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10 Population Growth and Economic Change in Eighteenth- and Early Nineteenth-Century England and Ireland

In recent papers on this important and controversial subject Professor Chambers has eloquently argued that although population growth and economic change were linked in eighteenth-century England the increase in population cannot be explained directly in economic terms.[1] This is a view no longer fashionable. As is well known, the traditional 'medical' explanations of a fall in the death rate have been discredited by medical historians, a conclusion that has led them to an assumption that economic growth must have preceded and 'caused' population expansion. In this essay I try to deal with some of the important problems raised by Professor Chambers, and attempt to demonstrate that the large increase in population during the eighteenth and early nineteenth centuries was in no way due to economic factors, but on the contrary was a major cause of economic change, which in England culminated in those changes known as the Industrial Revolution.

[1] See particularly J. D. Chambers, 'The Vale of Trent 1670–1800', *Econ. Hist. Rev.* Supp. 3. He concluded from this study that population 'was vulnerable to disease, but not as a result of famine. Epidemics could do their own work without its aid, nor it would seem, did they require the assistance of gin. . . For reasons which are far from clear, its [disease's] severity was mitigated from the middle of the [eighteenth] century in this region, especially in regard to the lower age groups. . . .'

I

The first point to be considered is whether the increase in population was due to a fall in the death rate or a rise in the birth rate. One of the most popular interpretations of the growth of population is the neo-Malthusian view that there was an increase in the birth rate due to expanding employment opportunities and a rise in the general standard of living, associated with the economic advances, encouraging earlier marriage and a higher marriage rate. However, there is evidence to suggest that both the age at marriage and the marriage rate were roughly constant throughout the eighteenth century.[1] Professor Chambers himself has published statistics for agricultural villages which suggest that both the birth and marriage rates may have declined between 1743 and 1801 in the Vale of Trent region.[2] In 1751 Thomas Short published statistics of population, baptisms, marriages, and burials during 1724–36 for seven market towns and fifty-four rural parishes.[3] According to his figures, the baptism rate was 33.8 per 1,000 and the burial rate 29.4 per 1,000; undoubtedly some births and deaths were not registered owing to the presence of Dissenters, particularly in the market towns. This, of course, would raise both the 'true' birth and death rates. If we compare these rates with those computed from civil registration returns in the 1840s, it is quite clear that the long-term birth rate was more or less constant, while there was a sharp fall in the death rate. The latter is also confirmed by the figures for agricultural villages published by Chambers.[4] One of the weakest points in the neo-Malthusian argument is that the fairly reliable figures of the 1840s indicate no particular association between the distribution of industry and high fertility rates. The counties with the highest age-specific birth and marriage rates and the lowest age at marriage during the early 1840s were Cambridge, Bedford, Huntingdon, and Northamptonshire, all largely agricultural counties; although Lancashire had a high crude

[1] The figures for the age at marriage are derived from marriage licences which are not entirely satisfactory. However, figures from parish registers suggest a similar conclusion. See C. C. Morell, 'Tudor Marriages and Infantile Mortality', *Journal of State Medicine*, XLIII (1935), p. 179.

[2] Chambers, *op. cit.*, p. 55. We do not have to take these figures too literally to conclude that the birth- and marriage-rates did not rise.

[3] T. Short, *New Observations on Bills of Mortality* (1751), p. 133.

[4] Chambers, *op. cit.*, p. 55. The reverse of these trends applied, however, in the town of Nottingham.

birth rate, its age specific birth rate and age at marriage appear to have been about average.[1] Furthermore, the age at marriage of spinsters appears to have varied little between different social strata during the eighteenth century, suggesting that economic considerations were not paramount in determining the age at marriage for women at least.[2]

It is difficult to draw any reliable conclusions from the statistics derived from the Anglican parish registers. The figures for burials are much more reliable than those for baptisms; this is because so few Nonconformists were buried outside the Anglican Church,[3] and the main reason for the under-registration of deaths was the existence of private burial grounds in the large cities.[4] If we exclude urban industrial counties from the analysis, it is clear that there was a substantial fall in the death rate during the eighteenth century,[5] not unlike that estimated by Talbot Griffiths.

In addition to this evidence, several recent studies of the aristocracy and gentry indicate that there was a sharp drop in mortality during the middle of the eighteenth century.[6] Hollingsworth's study of the

[1] The age at marriage in Lancashire was about the same as for the country as a whole. The ranking of age-specific birth-rates varies considerably according to which age group of women is considered; if the age group 20–30 is taken the age-specific birth-rate is below average, for the age group 15–45 it is above average. See *4th R. G. Report 1842* p. 9; *8th R. G. Report 1845* pp. 5, 37, 187, 191.

[2] The mean ages at marriage of spinsters calculated from the Nottinghamshire marriage bonds and allegations for the period 1701–70 were as follows (number in sample is given in brackets): Farmers and yeomen: 24 (285); Husbandmen: 24½ (235); Labourers and servants: 25 (390); Artisans and tradesmen: 23½ (290); 'Gentlemen': 24 (210).

[3] There were four baptism birth registers to one burial register kept by religious nonconformists before 1810. Few Methodists buried outside of the Anglican Church before 1810. See 'Report on Non-Parochial Registers', *Parl. Pap. 1837–38/28*.

[4] This was reflected in the death/burial ratios for different counties, e.g. the 1839–40 ratio for Lancashire was 1.61, as against the national average of 1.18. P. Deane and W. Cole, *British Economic Growth 1688–1959* (Cambridge, 1962), pp. 108, 109.

[5] According to the Deane and Cole figures, the death-rate in eighteen southern counties fell from 30.6/1,000 in 1701–50 to 20.6/1,000 in 1801–30. *Ibid.*, p. 127. Although these figures must not be taken too literally, the long-run trend is probably fairly accurately described by them.

[6] See my 'Population Change in Eighteenth-Century England. A Reinterpretion', *Econ. Hist. Rev.*, 2nd ser., XVIII (1965); T. H. Hollingsworth, 'A Demographic Study of the British Ducal Families', *Population Studies*, XI (1957); T. H. Hollingsworth 'The Demography Of The British Peerage', Supp., *Population Studies*, XVIII, No. 2 (1964).

aristocracy yielded the following increase of expectation of life at birth for females during the eighteenth century:

Table 1. Expectation of life at birth for aristocratic women.

1700–24	1723–49	1750–74	1775–99	1800–24
36.3	36.7	45.7	49.0	51.7[1]

Most of the increase in life-expectancy was due to the saving of life amongst younger age groups. These statistics are derived from sources sufficiently reliable for us to be sure that they describe a genuine sharp decline in mortality. Although it is not justifiable to generalize about the total population from such a finding, we must attempt to explain it in terms which might be relevant for the whole population. Obviously an explanation in terms of the quantity of food supply is irrelevant to groups such as the gentry and aristocracy. Mortality diminished so rapidly during 1750–74 that one must seek an explanation more radical than those usually given. It is my view that such an explanation is the effective introduction of inoculation against smallpox from about 1740 onwards.

The elimination of smallpox amongst the aristocracy could explain the whole of the rise in the expectation of life for that group,[2] and indeed for the whole of the increase in population during the late eighteenth and early nineteenth centuries. For the population as a whole inoculation only became popular after about 1765, when the Suttons perfected their much safer technique. Jenner himself recognized this, for he wrote 'that the common people were rarely inoculated for the smallpox, till that practice was rendered general by the improved method of the Suttons. . . .'[3] Howlett in 1782 collected statistics from 225 parishes for the two approximate periods 1734–53 and 1754–73; the balance of baptisms over burials in the first period was negligible,

[1] Hollingsworth, *op. cit.* (1964), p. 57.

[2] That inoculation was responsible for the elimination of smallpox, rather than vaccination, is supported by the negligible rise in life-expectancy for the aristocracy between 1800 and 1824.

[3] *The Medical Repository* (New York, 1803), V, 239. Chambers draws attention to payment by a Nottinghamshire parish to one of the Suttons for inoculating some poor children in 1767, *op. cit.*, p. 32 n. 4. He also notes a relatively slight smallpox epidemic occurring in Nottingham in 1801, which is not incompatible with the slow spread of inoculation in towns outlined in earlier papers. The same is to some extent true of Boston, Lincs. (mentioned by Chambers), where the decline of registered smallpox deaths was from 14.1 smallpox burials per 100 baptisms during 1749–75 to 5.25 per 100 during 1776–1802.

and was only slightly greater in the second, suggesting that the great increase in population occurred after 1770,[1] which fits in very well with the chronology of the spread of inoculation. Other medical and environmental 'improvements' were associated with the large towns, yet in 1801 only about a fifth of the total population lived in towns with a population greater than 10,000.[2] Even as late as the 1840s mortality in the large towns was very high: for example, about 48½ per cent of all males born in the Liverpool district died before the age of 5 during 1838–44[3] Any improvements in the large towns would have been more than outweighted by the consequence of a smaller proportion of the total population now living in the relatively healthy rural areas. Furthermore, the medical historians T. McKeown and R. G. Brown have pointed out that most of the medical 'improvements' during the eighteenth and nineteenth centuries, e.g. fever hospitals and midwifery services, were probably ineffective.[4] Even if they were effective it is doubtful whether they affected more than a very small minority of the total population.[5]

In the country as a whole smallpox was the only significant epidemic disease so far as mortality was concerned. For example, Charles Deering, the historian of Nottingham, wrote in 1751 that 'there mostly happens once in five Years some Distemperature in the Air, which either brings along with it some Epidemical Fever, (tho' seldom very Mortal) or renders the Small-Pox more dangerous than at other Times; of this last, the Year 1736, was a fatal Instance . . . the Burials exceeded that Year the Births by above 380. . . .'[6] Deering implied that smallpox occurred

[1] The exact figures are:

	Baptisms	Burials	Marriages
1734–53	109,478	104,750	34,110
1754–73	123,715	109,758	40,285

See J. Howlett, *Observations on The Increased Population, Healthiness . . . of Maidstone* (Maidstone, 1782), p. 14. This pamphlet was published anonymously and a copy of it is to be found in Maidstone Museum.

[2] See B. R. Mitchell and P. Deane, *Abstract of British Historical Statistics* (Cambridge, 1962), pp. 8, 24–27.

[3] *8th R.G. Report, 1846*, p. 206.

[4] T. McKeown and R. G. Brown, 'Medical Evidence Related to English Population Changes in the 18th Century', *Population Studies*, IX (1955–6).

[5] With reference to improvements in midwifery, the figures produced by Dr. Eversley for the Worcestershire area do not suggest any significant fall in infant mortality during the eighteenth and early nineteenth centuries; this finding is compatible with the high infant mortality rate (about 15 per cent) for England and Wales at the beginning of civil registration. See D. E. C. Eversley, 'A Survey of Population in an Area of Worcestershire from 1660–1850 on the Basis of Parish Records', *Population Studies*, X (1956–7), pp. 269–71.

[6] C. Deering, *Nottinghamshire Vetus Et Nova* (Nottingham, 1751), p. 82.

in Nottingham every five years or so, a cycle of epidemics that we know from bills of mortality and parish registers to be very similar to those in other towns like Northampton and Maidstone. He also pointed out that the 1736 epidemic was the most severe since the Plague. Smallpox was increasing in virulence throughout the seventeenth and eighteenth centuries, an increase which was particularly marked during the 1720s and afterwards. For example, the total number of smallpox deaths in Godalming, Surrey, was as follows: 1686, 50; 1701, 24; 1710–11, 39; 1722–3, 94.[1] This is the probable explanation for the check to population increase which occurred in the 1720s; although Creighton, the medical historian, mentions influenza as an important disease during this period, it never appears in bills of mortality and parish registers (under the label of fever) as accounting for large numbers of deaths during an epidemic, as does smallpox. An example of how misleading Creighton was on this question is to be found at Exeter in 1729. Creighton reported a rumour that the high mortality during that year was due to influenza, yet a local diarist did not mention the disease, but noted that 'The Small Pox was very fatall to some. Mr. Vivian lost all his children, being four sons.'[2]

It is possible, of course, that an improved standard of life diminished mortality amongst the general population, but such an explanation does not fit in with the chronology of population growth and *per capita* incomes. It is probable that it was during the first half of the eighteenth century, rather than the second, that any rise in real incomes of the labouring classes took place,[3] yet population increased much more rapidly at the end of the century. I have already pointed out that growing real incomes could hardly explain the sharp fall in mortality amongst the gentry and aristocracy; and further, there was surprisingly little variation in adult male mortality between different occupational groups, due to income differentials, during the middle of the nineteenth century,[4] suggesting that income factors were not important in determining rates of mortality.

2

The most recent comprehensive work on the history of Irish population during the eighteenth and early nineteenth centuries is that by Professor

[1] *Surrey Archeological Collections*, XXVII, pp. 16–20.
[2] See R. Pickard, *Population and Epidemics of Exeter* (1947), pp. 65, 66.
[3] For example, see Deane and Cole, *op. cit.*, pp. 19, 91.
[4] See the *14th R.G. Report 1851*, pp. XVIII, XXII.

Connell. He concluded that the great acceleration in population growth at the end of the eighteenth century was due 'very likely to the increase of fertility that followed earlier marriage'.[1] Dr. M. Drake, however, has recently criticized this interpretation on the ground that the statistics of the 1830s do not, in fact, indicate a low age at marriage.[2] The following statistics appear to support this criticism:

Table 2. Proportion Unmarried of 100 of the Population of the Respective Ages (Ireland, 1841)[3]

		Under 17	17–25	26–35	36–45	46–55	53 +
Males	Rural	100	93	44	16	16	8
	Civic	100	87	36	17	12	10
Females	Rural	100	81	28	15	12	12
	Civic	100	79	33	20	15	15

The distribution of the unmarried amongst various age groups was very similar to that in England at about the same time;[4] if one allows for the overstatement of early marriages in the statistics for the 1830s (as outlined by Drake), it would appear that the mean age of marriage of spinsters and bachelors was nearly the same for both Ireland and England, i.e. about 24½ for spinsters and 25½ for bachelors.[5] This finding agrees with the fact that both the crude birth rate and age-specific birth rate were similar for the two countries for the period around 1840.[6] It might be argued, of course, that the relatively late age

[1] K. H. Connell, *The Population of Ireland, 1750–1845* (Oxford, 1950), p. 248.

[2] M. Drake, 'Marriage and Population Growth in Ireland, 1750–1845', *Econ. Hist. Rev.*, 2nd ser., XVI (1963–4).

[3] Population Census Ireland 1841, *Parl. Pap. 1843/24*, pp. 41, 42. Indeed, Ireland appears to have had one of the highest mean ages at marriage and lowest marriage rates in Europe. The contradiction between the literary and statistical evidence was pointed out in *6th R.G. Report 1844*, pp. XXXIII, XXXIV.

[4] See Mitchell and Deane, *op. cit.*, pp. 15, 16.

[5] For English ages at marriage during 1839–41 see the *Fourth Annual Report of the Registrar General 1842*, p. 10.

[6] The proportion of women between 15 and 44 as a percentage of the total female population and the crude birth-rate were about the same for both countries during this period. See Connell, *op. cit.*, pp. 30, 37.

of marriage in Ireland was not typical of the period before 1841. Drake has examined the statistics for the 1830s and has concluded that a 'trend towards later marriage which they depict probably did not occur'.[1] Possibly at an even earlier period marriage took place at a lower age, but then the age at marriage would be *rising* throughout the early nineteenth century when population was increasing very rapidly. The only evidence for early marriage is literary rather than statistical, but if the evidence for the 1830s is typical we are unable to rely upon the estimates of casual observers. For example, Connell has written that 'according to an official summary of the immense mass of evidence presented to the Poor Inquiry Commission of 1836, men in Galway usually married when they were between 14 and 21; in Leitrim between 16 and 22; in Mayo and Sligo usually under 20, and in King's County between 17 and 20',[2] yet according to the 1841 Irish Census there were *only fifty-three* married men under the age of 17 in the whole of Ireland.[3] It is probable that the informants of the Commission had a vested interest in castigating the moral 'laxity' of agricultural labourers and small cultivators: they had to find an explanation for the poverty of the majority of the population, and what more convenient explanation than the Malthusian one?

Drake has argued that there are alternative explanations for the rapid expansion of the Irish population: (1) 'that a highly nutritious and regular diet of potatoes so improved the health of Irish women that their fecundity increased markedly';[4] and (2) 'that the universal acceptance of the potato as the staple food would lead to a once-and-for-all drop in the general level of mortality'.[5] There are two major difficulties with this interpretation: first that population increased rapidly only after 1772, whereas potatoes had been used widely in Ireland since at least the beginning of the eighteenth century; and second, that earlier diets were probably much more nutritious than the exclusive reliance on potatoes at a later date. Petty wrote in about 1671–2 that 'The Diet of these people [the Irish] is Milk, sweet and sower, thick and thin, which is also their Drink in Summertime, in Winter, Small-Beer or Water. . . . Their Food is Bread or Cakes, whereof a Penny serves

[1] Drake, *loc. cit.*, p. 311.

[2] K. H. Connell, 'Peasant Marriage in Ireland: its Structure and Development since the Famine', *Econ. Hist. Rev.*, 2nd ser., XIV (1961–2), p. 520.

[3] Population Census Ireland 1841, *Parl. Pap. 1843/24*, p. 439. There were only 480 married females under the age of 17.

[4] Drake, *loc. cit.*, p. 311.

[5] *Ibid.*, p. 312.

a Week for each; Potatoes from August till May, Mussels, Cockles and Oysters, near the Sea; Eggs and Butter, made very rancid, by keeping in Bags. As for Flesh . . . tis easier for them to have a Hen or Rabbit, than a piece of Beef of equal substance'.[1] Several contemporaries thought that the Irish poor could no longer afford milk and other 'extras' during the late eighteenth and early nineteenth centuries.[2] It seems inconceivable that the slightly more luxurious earlier diet was less nutritious than potatoes by themselves. And if potatoes were associated with higher fecundity, why were not Irish women more fertile than English women?

The death rate in Ireland appears to have been lower during the 1830s than it was in England. According to the retrospective statistics collected for the Irish census of 1841, the crude death rate was 16.8 per 1,000 for the years 1836–40,[3] whereas in England and Wales for the period 1838–41 it was 22.2 per 1,000.[4] That this finding is not an artefact of the method of collecting statistics or due to differences in the age composition of the two populations is demonstrated by comparing age-specific death rates for the year 1840/41.[5] Below the age of about 35 the Irish mortality rates were all lower than the English, but the great disparity occurred amongst young children—Ireland had a mortality rate of about 40 deaths per 1,000 children living under the age of five, whereas the equivalent English rate was about 67 per 1,000.[6] The explanation of this marked difference in child-mortality rates is probably that a much higher proportion of the Irish population lived in rural areas. Within Ireland, the urban civic districts had a child-mortality rate (about 78 per 1,000) well over twice that in the rural districts (about 35 per 1,000). The conclusion to be drawn from these comparisons is that like the age at marriage, and the age-specific birth and marriage rates, the age-specific death rate in Ireland was similar in

[1] Other writers during the late seventeenth century emphasize potatoes and milk in the diets of the Irish poor. See G. O'Brien, *The Economic History of Ireland in the 17th Century* (Dublin, 1919), pp. 137–42.

[2] G. O'Brien, *The Econ. Hist. of Ireland from the Union to the Famine* (1921), p. 21.

[3] *Ibid.*, p. 189.

[4] *Fifth Annual Report of the Registrar General 1843*, p. 379.

[5] As the number of deaths in 1840 was ascertained from a house to house survey made in the following year (1841), the figures presumably are reliable, especially for young children's deaths.

[6] For the Irish age-specific mortality rates see Connell, *Population of Ireland*, p. 193; for English mortality rates for roughly similar age groups, see Mitchell and Deane, *op. cit.*, pp. 38, 40; for the exact figures under the age of 5, *Fourth Annual Report of the Registrar General 1842*, p. 128.

about 1841 to that in England and Wales when allowance is made for distribution effects of population in urban and rural areas. This would imply that demographic factors were independent of economic differences, a conclusion similar to that reached from a study of the age at marriage and age-specific birth and marriage rates within England during the eighteenth and nineteenth centuries.

If the increase in Irish population is not to be explained in terms of a high birth rate associated with a low age at marriage, but in terms of a low death rate, what possible cause or series of causes could explain any *fall* in the death rate during the late eighteenth and early nineteenth centuries? We have already rejected the hypothesis that there was an improvement in the Irish diet during the eighteenth century. Professor Connell, after reviewing possible causes for a reduction in mortality, concluded that his 'examination of the social habits and the housing of the Irish, the dissemination of hospitals and dispensaries, the spread of vaccination and the incidence of fever does not support the proposition that in Ireland, as is said to have been the case in England, greater cleanliness and medical advances led to a substantial lowering of mortality'.[1] Professor Connell also reviewed the history of smallpox and inoculation, but unfortunately did not treat the subject at length; here it is only possible to elucidate some hypotheses and briefly illustrate them with relevant statistics.

Smallpox appears to have been present in Ireland at least from the Middle Ages onwards and had become endemic before the eighteenth century.[2] The disease seems to have occurred almost every year in Dublin during the period 1661–1746, when bills of mortality were kept.[3] According to statistics derived from these bills, smallpox accounted for about 20 per cent of the total deaths during the two periods 1661–90 and 1715–46.[4] Smallpox deaths 'accounted' for about 33 per cent of all children born during 1715–46, according to the Dublin bills of mortality. No other statistics of smallpox mortality are available for Ireland before the 1830s. However, several observers

[1] Connell, *op. cit.*, p. 239.

[2] As Rogers wrote in 1743: 'though of foreign Growth, and by Transplantation brought in amongst us, it is now become a Weed of our own Soil, and a Native of our Country'. Joseph Rogers, *Essay on Epidemic Diseases* (Dublin, 1734), p. 82.

[3] For a description of the content of the bills and relevant statistics, see J. Fleetwood, *History of Medicine in Ireland* (Dublin 1951), p. 65, and Dr. J. Rutty, *A Chronological History . . . of the Prevailing Diseases in Dublin* (Dublin, 1770).

[4] The actual figures are as follows: Dublin, 1661–90: smallpox deaths (annual average)—472, total deaths (annual average)—2,236. 1715–46 (excluding 1739): smallpox deaths—13,759, total deaths—74,585; total births—42,566.

described smallpox epidemics during one period of the eighteenth century. Dr. James Sims recounted the smallpox epidemic of 1766–7, writing that smallpox outbreaks 'with unheard of havock, desolated the close of this year [1766], and the succeeding spring of 1767. They had appeared above a year before along the eastern coast of the kingdom, and proceeded slowly westward with so even a pace, that a curious person might with ease have computed the rate of their progress. . . . As they had not visited the country for some years, numerous subjects were grown up for them to exercise their fury upon, and many blooming infants were just opening to the sun, in vain, since they were so soon to be cropt by this unfeeling spoiler. Of thousands who caught the infection in this [Tyrone] and the neighbouring counties, scarcely one-half escaped, and even of these, some with the loss of one or both eyes, and several with faces so altered, as to be known with difficulty by their most intimate acquaintances'.[1] A later epidemic in 1770 was less mortal but this was attributed to 'the want of subjects for them to exercise their fury upon, the preceding disorder having left few who had not undergone the malady, than to any abatement in their malignancy'.[2] These descriptions of smallpox epidemics in the countryside are identical with those to be found in England before the advent of inoculation, and smallpox was always more virulent in isolated country areas owing to a lack of a pool of antibodies.[3]

3

Inoculation was introduced into Ireland in 1725 and spread very slowly amongst the general population, although unfortunately little is known of the exact chronology. The watershed of the practice of inoculation in Ireland, like that in England, was probably the perfection of a safe technique by the Suttons during the 1760s. The Suttons appointed several partners in Ireland: 'Messrs. Houlton, Blake and Sparrow in Dublin; John Hailey, M.D. in Cork; John Morgan, M.D. in Straborne, Tyrone; and Messrs. Vachell, Ward, Shields & Arnold soon [1768] to be appointed to particular districts in Ireland'.[4] This development

[1] J. Sims, *Observations on Epidemic Disorders* (1773), pp. 36–38.
[2] *Ibid.*, pp. 134–5.
[3] See my paper in *Econ. Hist. Rev.*
[4] R. Houlton, *Indisputable Facts Relative To The Suttonian Art of Inoculation* (Dublin, 1768), p. 10.

appears to have marked the beginning of popular inoculation in Ireland. In 1769 'a special infirmary was set apart in the Foundling Hospital of Dublin, for Experimenting with inoculation upon the inmates'.[1] In April 1777 'agreeable to the humane resolutions of the King's County Infirmary, 461 persons were, in the course of last month, inoculated'.[2] The difficulty of tracing the history of inoculation in Ireland is that most of it was carried out by 'individuals [who] proceed from village to village several times during the year for the purpose of inoculating the infantile population',[3] a practice, of course, made necessary because there were at this time so few doctors in Ireland. Inoculation does not appear to have been used much during the 1766 epidemic as described by Sims, although he refers to the existence of 'inoculators' at that time.[4] Houlton observed in 1768 that several itinerant inoculators were claiming that they practised the safe Suttonian technique,[5] and as I have said this was probably the beginning of popular inoculation in Ireland.

By the beginning of the nineteenth century inoculation was practised almost universally. The Dublin College of Physicians, when asked in 1807 their opinion of vaccination, replied that 'Variolous Inoculation had been long, almost exclusively in the hands of a particular branch of the profession ("irregular practitioners") . . . being the usual medical attendants in families, and especially employed in the diseases of children. . . . Smallpox is rendered a much less formidable disease in Ireland by the frequency of inoculation for it . . . hence parents, not unnaturally, objected to the introduction of a new disease (vaccination) rather than not recur to that with the mildness and safety of which they are well acquainted.'[6] According to the Rev. H. Townsend, writing in 1810, the increase in population was partly due to 'the universal custom of inoculating children for the smallpox, a disorder, which was once a little less injurious in its ravages than the plague'.[7] The activities of the itinerant inoculators were noted in Derry in 1812,[8] and in Co. Water-

[1] Population Census 1851, *Parl. Pap. 1856/29*, p. 146.
[2] *Ibid.*, p. 422.
[3] Population Census Ireland 1841, *Parl. Pap. 1843/24*, p. XII.
[4] Sims, *op. cit.*, p. 42.
[5] Houlton, *op. cit.*, p. 25. 'Some, I am informed since my arrival in Ireland, are now travelling over several parts of the kingdom. . . .'
[6] *Report of the Royal College of Physicians of London on Vaccination* (1807).
[7] Rev. H. Townsend, *Statistical Survey of the County of Cork* (Dublin, 1810), p. 90.
[8] W. S. Mason, *Statistical Account, a Parochial Survey of Ireland*, I (Dublin 1814), p. 313.

ford, Cork, Kerry, and Clare at later dates.[1] Sir William Wilde noticed the activities of the inoculators as late as 1851.[2]

Connell accepts that inoculation was practised very extensively, but also accepts the traditional belief that inoculation spread smallpox to those who were not protected by it. I have dealt with this problem at some length elsewhere,[3] and it can be only briefly discussed here within the context of Irish experience. According to Sir William Wilde, vaccination was practised in Irish towns much more than in country areas, owing mainly to the preference for inoculation amongst the peasants.[4] Yet smallpox mortality was much less in the country areas than in the towns:[5]

Table 3. Irish Smallpox Mortality in Town and Country.

	Population (1841)	Smallpox deaths (1831–40)	Annual average smallpox deaths per million living
Civic districts	1,135,465	12,418	1,093
Rural districts	7,039,659	45,459	647

This difference cannot be explained by the different age structures of the town and countryside population—they were approximately similar—or by the greater extent of smallpox in the towns: everywhere in Ireland during the 1830s smallpox was a young child's disease, meaning that most children caught it (unless they were inoculated or vaccinated) by their fifth birthday.[6] In such a situation inoculation could not conceivably spread smallpox, as it was already a universal disease. Smallpox mortality was higher in urban areas because there was less inoculation and vaccination practised there; the rural areas had lower smallpox mortality rates because of the protection given by inoculation. The total smallpox mortality rate of Ireland was about 710 annual deaths per million living. Although this figure may appear at first sight to be high, it is, in fact, remarkably low if compared with earlier mortality rates. In Dublin during 1661–90, for instance, the smallpox

[1] *First Report of the General Board of Health in the City of Dublin*, pp. 94–97.
[2] Population Census Ireland 1851, *Parl. Pap. 1856/29*, p. 422.
[3] See the paper already cited.
[4] *The Epidemiological Society Report, 1852–53*, p. 29.
[5] *Royal Commission on Vaccination*, 1st Report (1889).
[6] 49,000 of the 58,000 total smallpox deaths during 1831–40 were of children under 5 years of age.

mortality rate had been about 8,600 per million.[1] Expressed as a proportion of total deaths, smallpox had accounted for about 20 per cent of deaths in the 1661–1745 period in Dublin, whereas in that city during 1831–40 it accounted for under 3 per cent of them.[2] The rate of 710 per million is also low by what might be expected if neither inoculation nor vaccination had been utilized on a wide scale. The case fatality rate of natural smallpox amongst infants was about forty deaths per 100 cases during the 1830s;[3] had all children under the age of 5 caught smallpox, the smallpox mortality rate would have been 400,000 deaths per 1,000,000 living rather than the 39,300 per 1,000,000 which was the actual rate for children under 5,[4] i.e. it would have been about ten times the actual rate.

The point of these hypothetical comparisons is to indicate the scale of saving of life by inoculation and vaccination. Although it is impossible to trace the exact decline of smallpox during the late eighteenth and early nineteenth centuries, there being no statistical information available for Ireland during this period, literary sources as already indicated suggest a rapid decline before the end of the eighteenth century. Sir William Wilde in his survey of smallpox epidemics mentions none after 1776, except for mild outbreaks in 1827 and afterwards.[5] Accepting, therefore, the effectiveness of inoculation, it may be concluded that the gradual disappearance of smallpox could account for the whole of the increase in population after about 1770.[6] The chronology of inoculation, it should be noticed, fits in very well with the great

[1] This is using Petty's population figure of 55,000 for Dublin; undoubtedly this is an underestimate, but so many deaths were not registered that the two underestimations appear to cancel each other out, i.e. the overall crude death-rate using Petty's population figure is about 40 per 1,000, a not unreasonable figure for a city the size of Dublin during this period.

[2] 'Report . . . by the . . . Vaccination Committee 1853', *Parl. Pap. 1852–53/101*, p. 80. None of the smallpox mortality statistics in this essay ought to be taken literally, as there were several reasons why smallpox deaths were under-registered.

[3] See the *Royal Commission on Vaccination*, 1st Report (1889), pp. 74, 215; *ibid.*, 6th Report, pp. 717–20; E. G. Edwards, *A Concise History of Smallpox and Vaccination* (1902), p. 55.

[4] Connell, *The Population of Ireland*, p. 219.

[5] Population Census Ireland 1851, *Parl. Pap. 1856/29*, p. 422.

[6] Certainly if the 1766–7 epidemic was typical of pre-inoculation experience, the disappearance of smallpox in Ireland could explain any increase in population. Generally, smallpox mortality appears to have been heavier in Ireland than in England; nevertheless population expansion in Ireland before 1770 was probably due to earlier long-term changes such as the disappearance of the plague. In this sense, the gradual elimination of smallpox would only explain the great acceleration of Irish population after 1770.

acceleration in population growth from about 1771 onwards as outlined by Professor Connell.[1]

4

I have suggested that the population growth in both England and Ireland during the latter half of the eighteenth and first half of the nineteenth centuries can be explained as a result of the gradual elimination of smallpox, and therefore may be considered independent of contemporary economic changes. But since it appears that the demographic experience of the two countries was very similar, why was it that economic effects were so different? The answer to this question is obviously complex, and involves consideration of a wide range of economic, social, and political factors; in my few remaining pages only some points of particular relevance can be suggested.

The cloth industry was England's chief commercial manufacture during the eighteenth century, but according to recent estimates it only accounted for about 5 per cent of the total national income,[2] and its domestic market appears to have hardly changed between 1695 and 1772.[3] As most of the expansion in the cloth industry before 1772 can be explained as a consequence of increasing exports, we must ask how much other economic growth during this period was due to domestic expansion. Deane and Cole have argued that a *general* economic expansion took place from the 1740s onwards. This conclusion is based, however, on an index of real output which is virtually an index of estimated population growth, as agriculture (43%) and rent and services (20%) are both based on questionable estimates of the size of population. An analysis of the production series that are available throws considerable doubt on the 1740s as a turning-point. As one writer has pointed out: 'Of the dozen or so commodities for which output figures are available there are several in which the levels reached in 1741–5 and 1746–50 were lower than those achieved earlier in the century. This is true of

[1] See Connell, *The Population of Ireland*, p. 25.

[2] P. Deane 'The Output of the British Woollen Industry in the Eighteenth Century', *Journal of Economic History*, XVII (1957), p. 221.

[3] According to Deane's estimate, domestic consumption of manufactured cloth was about £3 million in 1695. If one accepts the proportion of Yorkshire woollens and worsteds exported in 1772 as being typical of the country as a whole (at this time Yorkshire output accounted for about 60 per cent of the total), domestic consumption of manufactured woollen cloth was also about £3 million in 1772. See Deane, *op. cit.*, pp. 220, 221.

strong beer, starch, hides and skins, coal imports, raw silk and thrown silk. Indeed, for some of these commodities the 1740s is a low point. In other commodities, such as printed goods and soap, the acceleration of output was clearly later in the century.'[1] This criticism appears valid, since, if one takes Deane and Cole's own home industries index (beer, leather, candles, and soap), the uninterrupted and main increase in production certainly occurs after 1770.[2] One hypothesis which would explain differences in the chronology of increased consumption of different commodities is that the consumption of quality goods increased much sooner and in greater quantities than did that of cheaper goods. The output of tallow candles, used by poorer people, doubled between 1715 and the end of the century, whereas that of wax candles, used by the wealthier classes, increased nearly tenfold.[3] The production of high-quality white glass nearly quadrupled between 1747 and 1801, whereas that of common bottles only began to increase during the 1790s.[4] The best comparison between the output of quality and cheap

Table 4. Output of Quality and Cheap Goods 1695–1804.

	Imports of silk (1695–1704 = 100)	Strong beer production (1695–1704 = 100)
1695–1704	100	100
1705–14	92	99
1715–24	110	112
1725–34	130	104
1735–44	107	102
1745–54	116	108
1755–64	153	113
1765–74	182	112
1775–84	203	123
1785–94	225	136
1795–1804	217	163

[1] D. Whitehead, 'History to Scale? The British Economy in The Eighteenth Century', *Business Archives and History*, IV, No. 1 (Feb. 1964), p. 83.

[2] The index numbers were as follows (beginning at 1700 and continuing at every tenth year until 1800): 100, 98, 108, 105, 105, 107, 114, 114, 123, 137, 152. Deane and Cole, *op. cit.*, p. 78.

[3] T. S. Ashton, *An Economic History of England: The Eighteenth Century* (1955), p. 60.

[4] Mitchell and Deane, *op. cit.*, p. 267.

goods is between silk and beer.[1] The consumption of silk increased rapidly after 1755, whereas that of beer only really began to increase after 1775.

It may be suggested that the earlier expansion of the market for quality products was a result of the rapidly increasing population of the aristocracy, gentry, and other wealthy groups. During the eighteenth century about a quarter of the national income went to $3\frac{1}{2}$ per cent of all families, i.e. the aristocracy, gentry, and merchant class.[2] Due to decreased mortality their numbers probably quadrupled between 1750 and 1850,[3] and they were the social classes most able to translate their increased needs into effective demand. This could have occurred in several ways: by a switch from savings to consumption; by increased borrowing, including mortgaging of land; improvements of their assets, through the enclosure of land and a more intensive use of their capital in business;[4] and by a general exploitation of patronage through increased participation in Parliament, particularly with reference to finding places in the very rapidly expanding army.[5] The main problem would have been to find positions for their now surviving younger sons and provide their daughters with portions; possibly this was one of the reasons for the frequent failure of many of the poorer gentry and yeomanry during this period.

If the earlier analysis of the causes of the population increase is correct, mortality did not fall significantly amongst the poorer classes until after 1765, and this would explain why the consumption of cheaper commodities did not rise until after this date. It would appear that the domestic consumption of woollen cloth increased rapidly after about 1772: after this date the total output of woollen cloth rose, while the proportion exported fell from about 70 per cent in 1772 to 35 per cent

[1] Deane and Cole, *op. cit.*, p. 51. The index figures are only approximations.

[2] P. Mathias, 'The Social Structure in the Eighteenth Century: a Calculation by Joseph Massie', *Econ. Hist. Rev.*, 2nd ser., X (1957–8), pp. 42–45.

[3] See T. H. Hollingsworth, 'A Demographic Study of the British Ducal Families', *Population Studies*, XI (1957).

[4] Both the number of patents taken out and the number of bankruptcies increased sharply from the 1760s onwards: Mitchell and Deane, *op. cit.*, p. 268; Ashton, *op. cit.*, p. 254. The scale of possible profit from enclosures is indicated by the estimate of Gregory King in 1685 that only about half of the total land surface of England was cultivated, of which three-fifths was cultivated under the common-field system. See J. L. and B. Hammond, *The Village Labourer* (1919), p. 26 n. 1.

[5] According to an unpublished analysis of mine, the proportion of the old aristocracy in the House of Commons rose significantly during the eighteenth century, and younger sons of the aristocracy increased their numbers in the Church, Navy, and 'Civil Service', as well as in the Army. The colonial Army and mercantile 'administration' provided outlets particularly for younger sons of the gentry.

in 1805, and 20 per cent after the 1820s.[1] Beginning probably during the 1770s, there was a considerable expansion of the home market for cheap woollens and cottons, due almost certainly to an increase in population rather than a growth in *per capita* incomes. It is not necessary to describe the effects of the great upsurge in population after 1770 which affected every branch of economic and social life—the growth of canals, the improvement of roads, enclosure of land, development of the factory system—in short, the Industrial Revolution. Although increasing exports and the raised demand of the wealthy led to a growth of production, these were not the foundation of the change.[2] They helped to maintain the real incomes of the mass of the population, and therefore helped to translate increased needs (from an enlarged population) into effective demand, which raised prices and stimulated economic growth.[3] Only a radical expansion of mass markets could provide the sufficient condition necessary for the fundamental transformation of the economy, i.e. the growth of the new factory capitalism. It is no accident that this capitalism did emerge ultimately in Lancashire, after its earlier forms had developed elsewhere. Lancashire had been the centre of production of the very cheapest cloth in the early eighteenth century, and untrammelled by traditional constraints it was the natural place for the emergence of the factory system producing for a mass market.

5

In Ireland the result of the population explosion was the growth of a subsistence economy rather than an industrial revolution. Although the Irish census of 1841 returned about 30 per cent of the total occupied population as employed in industry, two-thirds of these were women, most of whom worked at home in domestic industry, providing goods for local consumption.[4] The only province with a sizeable male popu-

[1] Although this was partly due to the substitution of cottons for woollens in the export market, only about 30 per cent of all cottons were exported during the second half of the eighteenth century. See Deane and Cole, *op. cit.*, pp. 185, 196.

[2] The growth in the export market partly depended upon emigration, and thus on population increase at home; inoculation was also widely used in America and the West Indies, and so was contributory to population growth in these markets.

[3] According to figures computed by Arthur Young, the price of wheat (statute measure) at the Windsor Market was as follows: 1714–38—£1. 15*s.* 5*d.* per qtr.; 1739–63—£1. 14*s.* 2*d.*; 1764–88—£2. 6*s.* 6*d.* See A. Young, *Annals of Agriculture*, XIV (1790), pp. 228–30.

[4] T. W. Freeman, *Pre-Famine Ireland* (Manchester, 1957), pp. 76–77.

lation employed in industry was Ulster, the centre of the linen manufacture.[1] This industry had been encouraged since the beginning of the eighteenth century as a compensation for the destruction of the Irish woollen industry in 1699.[2] The export of linen cloth and yarn trebled between 1718–47 and 1748–77, about 90 per cent of it finding its way into the English market.[3] In 1771 it was estimated that the manufacture of linen was worth £2,200,106, 70 per cent of the output being exported.[4] Linen was estimated to be worth about half the total value of all exports during 1771–7,[5] but its export importance declined during the late eighteenth and early nineteenth centuries, while home consumption appears to have expanded sharply during the same period.[6] Cotton, however, began to displace linen, for, as one observer noted in 1840, 'men cannot live for what they get for [linen] weaving now. There is a great difference in respect of the appearance of weavers who come to market now and formerly; they are not so well dressed, nor near so comfortable looking: the fine sturdy young men, who once came to the market, have now gone out of the trade, and many have emigrated to America. I remember when it was the best trade in Ireland; now it has gone to nothing. The cotton trade has ruined the linen; formerly everybody wore linen, and now everybody wears cotton'.[7] The change was probably due to the abandonment of protection of Irish industry in 1825, as even the domestic cotton industry began to wilt under the competition from England.[8] The first cotton mill driven by water power in Ireland was established near Belfast in 1784;[9] by the 1830s and 1840s 'the deserted factory with its silent water wheel was already a familiar aspect of the Irish scene'.[10] One of the main reasons for the eclipse of Irish industry was the lack of coal, although presumably

[1] *Ibid.*

[2] Although the manufacture of woollen cloth was very small in Ireland at the end of the seventeenth century, it was growing very rapidly during the last decade. It was supressed at the instigation of English clothiers, who were afraid it might eventually provide overwhelming competition. See G. O'Brien, *The Economic History of Ireland in the 17th Century* (Dublin, 1919), pp. 227–9.

[3] A. W. Hutton, *Young's Tour of Ireland*, II (1892), pp. 200, 202.

[4] *Ibid.*, p. 201.

[5] *Ibid.*, p. 255.

[6] The following are contemporary estimates: linen manufacture 1771: exports —£1,541,200; home consumption—£658,906; value of linen manufacture 1817 —£3,151,752; exports of linen 1822—£861,944. See Hutton, *op. cit.*, p. 201, and O'Brien, *op. cit.* (1921), p. 302.

[7] Freeman, *op. cit.*, p. 85.

[8] See O'Brien, *Economic History of Ireland* . . . (1921), p. 311.

[9] Freeman, *op. cit.*, p. 85.

[10] *Ibid.*, p. 6.

the cheapness of labour might have more than offset the cost of importing coal from England.

Perhaps the failure of industry in Ireland was rooted in the nature of the country's social structure. Arthur Young had noted in 1779 that the 'only considerable manufacture in Ireland, which carries in all its parts the appearance of industry, is the linen; and it ought never to be forgotten that this is solely confined to the Protestant parts of the kingdom; yet we may see from the example of France and other countries that there is nothing in the Roman Catholic religion itself that is incompatible with manufacturing industry. The poor Catholics in the south of Ireland spin wool very generally, but the purchasers of their labour, and the whole worsted trade, is in the hands of the Quakers of Clonmell, Carrick, Bandon, etc. The fact is, the professors of that religion are under such discouragements that they cannot engage in any trade which requires both industry and capital. If they succeed and make a fortune, what are they to do with it? They can neither buy land, nor take a mortgage, nor even fine down the rent of a lease. Where is there a people in the world to be found industrious under such a circumstance?'[1]

Young was undoubtedly correct in emphasizing the lack of financial incentives for Catholics to engage in industry, and another factor probably as important was their lack of capital. Very little land was owned by Catholics, and as early as the late seventeenth century most of the Irish population were peasants relying on subsistence farming. According to one observer writing in 1691, 'their food is mostly milk and potatoes, their cloathing coarse bandrel cloth and linen, both of their own make; a pot of gruel; a griddle whereon to bake their bread, a little salt, snuff, and iron for their ploughs being almost all they troubled their shopkeeper or merchant for. A little hut or cabin to live in is all that the poverty of this sort hope or have ambition for'.[2] Petty had estimated that out of a total of 200,000 houses, 160,000 were without any chimney, suggesting that they 'live in a brutish nasty condition as in cabins with neither chimney, door, stair nor window'.[3] With this degree of poverty it must have been impossible for Catholic peasants to acquire capital sufficient to establish manufacturing industry, quite apart from the lack of a home market suitable for the absorption of such manufactures. Any capital available was owned by the Protestant

[1] Hutton, *op. cit.*, p. 65.
[2] O'Brien, *op. cit.* (1919), p. 141.
[3] *Ibid.*, pp. 137–8.

landlords, many of whom were absentees; and as the population grew it became increasingly lucrative for them to invest their money in land, from which it was possible to obtain very high rents.[1] The derivation of these rents was described by Arthur Young: 'The poverty, common among the small occupying tenantry, may be pretty well ascertained from their general conduct in hiring a farm . . . they provide labour, which in England is so considerable an article by assigning portions of land to cottars for their potatoe gardens, and keeping one or two cows for each of them, and by means of living themselves in the very poorest manner, and converting every pig, fowl, and even eggs into cash, they will make up their rent . . .'[2]

In 1841 Ireland had a subsistence economy based on small peasant cultivation, widely scattered throughout the whole country: only about 20 per cent of the population lived in villages and towns, the rest in isolated cabins.[3] Pressure of population drove cultivation of potatoes 'towards the summits of the hills'[4] and meant that 'every possible spot of land is laboured'.[5] Subdivision of land and an almost exclusive potato diet enabled population to grow, inasmuch as the survivors of diminished mortality did not starve—until the subsistence economy collapsed and there occurred the great famine. The causes and consequences can best be seen in the following table:[6]

Table 5. Size of Land Holdings in Ireland, 1841 and 1851.

Size of holdings	Number of holdings	
	1841	1851
Not exceeding 1 acre	134,314	37,728
Exceeding 1 but not exceeding 5 acres	310,436	88,083
Exceeding 5 but not exceeding 15 acres	252,799	191,854
Exceeding 15 but not exceeding 30 acres	79,342	141,311
Exceeding 30 acres	48,625	149,090

The very small peasants and casual labourers were virtually eliminated within a decade: these were the inhabitants of the 'growth class' hous-

[1] See O'Brien (1921), pp. 12, 89, 97, 98.
[2] Young, *op. cit.*, pp. 31, 32.
[3] Freeman, *op. cit.*, p. 27.
[4] Connell, *op. cit.*, p. 96.
[5] *Ibid.*, p. 118.
[6] O'Brien, *op. cit.* (1921), p. 59.

ing—one-room cabins—which declined in number by 355,689 between 1841 and 1851, a decline of about 70 per cent.[1] The majority of the people leaving these cabins probably emigrated, although their reliance on potato subsistence meant that many of them starved to death or died from fevers associated with the famine.

6

Unable to industrialize, and with a rapidly expanding population increasingly dependent on the potato, famine in Ireland was inevitable. In England, on the other hand, all the conditions for industrial growth had been present before the population explosion: a relatively high standard of living and a social structure encouraging enterprise and providing a potential mass market; a thriving textiles industry; the existence of provincial capital markets and a great and growing commercial centre in London; relative political stability; a progressive agriculture; sufficient technical innovation; abundant market outlets and sources of supply in overseas markets—to mention only the best known of the much-discussed influences on growth. Although in both countries population increased rapidly through the use of inoculation against smallpox, England was fortunate in being able to industralize and thus avoid the mass starvation that was the disastrous fate of Ireland.

[1] *Ibid.*, p. 59.