At the other end of the marital spectrum, as it were, a different set of imperatives were unleashed by proletarianization of the labour force. The demo-economic considerations of a proletarianized worker were essentially different from those of a traditional peasant or artisan in that the former was more dependent upon the contribution of his children to the family economy. For this reason there was a need to get over the "dependency hump" that emerged in the first years of marriage when not only were the young children a drain on the resources of the family economy but they partially withdrew the wife's labour as well. Once the eldest children began to contribute then the pressures would be lessened and the need to continue producing children would be commensurately less since there would be surviving children who could be expected to look after their parents in old age. But, as we have just seen, the pauperization of the labourers through the operation of the Old Poor Law, which supplemented wages with benefits accorded on a sliding scale geared to the number of children one had, tended to undermine this natural restraint on fertility. So, a vicious circle was created and the level of marital fertility rose.

Acting together, the earlier age at marriage and rising levels of fertility served to increase the birth rate sufficiently to account for the population growth that occurred in the 1750-1850 period. The undermining of the preventative check meant that the abundant reserves of *prolifick power* were unleased.

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[69] A similar rationale is put forward to explain the persistently high birth rate in rural India today. (See, M. MAMDANI, *The Myth of Population Control*, New York: Monthly Review Press, 1972).