

Eighteenth-Century Irish Population: New Perspectives from Old Sources

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The lack of other data has made fiscally motivated house counts the main basis of pre-censal Irish population estimates in the past. The source is potentially treacherous: in this paper spatial autocorrelation analysis of house counts at the county level is used to monitor its reliability over time. The new house totals which emerge, coupled with new estimates of mean household size, yield a different picture of aggregate and provincial population change between 1700 and 1821 than suggested in Connell's classic work. The final section of the paper suggests an interpretation of population change consistent with our revised figures.

THE demographic adventures of the Irish have earned them an enduring and not always enviable place in the literature. As long ago as 1807 Malthus set the tone: "Among the subjects peculiar to the state of Ireland is the extraordinary phenomenon of the very rapid increase of its population." His surmise that Irish population was rising faster than that of any other country in Western Europe was seemingly confirmed by contemporary studies and has also found support in later work. The Great Famine, which ensued barely a decade after his death and which is often cited as the classic example of a Malthusian positive check, has also been extensively studied, both for its importance in Irish history and its role as the last major subsistence crisis in Europe. Its aftermath turned Ireland into an "outlier" of a rather different kind, with emigration and the preventive check to the fore, a combination which resulted in a continuing fall in population over many decades.¹

Yet for all its inherent interest, the demographic history of Ireland remains in a somewhat unsatisfactory state. This is particularly true of the

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¹ Thomas R. Malthus, "Newenham and Others on the State of Ireland," *Edinburgh Review* (July 1808), p. 337. For an overview see Brendan M. Walsh, "A Perspective on Irish Population Patterns," *Eire-Ireland*, 4 (1969) pp. 3-21; Cormac Ó Gráda, "The Population of Ireland 1700-1900: A Survey," *Annales de Demographie Historique* (1979).

pre-Famine period, for which neither the contours nor the proximate causes of growth have been definitively settled. Issues such as the sensitivity of the age at marriage to economic conditions, and the role of emigration remain unresolved. In part the problem is a lag in applying modern techniques, but a more fundamental reason is the lack of reliable data. Ireland's first complete census was taken in 1821, and tractable data for earlier years are very scarce. Local enumerations were rarely taken, and parish registers, so revealing elsewhere, are few and far between. Those registers that survived began too late to be of much use in historical analysis.²

But there is at least one source available for the study of aggregate trends before the first census: the returns of the nearly universal hearth tax, introduced in 1662. The use of tax data may be seen as the resort of the desperate, when all alternative indicators of demographic change are unavailable. In the past, uncritical handling of this kind of source has tended to discredit it, and modern students of historical demography have perhaps been unduly wary of it—bad data, it would seem, are worse than no data. The returns relating to the Irish hearth-money tax have shared in this fate, and they have been treated less than seriously by some of those who have written on the demographic history of Ireland.³ The main purpose of this paper is to look once again at the surviving hearth-tax series and, by studying them at the county level, to observe changes over time and changes in the relationships between neighboring counties. This approach, for all its shortcomings, adds to our understanding of pre-Famine population trends and gives a hitherto missing regional dimension to the story of Irish population before 1821.

HEARTH-TAX AND ITS HISTORIOGRAPHY

The hearth-tax figures, in the form of aggregate totals of hearths taxed and houses subject to taxation, were the main element used in contemporary speculations on the overall size of Irish population between the 1670s and the 1790s, with house returns being treated as a proxy for households,

² Kenneth H. Connell, *The Population of Ireland 1750–1845* (Oxford, 1950) pp. 1–3; Joseph Lee, "Marriage and Population in Pre-Famine Ireland," *Economic History Review*, 21 (1968), 293–95; Valerie Morgan, "The Church of Ireland Registers of St. Patrick's Coleraine, as the Source for the Study of a Local Pre-Famine Population," *Ulster Folklife*, 19 (1973); Sean J. Connolly, "Illegitimacy and Pre-Nuptial Pregnancy in Ireland before 1864: The Evidence of Some Catholic Parish Registers," *Irish Economic and Social History*, 6 (1979) 6–7.

³ For modern comments on the Irish data, see George O'Brien, *The Economic History of Ireland in the Eighteenth Century* (Dublin and London, 1918), pp. 9–12; Connell, *Population*, pp. 3–15, 238–39; Michael Drake, "The Irish Demographic Crisis of 1740–1," *Historical Studies VI*, T. W. Moody, ed. (London, 1968), p. 120; Joseph Lee, ed., *The Population of Ireland before the 19th Century* (n.p., 1973), introduction. Historians dealing with late seventeenth-century Ireland have been more prepared to use hearth-tax evidence, albeit critically: Robin A. Butlin, "The Population of Dublin in the Late Seventeenth Century," *Irish Geography*, 5 (1965), 51–66; Louis M. Cullen, "Population Trends in Seventeenth-Century Ireland," *Economic and Social Review*, 6 (Jan. 1978), 149–65.

and independent evidence being employed to determine various household-size coefficients over time.⁴ The value of the figures as demographic evidence, however, began to be questioned in the late eighteenth century, and in 1790 Gervaise Bushe, one of the commissioners of the Irish Revenue Board (the body ultimately responsible for administering the tax), published a short but devastating critique of the accuracy of the figures before 1786, in which year an administrative reform within the hearth-tax department had begun.⁵ Further and more complete county figures appeared relating to 1791, but even these were treated with some skepticism by subsequent commentators, notably Thomas Newenham in the early nineteenth century.⁶ There were no further general returns of house numbers, for although the tax was to remain in force until 1824, single-hearth householders—the great majority in the countryside—were not taxed after 1795.

The first modern appraisal of the hearth-tax data was that by K. H. Connell, in the introduction to his classic monograph on early nineteenth-century population history, *The Population of Ireland 1750-1845* [1950]. His census-based analysis of the early nineteenth century has produced several long-running debates, but his judgments on the eighteenth century have not been challenged. Despite his candid admission that all pre-censal estimates could be seriously inaccurate, his numbers have been widely used without caveat.⁷ Connell's procedure was simply to assume that all official house figures that were derived from hearth-tax sources before 1788 were deficient by 50 percent. He argued that the degree of under-recording clearly demonstrated for the return of 1785 by Bushe and Newenham would have been at least as great in previous returns throughout the century. As for the final returns of 1791 he suggested they understated

⁴ Charles H. Hull, *The Economic Writings of Sir William Petty* (Cambridge, 1899), 1:141, 272, 2:610; Arthur Dobbs, *An Essay on the Trade and Improvement of Ireland* (Dublin, 1729-31), 2:4-9, 13-14; Thomas Dawson [Publicola], *The Great Importance and Necessity of Increasing Tillage* (Dublin, 1754), pp. 34-38; R. Brookes, *The Modern Gazeteer: Or Compendious Biographical Dictionary* (Dublin, 1765); [George Macartney], *An Account of Ireland* (London, 1773), p. 1; Bernard Scalé, *An Hibernian Atlas: Or General Description of the Kingdom of Ireland* (London, 1776). See also Charles Smith, *The Ancient and Present State of the County of Kerry* (Dublin, 1756), p. 77; *Dublin Magazine*, 2 (1763), 137, 367; 3 (1764-65), 331-32, 559-60.

⁵ Gervaise Parker Bushe, "An Essay Towards Ascertaining the Population of Ireland," *Transactions of the Royal Irish Academy: MDCC-LXXXIX*, 3 (Dublin, 1790), pp. 145-51. (An incomplete version of this paper has been reprinted in Lee, *Population of Ireland*.) See also Arthur Young, *A Tour in Ireland, with General Observations on the Present State of that Kingdom, Made in the Years 1776-1777 and 1778, and Brought Down to the End of 1779* (Dublin, 1780) vol. 2, appendix 87-88.

⁶ *House of Commons Journal (Irel.)* [henceforth *H. of C. Jnls. (Irel.)*], vol. 15 (1792-94), appendix ccii; Thomas Newenham, *A Statistical and Historical Inquiry into the Progress and Magnitude of the Population of Ireland* (London, 1805), pp. xii-xiii, 67-88. (This work has been reprinted in Lee, *Population of Ireland*.)

⁷ Connell, "Population," in Robert B. McDowell, *Irish Social Life 1800-1845* (Dublin, 1958), p. 80. Brian R. Mitchell and Phyllis Deane, *Abstract of British Historical Statistics* (Cambridge, 1952), p. 5; William E. Vaughan and André J. Fitzpatrick, eds., *Irish Historical Statistics: Population, 1821-1971* (Dublin, 1978), pp. 1-2.

total households by at least one-fifth.⁸ Connell's judgment has survived unscathed because his corrections in general were plausible and fitted his overall framework well. Yet his statistical manipulations were fairly rudimentary, and his investigation of the administrative context of the hearth tax superficial (this is understandable given the almost complete loss of relevant internal archives). With the acute data problems facing the student of eighteenth-century Irish demography, however, the hearth tax retains a special significance, and there is a powerful case for attempting to refine Connell's amendments of the returns.

The way is opened by querying Connell's view that the demonstrably low standards of the hearth-tax department in the mid-1780s were, in fact, common in the previous 120 years. His assumption that this was so is based on somewhat doubtful logic: "Unless, through the eighteenth century, the Government tolerated increasing laxity and dishonesty amongst its collectors, it is to be expected that efficiency would tend to increase if for no other reason than that as the country became more thickly populated the task of the collectors became less arduous."⁹ In other countries population growth has apparently had quite the reverse effect, with house or poll taxes growing more slowly than the actual rise in the number of households.¹⁰ There is certainly no *a priori* reason why the degree of inefficiency in the hearth-tax branch of the Irish revenue establishment should have been either constant over time or improving gradually. Indeed there are a number of reasons for supposing that the reforms of the 1780s were precipitated by a relatively recent decline in administrative standards, spanning 30 or 40 years.

There are other grounds for regarding Connell's verdict as less than conclusive. In his work he used returns of national house totals for 14 years in the eighteenth century, but results of five other years have now come to light and help fill in some of the gaps.¹¹ In themselves these supplementary figures do not transform the existing picture. But like some of the house returns used by Connell, they survive not merely in the form of national aggregates but are broken down into house totals for the 32 counties, with separate returns in some cases for the largest cities. Connell

⁸ Connell, *Population*, pp. 6–8.

⁹ *Ibid.*, p. 13.

¹⁰ Thomas H. Hollingsworth, *Historical Demography* (London, 1969), p. 118.

¹¹ Connell used national house totals for 1712, 1718, 1725, 1726, 1732, 1754 (corrected 1753), 1766, 1777, 1781, 1785, 1788, 1790, and 1791. Other series exist for 1706, 1744, 1749, 1752, and 1760. County figures used in this exercise have been drawn from the following sources: 1706, Trinity College, Dublin, MS 883/ii, p. 330; 1712, 1718, 1725, and 1726, Dobbs, *Essay on Trade*, vol. 2, pp. 5–6; 1732, *An Abstract of the Number of Protestant and Popish Families in the Several Counties and Provinces of Ireland . . . in . . . 1732 and 1733* (Dublin, 1736); 1744, 1749, 1752, 1753, and 1760, *Watson's Triple Almanac, 1748, 1751, 1753, 1754, and 1761*; 1777 and 1788, Bushe, "An Essay on Population"; 1791, *H. of C. Jns. (Irel.)*, vol. 15 (1792–94), appendix ccii. A revised 1791 series was used, taking where higher the county returns for 1790 as given in D. A. Beaufort, *Memoir of a Map of Ireland* (Dublin, 1792). For the 1821 house returns, see *Census of Ireland, 1821, Accounts and Papers*, British Parliamentary Papers, 1824, xii.

was aware of the survival of county data in some years—and of the importance of the regional dimension—but he resisted the temptation to make use of them, so convinced was he of their unreliability.¹²

THE COUNTY DATA: A TEST

The next step is to examine changes at the county level in hearth numbers over time. On the basis of this exercise we will seek to establish a measure of reliability, or at least credibility, of the different series. Equipped with this, we will explore regional variations in house numbers during the eighteenth century. If inefficiency, coupled with fraud, was the principal or even a major explanation of fluctuations in county house totals, then one should expect to find relatively little evidence of common regional trends shared by neighboring countries. Good data, on the other hand, should reflect such trends, because contiguous areas might be expected to experience similar population growth patterns. This is so because they are more likely to share a wide range of traits, from climate and soil quality to culture and access, and these traits should cause their comparative advantage in production to shift as the economy develops. We have sought to test the worth of the hearth-money data from this perspective by using the Moran test for spatial autocorrelation.

Spatial autocorrelation occurs when the presence of a quality or characteristic in one area or at one point makes its presence more or less likely in neighboring areas or at nearby points.¹³ By definition, when a spatial distribution shows a simple regional pattern, that is, where high values of a variable (or presences of a characteristic) are clustered together in one or two parts of the distribution and where low values of that variable (or absences of the characteristic) are clustered together in different parts of the distribution, there is positive spatial autocorrelation. A chessboard pattern, where the presence of a quality or characteristic makes it less likely in neighboring areas, displays negative spatial autocorrelation.

Coefficients to measure spatial autocorrelation have been derived by Moran and by Geary, and have been reviewed and their distribution theory developed by Dacey and particularly by Cliff and Ord.¹⁴ An autocorrelation coefficient for interval and ratio data is simply a weighted ratio of autocovariance to variance. Moran's I coefficient, the measure used in this

¹² Connell, *Population*, pp. 246–47.

¹³ Andrew D. Cliff and J. K. Ord, *Spatial Autocorrelation* (London, 1973), p. 1.

¹⁴ Patrick A. P. Moran, "Notes on Continuous Stochastic Phenomena," *Biometrika*, 37 (1950), 17–23; Roy C. Geary, "The Contiguity Ratio and Statistical Mapping," *The Incorporated Statistician*, 5 (1954), 115–45; M. F. Dacey, "A Review on Measures of Contiguity for Two and K-Color Maps," *Technical Report No. 2: Spatial Diffusion Study* (Dept. of Geography, Northwestern University, 1965); Cliff and Ord, *Spatial Autocorrelation*.

study, is defined as¹⁵

$$I = \frac{n}{W} \cdot \frac{\sum_{i=1}^n \sum_{j=1}^n w_{ij} \cdot z_i \cdot z_j}{\sum_{i=1}^n z_i^2}$$

where

$$z_i = (x_i - \bar{x})$$

x_i is the value of a variable x in area i

w_{ij} is the weight, or strength of spatial relationship, between areas i and j

$$W = \sum_{i=1}^n \sum_{j=1}^n w_{ij}$$

n is the number of areas.

The simplest system of weights is one in which w_{ij} is unity if areas i and j are contiguous and zero if they are not. To take into account the amount of common boundary and the distance between the centers of contiguous areas, the weights used in this study were calculated as

$$w_{ij} = k_i \cdot \beta_{ij} \cdot d_{ij}^{-1}$$

where

β_{ij} is the proportion of the length of boundary of area i which is common with area j

d_{ij} is the distance between the centers of areas i and j

k_i is a scaling factor such that

$$\sum_{j=1}^n w_{ij} = 1.$$

Under this system the weights between noncontiguous areas are still zero, but the strength of relationship between contiguous areas i and j will only rarely be the same as between j and i . The effect of the scaling factors k_i is to make all areas equally "important."

To test whether a spatial distribution displays autocorrelation, a value of Moran's I coefficient is computed from the formula above. If the spatial autocorrelation is positive, then the computed value of I should exceed that which would be expected from a random (non-autocorrelated) distribution.¹⁶ Obviously it is possible to produce at random a pattern which appears positively autocorrelated and gives a value of the I coefficient in excess of that expected from a random distribution. The probability of

¹⁵ Cliff and Ord, *Spatial Autocorrelation*, p. 12, equation 1.44.

¹⁶ The expected value of I from a random distribution is always $-(n-1)^{-1}$.

this occurring is computed from the sampling distribution of the I coefficient.

The spatial units used here are the 32 counties of Ireland, and because these units cannot be considered to be a sample of all possible Irish counties, the sampling distribution of the I coefficient has to be computed under the assumption of randomization. Simply stated, this distribution is the distribution of the I coefficients that would be produced by permuting the 32 recorded values around the 32 counties, and it has been shown to be asymptotically normal.¹⁷ Hence, when the amount by which the computed value of I exceeds the expected value is expressed as a ratio of the standard error of the expected value (the standard deviation of the sampling distribution), the computed value becomes a standard normal deviate; and the probability of it having arisen by change from a random (non-autocorrelated) distribution is given by its probability under the normal distribution. If this probability, α , is sufficiently small (less than 0.05, or 5 percent), the null hypothesis of a random distribution can be rejected in favor of the alternate hypothesis that the distribution is positively spatially autocorrelated, that is, there is a regional pattern.

Spatial patterns in demographic change have been observed for Britain and France from an early period, and are still present today.¹⁸ Unpublished work by one of the authors has shown that the rates of population change in the Irish Republic in the twentieth century when computed for rural districts show consistent and strong positive spatial autocorrelation. Recently, R. R. Sokal has produced the same finding for the twentieth century, although his analysis uses county data, employs a different system of weights, and considers only growth rates between "adjacent" pairs of census years.¹⁹ In his analysis, however, growth rates between 1871 and 1911 fail to show significant positive spatial autocorrelation.

Our analysis of the rates of growth of county population totals between each pair of census years in the period 1821–1881 does show consistent positive spatial autocorrelation (Figure 1a). Of the 21 intercensal periods, 20 produce positive spatial autocorrelation coefficients significantly different from the expected value, each with a probability of occurrence at random of less than 5 percent. At random, the expected number of such coefficients would be one or two.²⁰ It might be expected that as the time span

¹⁷ Formulae for the computation of the standard error of I under the assumption of randomization are given by Cliff and Ord, *Spatial Autocorrelation*, p. 15, equation 1.68.

¹⁸ Jacques Dupâquier, "La Population Rurale du Bassin Parisien à l'Époque de Louis XIV" (Ph.D. diss., University of Paris I, 2 Vols., 1977) summarized and reviewed by Jean-Pierre Poussou, *Annales de Démographie Historique* (1978), pp. 473–87; Richard M. Smith, "Population and Its Geography in England 1500–1700" in Robin A. Butlin and R. A. Dodgshon, eds., *An Historical Geography of England and Wales* (London, 1978), pp. 199–237.

¹⁹ Robert R. Sokal, "Ecological Parameters Inferred from Spatial Correlograms," in G. P. Patil and M. Rosenzweig, eds., *Contemporary Quantitative Ecology and Related Ecometrics* (Fairland, Maryland, 1979).

²⁰ The expected number of significant coefficients is actually 5 percent of 21, i.e., 1.05. However, .05 of a coefficient has no meaning.

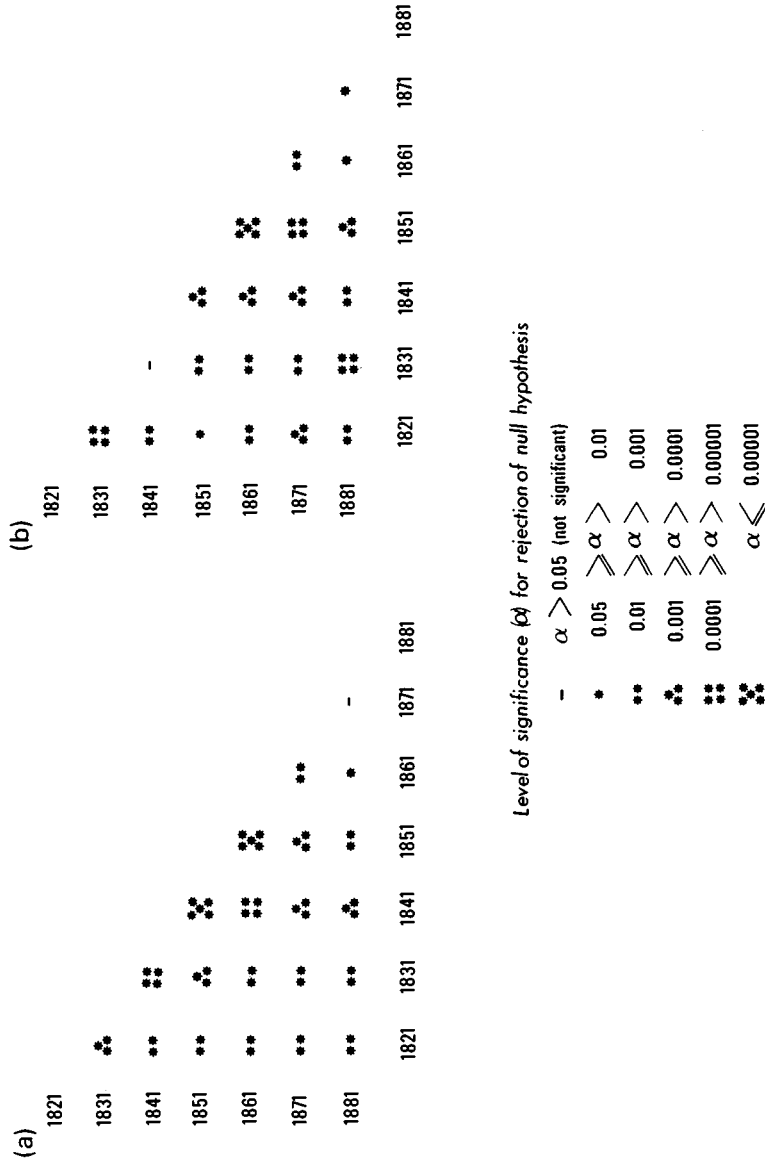


FIGURE 1
SIGNIFICANCE OF POSITIVE SPATIAL AUTOCORRELATION COEFFICIENTS
FOR GROWTH RATES BETWEEN ALL PAIRS OF CENSUS YEARS, 1821-1881

(a) Growth in Population

(b) Growth in Inhabited Houses

Source: Censal data as reported in William E. Vaughan and André J. Fitzpatrick, *Irish Historical Statistics: 1821-1971* (Dublin, 1978), pp. 3ff.

of the intercensal period increases, the stronger the positive autocorrelation of the spatial pattern of change would become, given that the effects of local variations and minor data errors would diminish; there is, however, no evidence from the coefficients to support this expectation.

When the spatial structure of rates of change in county totals of inhabited houses for the same seven censuses is analysed the results are very similar (Figure 1b). Again, all the coefficients indicate positive spatial autocorrelation, 20 out of 21 of them having a probability of less than 5 percent of having arisen by chance. These autocorrelation coefficients can be compared with those derived from the rates of change in population by comparing their probabilities of occurrence at random (classified into the six arbitrary groups shown in Figure 1). Nine of the pairs of coefficients are in the same probability category; ten pairs differ by only one category; one pair differs by two categories; and one pair differs by four categories. This last case, concerning the rates of change between 1831 and 1841, displays a slight weakness of the autocorrelation coefficient: because it is based on the deviations of each observation from the mean, when the absolute range of the observations is very small, as is the case with the rates of growth of both population and houses between 1831 and 1841, variations which in reality may be unimportant are given undue emphasis, and the coefficient may be distorted.²¹ Another distortion of the autocorrelation coefficient can occur when there are a few extreme observations: if these are located in contiguous areas the coefficient will be distorted towards a positive value; but if they are located in noncontiguous areas the coefficient will be distorted towards a negative value. An illustration of this latter case is the spatial pattern of rates of change of population between 1871 and 1881; the overall regional trend is made nonsignificant principally by the presence of increases in Antrim (Belfast) and Dublin amidst the generally high rates of decrease in contiguous counties. The resultant pattern of weak positive autocorrelation continued until 1891, and the values of the coefficients were further reduced by the enlargement of Belfast County Borough boundaries in 1896, transferring approximately 60,000 persons from Down to Antrim (Belfast).

Despite these reservations about the nature of the autocorrelation coefficient, the conclusion to be drawn from this preliminary analysis is both simple and clear. In the nineteenth and twentieth centuries in Ireland, rates of population growth show a strong regional component; in the nineteenth century rates of growth in house numbers show a regional component very similar to that of population growth. Thus it is hypothesized that if the county totals of taxed hearths in the eighteenth century are to be considered reliable (that is, that they were recorded consistently, and with the same degree of accuracy):

²¹ The marked rise in emigration during the 1830s may help explain the much weaker autocorrelation of population change as compared to that of houses.

- (i) the spatial pattern of the growth of taxed hearths should show a strong regional component (positive autocorrelation);
- (ii) these patterns of growth should accord with existing historical evidence.

The spatial autocorrelation coefficients were used to test the first part of this hypothesis; the second is touched on in the third section of this paper.

The time-span of the available eighteenth-century data is fairly impressive. Scattered hearth returns have survived for some districts dating from the initial years of hearth tax, although no comprehensive national house data as such exist for any year before 1706; from the later 1660s hearth-tax collection had been farmed out, each county forming a separate annual farm. (Complete returns of what appear to be the net bids of the successful county farmers have come to light for eight years between 1672 and 1700, and we have used these series—problematical as they may be—for purposes of comparison with the later house returns.) Tax farming was gradually abandoned after 1702, and by 1706 a system of direct management had been introduced across the country.²²

The eighteenth-century county house returns that we have used are drawn mainly from parliamentary accounts, contemporary directories, and the writings of Arthur Dobbs. But the administrative structure of the revenue service was not in fact organized on a county basis, so that county totals of hearth-tax revenue and of house numbers were only calculated with some inconvenience by the examiner of hearth money in Dublin, or by visitors like Dobbs to his office. Hearth tax was in the first instance assessed and received by “collectors” with the assistance of parish constables: in 1751 there were 85 collectors in the country (a figure which cannot have grown at all since the mid-1720s, although there appears to have been some expansion in the number of collection districts in the 1710s or early 1720s). Over the collectors in 1751 were 20 supervisors, who were responsible for keeping additional registers of houses, hearths, and receipts to those of the collectors, and both sets of books were audited in Dublin each year.²³ Collectors were assigned to specific “walks,” areas which usually formed several baronies—the administrative subdivision of counties—and abstracts of each walk sent up to Dublin gave a breakdown by parish of hearth and house totals in the previous year, newly chargeable hearths, exempt houses, arrears, and total receipts. A very small number of these abstracts have survived, so that we are dependent on the accuracy of the transcription and the arithmetic of those who converted parish and baronial data drawn from the abstracts into county totals. Several mistakes were evidently made in some of the series, but at least there were no problems about boundaries: the same county, barony, and civil

²² “State of the Revenue of Ireland,” [c. 1693], Add. ms 36651, pp. 12-13ff, British Library, London; Minutes of the Revenue Commissioners of Ireland, 1702-1703, 12 Jan. 1702/03, CUST/1, Customs House Library, London; Cullen, “Population Trends,” pp. 150-51.

²³ *H. of C. Jnls. (Irel.)*, vol. 7 (1761-64), appendix cccviii-ix.

parish units were used by the hearth-tax collectors throughout the eighteenth century. It is not known how regularly the abstracts that were sent up to Dublin were revised annually. In other words it is possible that the printed returns do not always relate to the years alleged, although from the small amount of direct evidence it would seem that there were indeed continual adjustments in the collectors' returns.²⁴ But whether this was uniform practice is difficult to say. The possibility of some stickiness in the local returns obviously introduces a further error factor, especially in the measurement of short-term fluctuations.

The main data used in this test were: the totals of taxed dwellings for each of the 32 counties of Ireland as recorded in the returns for the 14 years 1706, 1712, 1718, 1725, 1726, 1732, 1744, 1749, 1752, 1753, 1760, 1766, 1788, and 1791; the gross totals (that is, including officially exempt dwellings) for 1777; the gross totals (including exempt plus new dwellings) to form additional series for 1788 and 1791; and finally the total number of inhabited dwellings for each county as recorded in the 1821 census. For four of the years (1712, 1726, 1732, and 1791) for which the hearth data survive there is some doubt about individual county totals, and for those years both uncorrected and corrected versions were used.

Spatial autocorrelation coefficients were derived for the 120 possible pairs of years from which growth rates in recorded households could be computed. Their significance levels are recorded in Figure 2. Considering the corrected series only for 1712, 1726, and 1732, and the net series only for 1788 and 1791, 73 of the pairs of years show positive autocorrelation with a probability of less than 5 percent having arisen by chance, against a random expectancy of six. When the gross totals for 1788 and 1791 are substituted, the number of significant coefficients drops to 71. All pairs of years involving the 1821 census of population data show significant positive autocorrelation; when these are excluded, the number of significant coefficients from the remaining 105 pairs is 57 (net totals for 1788 and 1791) or 55 (gross totals for 1788 and 1791), against a random expectancy of five or six. The hearth tax enumerations, then, reveal the expected pattern of a regional component of growth, but with a far greater proportion of nonsignificant coefficients than shown by the nineteenth-century census data.

Eight of the nonsignificant coefficients derive from rates of growth computed from "adjacent" enumeration years. This would suggest that the data are not sufficiently reliable to produce estimates of short-term changes in household numbers. But by far the greatest contributors to nonsignificant coefficients are the years 1752, 1753, 1760, 1766, and 1777. When these years are excluded, 37 of the remaining 45 coefficients are sig-

²⁴ The longest continuous series of local returns is that for the cantred of Upper Ossory which covers every year between 1704 and 1794; in this the smallest change recorded between one year and the next is 0.15 percent (1768/1769); Edward Ledwich, *A Statistical Account of the Parish of Aghaboe* (Dublin, 1796), pp. 46-47.

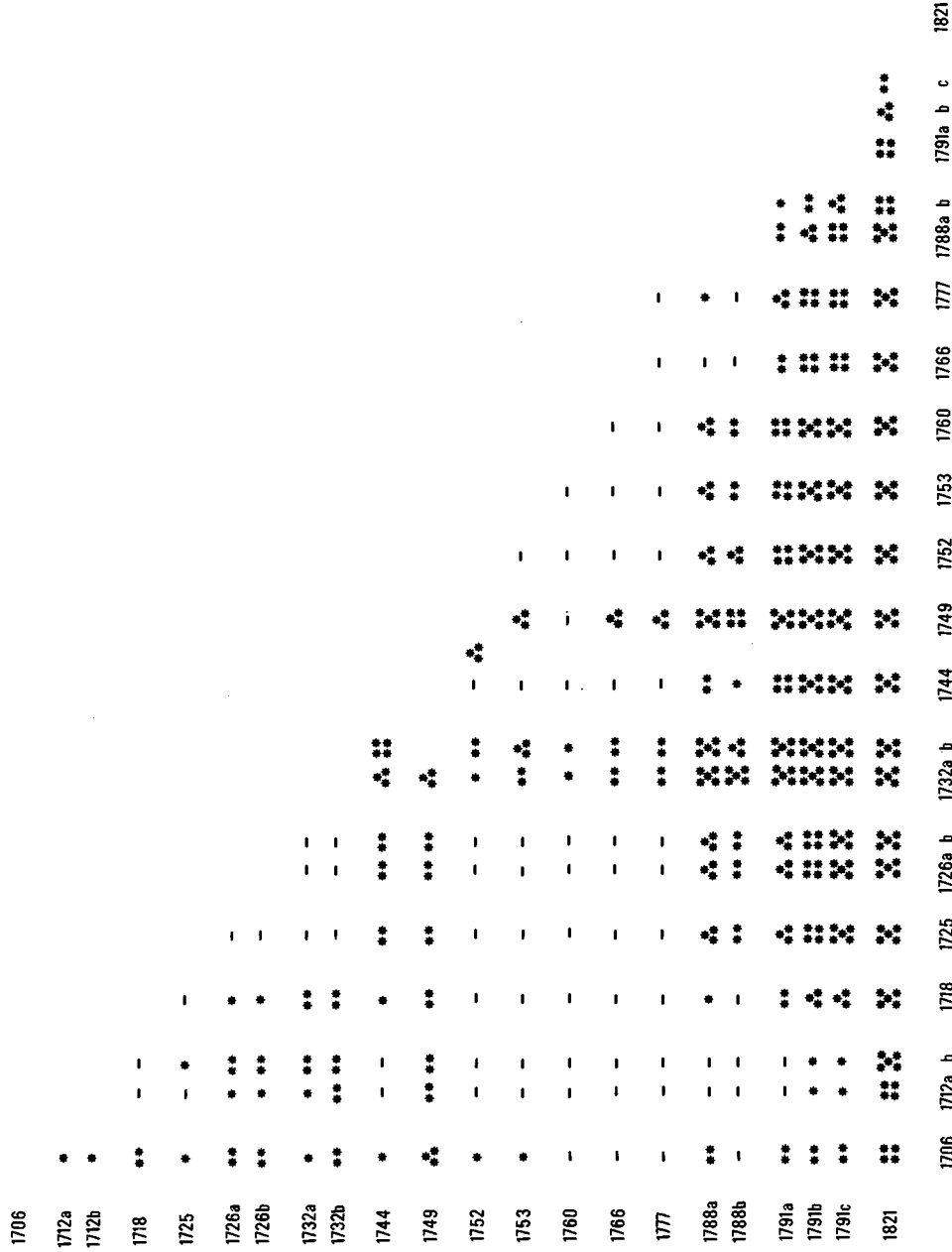


FIGURE 2
SIGNIFICANCE OF POSITIVE SPATIAL AUTOCORRELATION COEFFICIENTS
FOR GROWTH RATES BETWEEN ALL PAIRS OF HEARTH TAXYEARS 1706-1791
AND 1821 CENSUS

nificant, against a random expectancy of two or three, a result much closer to the nineteenth-century finding.

The 60 coefficients relating to the years 1752–1777 still show 20 significant positive autocorrelations against a random expectancy of three; nine of these relate to the years 1732 and 1749, and another nine to 1788 and 1791. It might be expected that the 1777 figures, being gross returns, would not yield significant coefficients when paired with the net returns of other years. But this is not the case when the results for the gross and net returns for 1788 and 1791 are compared; both gross and net returns show the same pattern of autocorrelation, with the net coefficients being slightly stronger for 1788, and slightly weaker for 1791.

The most striking finding, however, is that there is not one significant autocorrelation within the period 1752–1777. There are two hypotheses to account for this. The first is that there was no regional pattern of growth of taxable houses, but there is no evidence to support this hypothesis. The second hypothesis sees the data themselves rather than the inconsistency of spatial patterns as the source of the problem.

Overall one can conclude that the spatial autocorrelation test as used here appears to be sensitive to relatively modest alterations in intercounty variations. Nevertheless, as a means of evaluating the quality of aggregate census data the test is obviously a fairly crude barometer. Its real value (in relation to demographic data) is as a means of distinguishing between data series of widely differing reliability and of identifying the existence of regional trends in the better series.

FLUCTUATIONS IN THE QUALITY OF THE DATA: SOME EXPLANATIONS

The results of the test on the eighteenth-century data suggest on the face of it relatively good hearth-tax returns for the first half of the century, a perceptible decline in their quality after mid-century, and improvement setting in only at the end of the 1780s. But could the good results of the earlier period prompt misleading inferences about growth patterns before mid-century? One answer is that critics of hearth-tax returns, from Bushe in the eighteenth to Connell in the twentieth century, all emphasized that their defects stemmed from laziness, ignorance, and corruption, which when taken together are most unlikely to have been distributed in a sufficiently systematic way across counties as to give the positive results obtained in the test. Another answer is that the decline in the significance of the coefficients after mid-century and the later improvement tally well with our reading of changes in the standards of hearth-tax administration over the period. Nevertheless, the possibility of nonrandom flaws in the earlier data remains, though even if some such biases exist—and it is impossible to prove that they did not—we would argue that these would not upset our findings on regional variations and trends, since it is unlikely

that adjustments for regional under-enumeration would substantially alter the relative as distinct from absolute values.

If we assume that the disappearance of a regional pattern is primarily an indication of the deterioration in the reliability of the county data after mid-century, how is it possible to account for such a trend? There are two plausible explanations for the phenomenon, and they are not mutually exclusive. The first relates to the internal history of the hearth-tax administration, and the second to the changing demographic and economic environment.

There is little difficulty in documenting the belief that the administration of the hearth tax immediately prior to the late 1780s was gravely deficient. Pamphleteers, parliamentarians, and pioneer demographers over the next generation condemned the fraud, petty oppression, and inefficiency that was said to characterize the service.²⁵ Furthermore, it is clear that some of the deficiencies that the reformers sought to remedy had deep roots. Sixty years earlier Arthur Dobbs in his *Essay on Trade* (1729–1731) had criticized the inconsistent practice of collectors in furnishing details of exempted houses, a result of carelessness, he implied, rather than of fraud. And from the occasional references to hearth-tax officials that appear in the formal minutes of the revenue commissioners in the 1720s and 1730s it seems likely that there was some slackness in book-keeping and auditing. Yet the deep skepticism about hearth-tax statistics in the writings of the 1780s and 1790s seems to have been quite absent half a century earlier.²⁶

One factor which seems to have contributed to a decline in the quality of hearth-tax administration from around mid-century was the falling real income of collectors. Their annual salary of £40 p.a. remained unaltered until the late 1780s; supervisors at £60 p.a. were similarly disadvantaged in a period of mild inflation in the third quarter of the century. The opportunities for legally augmenting their salaries were very limited, and taxpayers were not supposed to be charged any collection fee. When direct management by the revenue commissioners had been introduced around 1706 the salary of £40 no doubt offered the prospect of a fairly respectable standard of living, not too different from that of many lesser clergy in the Church of Ireland. In response to the falling value of their salaries the collectors seem to have had increasing resource to corrupt practices. Certainly in other branches of inland revenue an attenuation of income was held responsible for the growth of various forms of fraudulent behavior, only curbed when there was a general revision of payments. Thus, in spite of the erosion of the face value of the salary the post of hearth-tax collector was able to retain its attractiveness as a lucrative “job” into the latter part of the century. Thomas Connolly, speaking in

²⁵ See Connell, *Population*, pp. 6–8.

²⁶ We have not come across any serious questioning of the value of the hearth-tax data earlier than that by Arthur Young in the latter 1770s (see fn. 5).

the 1788 parliamentary debate on hearth money, claims “that it was well-known, that when a gentleman solicited, from the minister, a hearth-money collection, that instead of £40 a year, its nominal value, that he considered it as (valued) from £1 to £200 a year, and whence did this arise, but out of the plunder of the people, already too wretched, by taking indulgence money. . . .”²⁷ One can discount for the rhetoric of parliamentary opposition, but there is still the probability that there was some truth in Connolly’s assertion, that the income from illegal fees—particularly from unrecorded new and pauper households who were charged a sum less than the two shillings tax—overshadowed the formal salary.

The social background of the collectors and supervisors appears to have changed little, for all the stagnation of official salaries. Collectors appear to have become less personally involved in hearth enumeration and tax gathering, leaving much of the task to less “responsible” and possibly less literate deputies. Associated with this was the relaxation of administrative standards at the center; there seems, for instance, to have been rather less interchanging of collectors between districts. Such tendencies came with the increasing politicization of the whole revenue establishment, notably in the 1750s and 1760s when control over appointments had fallen almost completely into the hands of one of the revenue commissioners, John Ponsonby, leader of a major parliamentary group in the Irish Commons. Many new hearth-money collection districts were established at this time, yet gross hearth-tax revenue became suspiciously stagnant.²⁸

The control of revenue patronage subsequently passed to the Irish lord lieutenant after 1772, but the damage done in the previous one or two decades was not at first repaired: the standards of bookkeeping, discipline, and honesty, which appear to have slipped in the 1750s and 1760s, left much to be desired even in the early 1780s. In 1781 a parliamentary investigation into hearth-tax revenue was held covering the previous 20 years, at which the examiner of hearth money was unable to comply with a specific parliamentary order to produce county house totals for the period since 1760, a task which should have been possible if the abstracts had been properly maintained. In the wake of the administrative reform movement, however, which was profoundly affecting government and public service in Britain in the early 1780s, change came to the Irish Revenue Board: within two years of his appointment as a revenue commis-

²⁷ *Irish Parliamentary Register*, 1788, p. 400.

²⁸ The remarks in this paragraph are based on an examination of a sample of minute-books of the Irish Revenue Commissioners between 1696 and 1786 (CUST/1 in Customs House Library, London, and Public Record Office, London). The establishment lists relating to officers on the hearth-tax payroll have not survived, however, and so our conclusions here must be regarded as tentative. For trends in hearth-tax revenue and details of hearth-tax offices in the 1750s and 1760s, see *H. of C. Jnls. (Irel.)*, vol. 7 (1761–64), appendix cccviii–ix; vol. 10 (1779–82), appendix cccxliv; vol. 11 (1783–85), appendix xlv. For the politics of the Revenue Board, see Thomas Bartlett, “Viscount Townshend and the Irish Revenue Board,” *Proceedings of the Royal Irish Academy*, vol. 89, sec. C (1979), especially pp. 156–58.

sioner in 1784, the politically well-connected Bushe sought to rationalize the levying and collection of hearth tax, and to find out the true numbers of those who paid the tax, those who did not, and those who should. It was perhaps symptomatic of the recent history of the department that in his private submissions to the government in 1788 about house growth trends, Bushe had to draw on *Watson's Almanack*, a contemporary digest of facts and figures, rather than on internal archives for earlier county totals. By the end of the 1780s the practice of collectors taking "indulgence money" from houses that were invisible in the official returns was being stamped out through more rigorous central supervision, through the introduction of bonuses to collectors for new houses (and hearths) enrolled, and through the channelling of official funds toward the remuneration of deputies and other assistants.²⁹

A second explanation for the declining quality of the data in the second half of the century in demographic and economic: the relative growth of economically marginal households in many counties, set against the absolute growth of population. The relative growth of pauper families who would have been unable to pay the two-shilling tax cannot of course be demonstrated statistically, but there is substantial evidence of this trend in some regions.³⁰ The result was that a growing proportion of the population was either not being recorded or, at best, being arbitrarily noticed in the hearth-tax returns.

The problem originated in the unsatisfactory procedures that collectors were to follow when confronted with pauper households. In the initial Irish legislation establishing the tax in 1662–1663, there had been three categories of exemption: newly built hearths (or houses) which were not charged tax in the year of their completion; buildings other than private residences (such as barracks, hospitals, schools, workhouses, and public buildings); and, most important, residences where the family was dependent on alms, or alternatively where the household head was a pauper. A pauper was defined as one whose house and land were each worth less than eight shillings a year and whose personal property was worth less than £4; those in this latter category who obtained exemption certificates from a magistrate were excused from paying the tax. Three years after the first act, amending legislation revealed some of the loopholes: exemption was restricted to those dependent on alms, and *widows* whose property was below the statutorily defined poverty line of 1662–1663. Over-liberal

²⁹ Gervaise Parker Bushe to the Lord Lieutenant (Marquis of Buckingham), 6 March 1788, MS STG Box 29(2), Huntington Library, San Marino, California; *H. of C. Jnls. (Irel.)*, vol. 10 (1779–82), p. 360, appendix dxxii; *H. of C. Jnls. (Irel.)*, vol. 15 (1792–94), appendix ccii, cccxxxvii; Bushe, "An Essay on Population," pp. 145–52; John Torrance, "Social Class and Bureaucratic Innovation 1780–1787," *Past & Present* (Feb. 1978), 56–81.

³⁰ David Dickson, "An Economic History of the Cork Region in the Eighteenth Century," (Ph.D. diss., University of Dublin, 1977), pp. 400–11, 639–41. See also *Dublin Magazine*, 3 (1764–65), 559–60; Nicholas Viscount Taaffe, *Observations on Affairs in Ireland, from the Settlement in 1691, to the Present Time* (Dublin, 1766), p. 13.

interpretation of the exemption clause remained a problem in the later seventeenth century, and changes in official definitions of exemption led to considerable confusion until the 1665 restrictions were restored in 1697.³¹

In eighteenth-century collectors' accounts the houses exempt from the tax were normally described as widow or certificate houses, that is, houses which were covered by magistrates' certificates of poverty. For the most part returns of these exempt houses have not survived in any form, but even if we have a full record of them there would be several problems. The difficulties involved in obtaining a widow's certificate from a magistrate authorized to grant one were considerable, at least in counties where resident magistrates were thin on the ground, and even when regulations were changed to permit any two magistrates acting together to grant exemptions, it was a system open to at least inconsistent practices.³² It is doubtful if magistrates accepted the poverty line as defined in 1662 as a meaningful criterion a century later.

The exemption of those dependent on alms raises even more problems of interpretation and implementation. Thomas Bacon, in his 1734 treatise on the Irish Revenue, noted that the intent of the original 1662–1663 act had been to exempt only those “who were not able to labour by reason of age, sickness or other bodily infirmity.” But he complained that there were “numbers of idle lazy beggars in this Kingdom who live entirely on the mistaken charity of the public . . . such indolent vagrants were never designed to be favoured by this Act, which ought strictly and literally to be put in force against them.”³³ The problem was not just that “sturdy beggars” were being exempt from the tax, however, but that collectors were being inconsistent in recording their numbers, “some in the abstracts returning them, some in part, and some not at all . . . the collectors being frequently removed from one district to another, occasions the poor in some years to be return'd in others not, according to the care or negligence of the several collectors,” an observation that is borne out in the dozen surviving district abstracts dating from the first four decades of the century, where the exempted pauper houses as a percentage of the gross total of recorded houses varies from 0.6 to 13.9.³⁴

The only contemporary estimate of the total number of exempted pauper houses in the early eighteenth century was made by Arthur Dobbs, calculated from returns he examined for 18 out of the 32 counties in 1725. He put forward a figure of 13,488 pauper houses, 3.4 percent of the taxed

³¹ See Edward MacLysaght, “Seventeenth-Century Hearth-Money Rolls . . . Relating to Co. Sligo,” *Analecta Hibernica*, 24 (1967), 5–16.

³² See for instance Smith, *Kerry*, p. 77n.

³³ Thomas Bacon, *A Complete System of the Revenue of Ireland, and Its Several Branches of Import, Export, and Inland Duties* (Dublin, 1734), pp. 391–92n.

³⁴ Dobbs, *Essay on Trade*, vol. 2, p. 7. For a tabulation of the extant district abstracts and the recorded exemption/net house ratios in these, see the authors' paper, “Hearth Tax, Household Size and Irish Population Change 1672–1821,” available on request.

and pauper house total. If this figure is to be believed it would suggest that Bacon's grumbling was rather out of place, and that exempt houses formed a very small percentage of the population.³⁵ But Dobbs's estimate of the pauper house share is in marked contrast to the returns of houses which became available in the late 1780s as the hearth-tax administration was being purged. One must assume that Dobbs's figure is a serious underestimate. It is tempting to take the easy way out and to use the latest and most comprehensive figures, those for 1791, and to apply the exempt-to-total house ratio of that year in each county to earlier "net" returns; however, this would be to ignore the strong indications that the relative size of the unrecorded section of the population had been growing since Dobbs's time. It seems reasonable to assume that many poor households, not eligible for exemption as measured by the old and increasingly unrealistic poverty line, were indulged by collectors in return for a small "back-hander"; that as the numbers of impoverished households grew absolutely and probably relatively in several regions, the old system of certification became impractical and was breaking down; and that with a cumbersome system for recovering arrears of tax, collectors and their deputies took the line of least resistance by moving pauper houses off the official record, or by not entering them when they first appeared. The fact that the pauper category jumped quite disproportionately as gradually more accurate figures of house totals were produced at the end of the 1780s pinpoints the most serious form of under-registration by that time: nearly 44 percent of the houses added to the gross official returns between 1785 and 1791 were designated as "pauper."³⁶

Admittedly a more flexible definition of poverty was employed after 1786, but there is no evidence that previously *taxed* houses were being regarded as exempt: the 112,556 pauper houses in 1791 were an amalgam of beggars' and widows' certificate houses, and of ones previously unrecorded, "indulged" on grounds of poverty.

THE DEGREE OF UNDER-ENUMERATION: SOME ESTIMATES

These uncertainties about exemption are part of the broader question as to how far hearth tax can be used as an actual measure of population change. Connell's tentative estimate of the degree of under-recording, based on evidence of the deficiencies of the tax in the years prior to 1786, is at best somewhat crude, and clearly can be improved on. Given the findings of the spatial autocorrelation test and the multiplicity of causes of error known to be creeping into the figures after mid-century, there is a

³⁵ Dobbs, *Essay on Trade*, vol. 2, pp. 8–9.

³⁶ For the 1785 return, see the initial table in Bushe, "An Essay on Population"; for 1791, see *H. of C. Jnls. (Irel.)*, vol. 15 (1792–1794), appendix ccii. Bushe suggested in 1788 that "paupers" (i.e., those dependent on alms) were "rather more" in number than those certified as "widows": Bushe to Buckingham, 6 March 1788, MS STG Box 29(2), Huntington Library, San Marino, California.

good case for ignoring all series of house returns in the years after 1753 and before 1788. This reduces the problem to one of determining the reliability of the "purified" figures 1788 and 1791, and of deciding how far the series for 1706 up to 1753 can be compared in terms of reliability with them. As the process of purification and reform had certainly not run its course by 1788 it is best to concentrate on the 1791 figures, and to use them as the key to the late eighteenth-century situation.

The published returns for that year give county totals for every size of taxed house from those with one hearth to the two mansions (both in County Kildare) returned as paying for 114 hearths, together with the number of pauper houses and of new houses not liable to pay the tax until the following year.³⁷ It is difficult, with so little internal documentation of the hearth-tax department surviving, to assess the strength of official confidence in these returns, which were made to a parliamentary committee shortly before the maximum valuation of households eligible for exemption was considerably raised. Connell was moderately skeptical of the 1791 returns, drawing support from somewhat suspect remarks made a decade and a half after the event by Newenham. He raised the 1791 figures upwards by multiplying the pauper and new-house returns by a factor of two, thus inflating the official gross total by about 20 percent. We have argued elsewhere that this is too drastic an adjustment, and would suggest that a more modest correction of the pauper house by one-half seems to be nearer the mark.³⁸

Adjustments to the figures for the years between 1706 and 1753 must be more speculative. We can, however, be confident that Connell's suggested 50 percent inflation of the returns for that period is on the high side. But to correct the house returns by taking an average of the few contemporary exemption returns in the surviving abstracts would be to err to the opposite extreme. We have sought to establish upper- and lower-bound estimates in the following way. For the period before 1753 we have analyzed a number of private or otherwise local enumerations which can be linked in a rough way with the hearth-money returns. Two of these, an estate census which covers the barony of Shillelagh in County Wicklow in 1729, and a local government return for the barony of Ikerrin, County Tipperary in 1750, falls somewhat short of the hearth-tax returns, suggesting that the latter could hardly have missed a large number of paupers in those particular districts.³⁹

Several others, however, exceed the hearth-tax return: the most extreme

³⁷ *H. of C. Jnl. (Irel.)*, vol. 15 (1792-94), appendix excvii-ccii.

³⁸ Connell, *Population*, pp. 7, 9-12. It seems justifiable to exclude the new houses from the upward adjustment; Wray's reported testimony on this is ambiguous, while Bushe in 1790 stated clearly that the current official returns of new houses were in fact the most reliable of all: Bushe, "An Essay on Population," p. 154.

³⁹ In the former case, the estate census gave a total of 820 households, the hearth-tax returns, 1,040 (although the area covered by the latter was almost certainly slightly larger): Survey of Lord Malton's Estate by Mr. Hume, 1730, MS 6054, National Library of Ireland; for 1732 hearth-tax returns broken

case is the diocesan census of Elphin in 1749, which took in most of County Roscommon, and returned one-third more households than the hearth-money count of 1753.⁴⁰ Bearing in mind that the harvest crises of the 1740s, particularly serious in Roscommon, may have greatly swelled the numbers below the poverty line, and the likelihood that the proportion of “paupers” was higher than average in that county even in normal times, we have used this result to provide an upper-bound working estimate of under-enumeration in 1753, which we suggest can also be adopted for county-weighted adjustments to the returns from 1712 onwards.⁴¹ At the national level this implies an inflation of official returns by an overall average of about 34 percent—allowing for certificate houses, new houses, compounded houses, and habitations unrecorded for one reason or another.

For a lower-bound estimate of under-recording in early eighteenth-century returns we have gone back to the collectors’ returns of exempt houses in the surviving early eighteenth-century abstracts. Most of these date from the 1730s and seem implausibly low even for that period; we have taken the two highest returns available, one for a walk in County Sligo in 1707–1708, the other for Coleraine district in 1737–1738, which straddled east County Derry and north County Antrim. In the first, the total of pauper to taxed houses was in the ratio 10:100, in the latter 9:100; this can be compared with the recorded 1791 ratios for County Sligo of 20:100 and 16/17:100 for Counties Derry and Antrim, that is, an exemption-to-net-house-total ratio for the early eighteenth century running at about half for 1791.⁴² If such an adjustment is made at county level (and if *new* houses are assumed to have appeared at a rate similar to that in 1791) then the official returns would be enlarged by an overall average of about 14 percent.

Revised house totals as variously calculated are set out in Table 1. Upper- and lower-bound estimates for the data up to 1753 are included, first because of the somewhat ambiguous results from our exercises in cross-

down by barony, see MS 1742, pp. 43–48ff, Lambeth Palace Library, London. The Ikerrin return of 1750 of approximately 550 Catholic householders can be compared with a hearth-tax return for the barony of 840 dating from 1732, but adjusted by reference to the continuous hearth-tax series for the contiguous cantred of Upper Ossory: “The Popish Inhabitants of the Half Barony of Ikerrin in 1750,” *Irish Genealogist*, 6 (Nov. 1973), 578–83; Ledwich, *Aghaboe*, pp. 46–47. These exercises are discussed more fully in the authors’ paper cited in fn. 34.

⁴⁰ The recorded number of taxed houses for the county was 6,211 in 1749 and 8,780 in 1753. The diocesan returns suggest a total for the county of about 13,200 families in 1749 (when certain adjustments for several missing parishes are made): Census of the Diocese of Elphin, 1749, MS 2466, Public Record Office of Ireland.

⁴¹ Fifteen years later one correspondent writing on County Roscommon and the “depopulated” state of the district dominated by large graziers noted that to the official hearth-tax figure for the county, 8,841 houses, “some thousand cottages not worth 20s each should be taken in”: *Dublin Magazine*, 3 (1764–65), 560.

⁴² For the Sligo and Coleraine returns of 1707–08 and 1737–38: P.R.O.I., Customs and Excise Papers, 2B. 105.23 and 2B. 105.10.

TABLE I
REVISED HOUSE RETURNS: NATIONAL TOTALS 1706-1821

<i>Year</i>	<i>Official</i>	<i>Authors' Lower-Bound Estimates</i>	<i>Authors' Upper Bound Estimates</i>	<i>Connell's Estimates</i>
1706	308,100 ^a	350,300	410,900	—
1712	349,900 ^a	395,400	463,400	524,800
1725	386,200 ^a	438,500	513,700	579,300
1732	386,900 ^a	439,300	514,500	580,400
1744	357,700 ^a	406,000	475,600	—
1749	357,600 ^a	405,600	474,500	—
1753	395,400 ^a	448,800	525,500	593,200
			757,400	841,300
1791	701,100			1,142,291

^a Net of exempted houses

Source: See text.

checking and second because of the possibility of some degree of variation in the reliability of the earlier "acceptable" returns. There is no way at present of determining the relative accuracy of the different series covering the period, or the degree of variation over time other than by reference to our test findings, although future work on the administrative history of the hearth tax may allow a more refined assessment. On present evidence, however, it seems unlikely that at either the national or the local levels were there sharp fluctuations within the range of our upper- and lower-bound estimates in the degree of under-recording over the first third of the century. Given the perturbations of the 1740s, however, and the amplitude of fluctuations in taxed house totals for some counties, the strict comparability of the series for 1744, 1749, and 1753 is rather more open to question.

CONCLUSIONS AND SPECULATIONS

This partial rehabilitation of the hearth-tax figures has some interesting implications for our understanding of eighteenth-century Irish population behavior. If it is conceded that the data are firm enough until the 1750s and at the end of the 1780s to support arguments about regional trends during these periods and between them, then it is apparent that there were strong contrasts in household formation within the county during the period. Regional patterns and intercounty variations are revealed in the maps in Figure 3 which record the rates of change in county totals of *taxed* houses. And if it is accepted that the degree of under-recording in the returns for the first half of the century was tolerably consistent over time and that the returns from that period can be married to the better attested series for 1791, then estimates of long-term trends in the rate of house growth can be advanced.

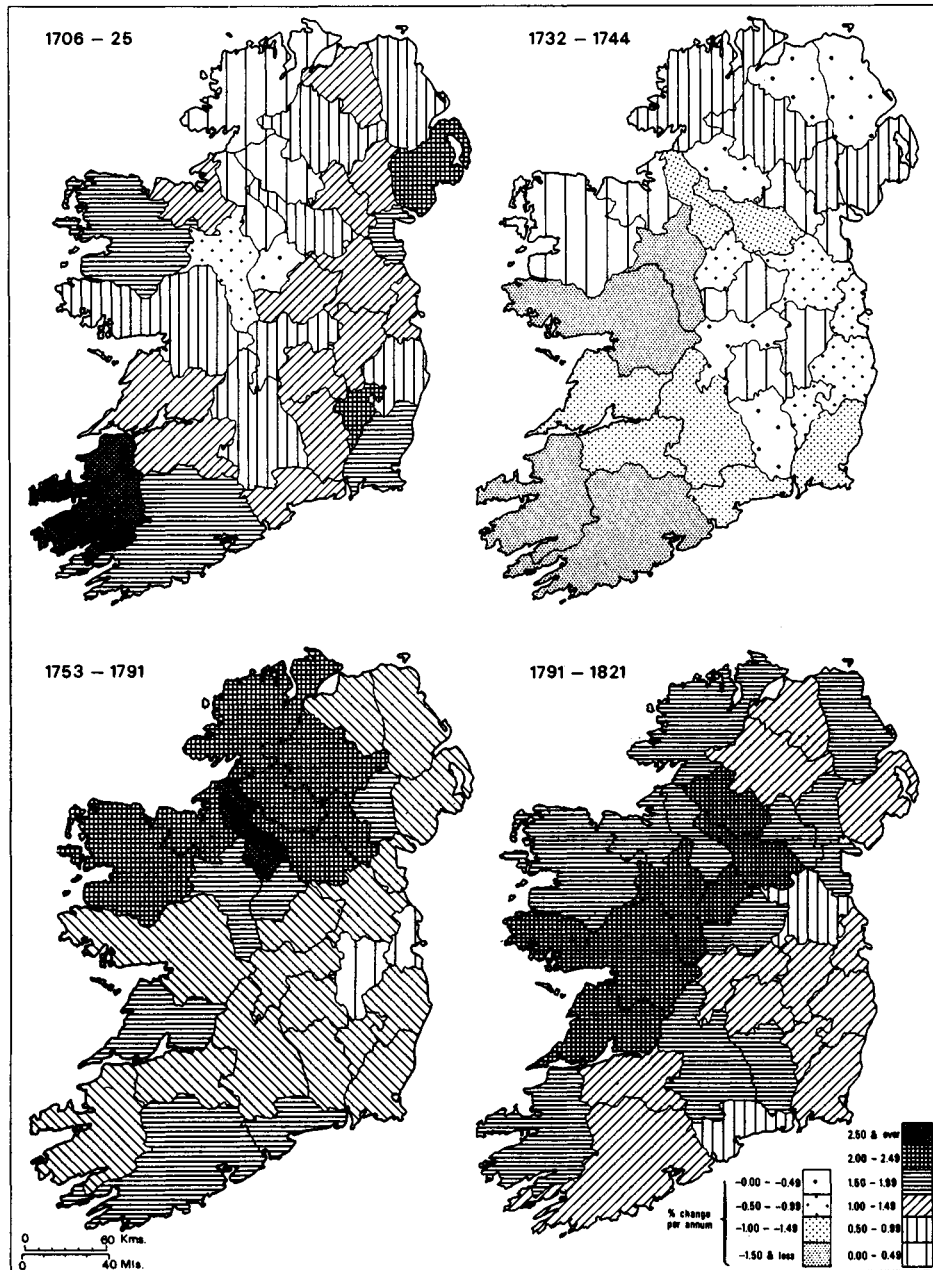


FIGURE 3
RATES OF CHANGE IN COUNTY TOTALS OF TAXED HOUSES

Here it is only possible to point to several of the more obvious demographic implications of our figures. But before doing so it is necessary to say a few words about mean household size—the key problem in measuring population trends based on house returns. Connell suggested a series

of national estimates spanning the era of the hearth-tax statistics, and these have been generally accepted by historians.⁴³ They are in fact modified versions of the estimates given in the familiar contemporary printed sources, and although these house multipliers probably identify the direction of household-size trends correctly—an early eighteenth-century fall and a gradual rise thereafter—we suspect that they are misleading on two counts. From an examination of a fairly wide range of surveys, some local, others forming almost country-wide samples, it would appear that there was a more pronounced shift in mean household size over the century than Connell believed; more importantly for regional analysis, there are fairly clear indications from these surveys of long-standing inter-provincial differences in household size (whatever the variations were within provinces). We have discussed our revision of Connell's estimates elsewhere.⁴⁴ Although the evidence is distinctly patchy, both temporally and spatially, we feel that there is a strong case for using province-specific estimates of mean household size when deriving population totals from the hearth-tax figures, and we have used our provisional estimates in calculating the population totals set out in Table 2.⁴⁵

The immediate impression given by our estimates of house and population movement is of a dramatic contrast between the two halves of the century: modest advances and evident setbacks before 1749, and rapid or very rapid growth thenceforth, a scenario somewhat different from that proposed by Connell, but not radically so. He, of course, argued for a later "take-off," and less spectacular rates of growth. Closer examination of our figures, however, shows marked provincial differences, and evidence of quite pronounced growth over most parts of the country in the first quarter of the century (Table 3). The possibility of some kind of population equilibrium in the first half of the century, suggested by the aggregate national totals, is belied by the regional figures, notably those for Munster which display striking growth and then precipitate fall. The fairly vigorous pattern of house expansion which many counties seem to have experienced up until the mid-1720s is not in fact as surprising a finding as it might appear, for indirect evidence from hearth-tax receipts ante-

⁴³ Connell, *Population*, pp. 14–24.

⁴⁴ The sources and their limitations are discussed at length in the authors' paper cited in fn. 34.

⁴⁵ The following are our working estimates of regional mean household size:

<i>Year</i>	<i>Leinster</i>	<i>Munster</i>	<i>Ulster</i>	<i>Connaught</i>
1706	5.2	5.2	4.7	4.8
1712	5.2	5.2	4.7	4.8
1725	5.1	5.2	4.7	4.8
1732	5.0	5.2	4.6	4.7
1744	4.9	4.4	4.7	4.8
1749	5.0	4.7	4.7	4.8
1753	5.1	4.8	4.8	4.8
1791	5.9	5.8	5.9	5.3
(1821)	6.3	6.3	5.6	5.6)

TABLE 2
PROVINCIAL POPULATION ESTIMATES, 1706-1821
(tens of thousands)

	1706	1712	1725	1732	1744	1749	1753	1791	1821
Leinster	54	59	67	66	62	65	71	118	176
	(a)	69	78	77	72	76	82		
Munster	51	58	67	70	49	54	59	120	294
	(a)	67	77	80	56	62	68		
Ulster	44	54	56	52	55	53	62	143	200
	(a)	63	65	61	64	61	72		
Connaught	25	26	28	28	25	23	28	61	111
	(a)	33	36	35	32	29	35		
IRELAND	175	198	218	216	191	195	220	442	680
	(a)	232	256	253	223	228	257		
	(b)								

(a) weighted lower-bound adjustment for exemptions etc. (official returns \times 1.14 approximately).

(b) weighted upper-bound adjustment for exemptions etc. (official returns \times 1.34 approximately).

Returns for 1791 are gross returns (corrected series) \times 1.08 approximately.

Returns for 1821 are official census figures of population.

Source: See text.

TABLE 3
PROVINCIAL GROWTH, RATE ESTIMATES
(percent per annum)

	1706-12	1712-25	1725-32	1732-44	1744-49	1753-91	1791-1821
Leinster	+1.6	+1.0	-0.1	-0.6	+1.1	(a) + 1.0 (b) + 1.4	+1.3
Munster	+2.2	+1.1	+0.6	-3.1	+2.1	(a) + 1.5 (b) + 1.9	+1.6
Ulster	+3.4	+0.2	-0.1	+0.4	-0.8	(a) + 1.8 (b) + 2.2	+1.1
Connaught	+0.5	+0.6	-0.4	-0.7	-2.3	(a) + 1.5 (b) + 2.1	+2.0
IRELAND	+2.1	+0.8	-0.2	-1.0	+0.4	(a) + 1.4 (b) + 1.9	+1.4

Note: (a) and (b) as in Table 2; that is, the (a) figures use the upper-bound population in 1753, the (b) figures use the lower bound.
Source: Data from Table 2.

dating the period of direct management (that is, pre-1706) implies that in many parts of the country there had been an impressive growth in taxed households before the Williamite wars (1689–1691), and recovery albeit of an unsteady sort thereafter.⁴⁶

Most counties are credited with little growth or actual decline in their house numbers between those years in the second quarter of the eighteenth century for which county returns are extant (1725, 1726, 1732, 1744, and 1749). There is strong corroborative evidence that such apparent setbacks reflected major demographic processes: there is fairly plentiful literary evidence on the severity of the harvest crises of 1727–1729, 1739–1741, and 1744–1745.⁴⁷ There are also the more tentative findings of several parish-register studies which point to the heightened incidence of mortality crises affecting children, especially in the 1730s and 1740s.⁴⁸ The geography of house decline between 1732 and 1744 is particularly clear-cut. Sharp falls are recorded in all of Munster and the southern half of Connaught; elsewhere there were some signs of growth in the northwest, in south Ulster, and in a few Leinster counties. The timing of the downturn is pinpointed by the trend in hearth-tax revenue receipts (unlike the house returns, these are available—as national totals—for every year): hesitant growth in the later 1730s, and then a fall in revenue of about 10 percent over the three years from 1739 to 1742.⁴⁹ This reverse coincided with what was undoubtedly the country's worst mortality crisis of the eighteenth century. The "great frost" of early 1740 was, of course, the beginning of two years of distress in many parts of Western Europe, but the severity of the Irish crisis was probably unique.⁵⁰ Our evidence points to an excess death rate well above 50 per 1,000 in each of the two years of famine epidemic, and it confirms literary evidence as to the southern complexion of the crisis; half the total mortality in 1740–1741 may have been

⁴⁶ The pre-1706 hearth-tax evidence and its interpretation is discussed in detail in the authors' paper cited in fn. 34.

⁴⁷ For the 1727–29 crisis, see [George Rye], *Considerations on Agriculture* (Dublin, 1730), pp. v–vi; Dobbs, *Essay on Trade*, vol. 2, p. 13; *Letters Written by His Excellency Hugh Boulter, D.D. to Several Ministers of State in England, and Some Others. Containing an Account of the Most Interesting Transactions Which Passed in Ireland from 1724 to 1738* (Dublin, 1770), pp. 151, 178, 181–82, 202, 228–31, 237; Lecky, *Eighteenth-Century Ireland*, vol. 1, pp. 184–85; L. M. Cullen, *Economic History of Ireland Since 1660*, 2nd ed. (London, 1976), pp. 46–47. For that of 1739–41, see John Rutt, *A Chronological History of the Weather and Seasons, and of Prevailing Diseases in Dublin* (London, 1770); Drake, "Irish Demographic Crisis," passim; Cullen, *Economic History*, pp. 57, 68–69. Dickson, "Eighteenth-Century Cork," pp. 622–23, 630–34.

⁴⁸ See for instance Valerie Morgan, "Mortality in Magherafelt in the Early Eighteenth Century," *Irish Historical Studies*, 19 (Sept. 1974), 130–34. Dickson, "Eighteenth-Century Cork," pp. 634–35. See also Rutt, *Weather and Seasons*, p. 24.

⁴⁹ British Library Add. MS. 18,022. Net hearth-tax revenue dropped from £45,045 in 1739–40 to £41,166 in 1742–43, a fall of 9.4 percent.

⁵⁰ Drake, "Irish Demographic Crisis," pp. 101–24; Cullen, *Economic History of Ireland*, pp. 57, 68–69; Dickson, "Eighteenth-Century Cork," pp. 622–23, 630–34; see also Michael Flinn, "The Stabilization of Mortality in Pre-Industrial Western Europe," *Journal of European Economic History*, 3 (1974) 292, 301–02, 311.

contained within Munster, the province which had a legacy of almost unchecked house growth stretching back before the turn of the century.⁵¹

The population growth rates suggested in Tables 2 and 3 for 1753–1791 leave little room for later subsistence crises of comparable magnitude. Ireland's famous 70-year gap in destructive famines would seem to be confirmed.⁵² The rates of house growth alone were very high by the standards of eighteenth-century Europe, and if mean household size was increasing at the same time, then indeed the island was maintaining a remarkably sustained growth in its food supplies. But the higher revised growth rates seem less remarkable when they are compared to those for 1791–1821; in three of the four provinces growth rates over 1791–1821 fall within our minimum and maximum growth estimates for the years between 1753 and 1791.⁵³ Munster and Leinster may have experienced some slackening in population growth after 1791 if not in the rate of house formation. But in the case of Ulster its very high growth rate between the 1740s and 1790s was not it seems maintained, and it is the one region where household size appears to have contracted in the 30 years after 1791; here changes in the structure of the linen industry and transatlantic migration flows may be relevant. Counties exhibiting greatest growth between 1753 and 1821 were those in Connaught and west Ulster, embracing areas which had considerable reserves of poor quality land for marginal cultivation and abundant domestic fuel supplies and which were benefitting from a rapidly improving transport network of roads and water navigation after the 1780s.

These perspectives invite a reinspection of the "old reliables" of Irish demographic history, early marriage and the potato. As regards the first, one could argue that if the early eighteenth century had the characteristics suggested here of sharp but insecure growth, then explanations of a late eighteenth-century "take-off" based on the mechanism of fertility change become less attractive. Taking the island as a whole there seems to have been a potential for rapid growth throughout the century, for there is no convincing evidence that the low age of marriage and high nuptiality rates of a later period were recent characteristics of the population. As for the

⁵¹ This issue is discussed at length in the authors' paper cited in fn. 34. For other evidence on Munster in the crisis, see Thomas Dawson [Publicola], *A Letter From a Gentleman in the Province of Munster to His Grace the Lord Primate*, (dated 25 May 1741), p. 7; Ruddy, *Weather and Seasons*, pp. 86, 88. Cf. Drake, "Irish Demographic Crisis," pp. 117–120; Dickson, "Eighteenth-Century Cork," pp. 630–34.

⁵² Connell, *Population*, pp. 144–46; Drake, "Irish Demographic Crisis," pp. 122–23. Very high food prices in 1756–57, 1766–67 and 1783–84 undoubtedly raised mortality levels, but evidence of virulent fevers and widespread resort to begging and vagrancy—the most commented on characteristics of mortality crises in the first half of the century—is fairly limited. Newenham estimated that the (excess) mortality in the 1799–1801 period of food shortages was not greater than 40,000 for the country as a whole: Newenham, *Population of Ireland*, pp. 131–32.

⁵³ The regional pattern of house growth between 1791 and 1821 as derived from the hearth-tax returns, was echoed, although with some "noise" in the age structure of the 1821 population: compare Map 4 and Figure I in Cormac Ó Gráda, "Demographic Adjustment and Seasonal Migration in Nineteenth-Century Ireland," *Etudes Rurales* (1981, forthcoming).

potato, while it can by no means be exclusively credited with the freedom gained from major mortality crises after the 1740s, it does seem to have fueled population advance in two distinct ways: like rural industry it reduced the fixed cost of setting up a family and the marginal cost of children, and in addition, by reducing the year-to-year variation in incomes, the tandem diet of potatoes and oatmeal that prevailed for most of the century must have cut the risk of famine considerably.⁵⁴

Cullen has suggested that Irish population may have doubled over the course of the seventeenth century, and our tentative estimates indicate that, despite a hiatus in the second quarter, the performance was bettered in the eighteenth.⁵⁵ All in all, a very rapid secular rate of increase by European standards is implied. In demographic history at least, Ireland seems set to remain an outlier.

⁵⁴ Cullen, "Irish History Without the Potato," p. 82; Flinn, "Mortality," pp. 310–11. The value of the correlation between grain and potato yields in eighteenth-century Ireland is unknown, but how dietary insurance may have contributed to the "gap in famines" may be seen from the following (hopefully not too fanciful) example. Assume that grain and potatoes contributed equally to income and that the correlation between their yields, R , equalled zero. Then it can be shown that the overall income variation would have been reduced by $1 - [(1 + R)/2]^{1/2}$, or by around 30 percent. For $R = +0.3$, the reduction in income variation would have been around 20 percent. The earliest comparable yield data to hand are for France: there the year-to-year correlation between potato and wheat yields for 1829–44 was close to zero. See B. R. Mitchell, *European Historical Statistics 1750–1970* (London, 1975), p. 199; Donald N. McCloskey, "English Open Fields as Behaviour Towards Risk," in P. Uselding, ed., *Research in Economic History*, I (Greenwich, CT, 1976), pp. 134–36.

⁵⁵ Cullen, "Population Trends," pp. 162–63.