Estimating English medieval population:
reconciling time series and cross sectional evidence[1]

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1.1.1 Introduction

Economic growth can be either extensive or intensive. Extensive growth arises where more output is produced in line with a growing population but with living standards remaining constant, while intensive growth arises where more output is produced by each person. In the former case, there is no economic development, as the economy simply reproduces itself on a larger scale: in the latter, living standards rise as the economy goes through a process of economic development. To understand the long-run growth of the British economy reaching back to the thirteenth century therefore requires knowledge of the trajectories followed by both population and GDP. Of particular interest is whether periods of intensive growth, distinguished by rising per capita GDP, were accompanied by expanding or contracting population. For it is one thing for living standards to rise during a period of population decline, such as that induced by the recurrent plagues of the second half of the fourteenth century, when survivors found themselves able to add the land and capital of those who had perished to their own stocks, but quite another for living standards and population to rise together, particularly given the emphasis of Malthus [1798] on diminishing returns. Indeed, Kuznets (1966: 34-85) identified simultaneous growth of population and per capita income

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(i.e. the concurrence of intensive and extensive growth) as one of the key features that distinguished modern from pre-industrial economic growth.

A full discussion of these issues surrounding the transition to modern economic growth will have to wait until after the estimates of GDP per capita have been established in Part I of this study. Meanwhile, the first variable to be reconstructed will be population. The reason for giving this variable priority is not just because of its importance in estimating GDP per capita, nor even because extensive growth is also of interest in its own right. Rather, it is because, following a long tradition started by Deane and Cole (1967) in their pioneering study of British historical national accounting, estimation of some of the component parts of GDP requires knowledge of the size of the population. Indeed, as will become clearer later, the scale of the population feeds directly into the estimation of the output of parts of the service sector. Aggregate development of England's population since 1541 is now firmly established, and there is little disagreement respecting the population of the rest of Great Britain after 1700. This chapter will therefore focus its attention on reconstruction of English population before 1541, several aspects of which remain controversial.

The pioneering work on English medieval population by Russell (1948) established benchmark levels of population for 1086 and 1377 and deployed time-series evidence to link these to each other and to estimates for the early-modern period. Russell paid particular attention to the consistency of his estimates over this long sweep of history and arrived at the conclusion that the peak level of medieval population before the Black Death was around 3.7 million. This view was challenged by Postan (1966), who criticised both of Russell's benchmarks as unrealistically low. He advocated a much higher level of population throughout the medieval period, and a peak level before the Great Famine of around 6 million, but did not consider the difficulties of reconciling such high figures with the early-modern estimates, which have subsequently been established more firmly by Wrigley and

Schofield (1989). Furthermore, it must be noted that Postan (1966: 561) regarded any such quantitative exercise with a high degree of scepticism, reflected in his phrase 'the lure of aggregates'.

Postan's view of medieval population has proved influential, with Smith (1988: 191) concluding that 'there is every reason to accept an English population in 1300 of over 6 million'. Yet not all have been convinced. In particular, Blanchard (1996) points to the lack of substantive evidence offered by Postan (1966) and subsequent writers for their criticisms of the main assumptions underpinning Russell's 1086 and 1377 benchmark estimates, and endorses a lower rather than higher estimate of the population at its pre Black Death peak. In like vein, Campbell (2000) questions whether domestic agriculture could have provided enough food for more than 5 million people. It is worth noting that by the 1650s, when the economy was more developed and technology more advanced, the population still numbered barely 5.4 million. Also at issue are whether the Great Famine of 1315-22 or Black Death of 1348-9 constituted the key demographic turning point, the scale and duration of the fifteenth-century downturn in numbers, and when the upturn began that was clearly in full swing by the 1540s when the first parish registers come on stream.

The chapter proceeds as follows. Russell's (1948) benchmark estimates of population levels and evidence on rates of population change during the medieval period are critically reviewed in section 1.1.2. Section 1.1.3 then derives a new time-series for aggregate population from manor-level data on tenant numbers using an appropriate regional weighting scheme. The absolute level of the population in the medieval period is pinned down by linking the estimated time series to the revised benchmark for 1377, with the need for consistency with the benchmarks for 1086, 1522 and 1541 limiting the degrees of freedom. Russell's benchmarks for 1086 and 1377 are shown to have been too low, but not by as much as suggested by Postan (1966), so that the medieval population peaks at less than 5 million.

How the national total was distributed across counties and how that distribution evolved over time is then considered in section 1.1.4. Sections 1.1.5 and 1.1.6 set out the much less controversial trends in population for, respectively, England 1541-1700 and Great Britain 1700-1870. Section 1.1.7 concludes.

1.1.2 The building blocks of medieval population estimates

To be convincing, estimates of English medieval population must be able to encompass both the macro cross-sectional evidence for a number of benchmark years, including most obviously that from Domesday Book for 1086 and the poll tax returns of 1377, as well as the time-series evidence amassed by scholars over the years from diverse mostly micro-level sources. The time series must be able to link up the medieval benchmarks as well as connect to the more reliably grounded population estimates for the early modern period, starting in 1541. Although the quality, quantity and range of the available evidence are superior to those extant for most other countries at this early period in time, reconciling the cross-sectional and time-series data with each other and the more firmly grounded estimates available from 1541 is far from unproblematic.

1.1.2.1 A benchmark for 1086

A benchmark estimate of population for 1086 can be derived from Domesday Book. The pioneering study was by Russell (1948) and his assumptions are set out in the first column of Table 1.1.01. The starting point is the total of rural households recorded in Domesday Book, to which must be added tenants-in-chief and under-tenants, as well as an allowance for the omitted four northern counties. Russell applied an average household multiplier of 3.5 to arrive at total rural population. Finally, he made an allowance for urban population, since towns were largely omitted from William I's great survey. Darby (1977: 89) presented a number of alternative estimates. One issue is whether slaves should be included as household

heads, as in Russell (1948), or individuals. Nevertheless, as there were only 28,100 slaves, this does not make a very large difference and is not pursued here. Of more significance is the effect of increasing the household multiplier. Darby (1977: 88) claimed that later medieval evidence suggests a multiplier of 4.5 to 5.0, and that the figure for 1086 is unlikely to have been much less. Using Russell's assumption results in a total population of 1.11 million, while Darby's approach yields a population of between 1.45 and 1.60 million.

Table 1.1.01 about here

Although Harvey (1988: 48-49) did not present any underlying calculations, she claimed that the Domesday population could well have approached 2 million. Rather than arguing for a higher household multiplier, Harvey (1988) proposed a much greater scale of omissions than the 5 per cent allowance made by Darby (1977), on the grounds that Domesday Book was more concerned with the landed wealth of the tenants-in-chief and their head tenants, and hence tended to under-record or omit independent small-holders, sub-tenants and those who were landless. The final column of Table 1.1.01 presents an estimate of the English population in 1086 in the spirit of Harvey's assumptions. This involves increasing the rate of omissions from 5 per cent to 25 per cent — the maximal scale of omissions claimed by Postan (1966: 562) for the Poll Tax of 1377 — which results in a population of 1.87 million. Note that for the population to exceed 2 million, which Harvey (1988: 49) claims should not be ruled out, would require an omissions rate of the order of 40 per cent.

1.1.2.2 A benchmark for 1377

It is also possible to obtain a benchmark estimate of population from the returns to the poll tax of 1377, to which adult males and females contributed at a fixed per capita rate. The key assumptions made by Russell (1948: 146) to derive a population total for England are the proportion of children in the population and the rate of under-enumeration. Russell's

assumptions and results are set out in the first column of Table 1.1.02. Postan (1966: 562) suggested alternative assumptions, leading to the results set out in the second column of Table 1.1.02. Whereas Russell assumed that children under the age of 15 accounted for 33.3 per cent of the population, Postan suggested that the ratio may have been as high as 40 to 45 per cent. For the period after 1541, when reliable data become available, the percentage of under-15s in the population never rose above 40 per cent, which surely represents the upper limit for 1377 (Wrigley and Schofield, 1989: Table A3.1). As Blanchard (1996) points out, such a high ratio tended to occur in periods of rapid population growth driven by high fertility. Since population was declining in the aftermath of the Black Death, a ratio as high as 40 to 45 per cent in the 1370s is improbable and a lower ratio more likely.

Table 1.1.02 about here

The second assumption of Russell that was challenged by Postan concerns the assumed rate of under-enumeration. Russell's figure of 5 per cent is based on an examination of the distribution of terminal numbers of local tax returns for evidence of excessive rounding, together with an allowance for 'indigent and untaxed persons'. Postan suggests a much higher rate of 25 per cent, which he justifies with reference to discrepancies between the poll tax returns and unspecified manorial sources. Poos (1991), however, supports Russell's ratio on the basis of a comparison of the poll tax returns and tithing evidence for a sample of Essex parishes. For a later period, Campbell (1981: 150) uses the discrepancy between the tax returns of 1524-1525 and the muster rolls of 1522 to infer an evasion rate of males varying from a minimum of 5 per cent to a maximum of 20 per cent, arguing for an average figure of the order of 10 per cent. The poll taxes, of course, taxed both adult males and females, and although the latter may have been less visible to the taxers than the former, Goldberg (1990:

200) concludes that 'the under-enumeration of women cannot have been a serious fault of the earlier [i.e. 1377] returns'.

Russell's assumptions of a 33.3 per cent children's share and a 5 per cent under-enumeration rate yield a population total for 1377 of 2.23 million, while Postan's assumptions of a 45 per cent children's share and a 25 per cent under-enumeration rate lead to an estimate of 3.22 million. The third column of Table 1.1.02 presents a 'best estimate' of 2.50 million, based on a children's share of 37.5 per cent and an under-enumeration rate of 10 per cent, more in line with Wrigley and Schofield's demographic evidence and Poos and Campbell's tax-evasion evidence.

1.1.2.3 Population trends, 1086-1317

The next step is to establish population trends between the two benchmarks and link them up to the early modern estimates of Wrigley and Schofield (1989), as amended in Wrigley and others (1997). The starting point is the time-series evidence of tenant numbers assembled by Hallam (1988) for the period 1086-1317. Hallam's methodology was to find population estimates for individual manors at benchmark years from diverse sources and compare them with the population for the same manors given in Domesday Book. Index numbers of population were then constructed for up to eight regions and for the country as a whole, taking account of regional diversity. The composition of the eight regions used by Hallam is indicated in the notes to Table 1.1.03. To obtain a reliable index of population for England as a whole, it is important to ensure a balance between the relatively high density core regions to the south and east of a line running roughly from the Wash to the Severn Estuary, and the lower-density peripheral regions to the north and west of this line, including southwest England.

Table 1.1.03 about here

Hallam's (1988) estimates (Table 1.1.03) suggest that population in the country as a whole roughly tripled between 1086 and 1262, before stagnating to 1317. There are, however, a number of problems with these estimates, which become apparent upon close inspection of the data. First, dividing the dataset into eight regions means that the number of observations for any particular region is quite small, making it difficult to place much faith in the regional breakdown, even if the aggregate picture is reasonably plausible. Thus, for example, it seems inconceivable that the population of Northern England could have behaved in the wildly volatile fashion suggested by Table 1.1.03. Second, when the underlying data presented by Hallam (1988) are examined in more detail, it becomes apparent that although the estimates are presented for particular years, they often cover an extremely wide range of surrounding years. The most extreme case is 1149, which actually covers most of the twelfth century, spanning the period 1114-93.

Table 1.1.04 about here

Hallam's (1988) dataset, checked, corrected and augmented with additional material, has therefore been reworked to produce a revised set of population estimates for the period 1086-1315, and the same approach then extended to the period after 1315. Table 1.1.04A presents these estimates for the period 1086-1315 on a national basis only, since, although the data are sufficient to establish the national trend, they are too thinly spread to derive reliable sub-trends for individual regions. Hallam's method of weighting individual manors by the importance of the counties in which they were based is nevertheless followed. A full listing of the manors is provided in Appendix 1.1.1, while the population of individual counties is discussed in Section 1.1.4. Compared with Hallam (1988), a slightly smaller population increase is found between 1086 and the late thirteenth century, but a similar pattern of faster growth in the twelfth than in the thirteenth century. Note that the annual population growth

rates presented in the table provide a check on the credibility of the estimates by demonstrating that successive benchmark estimates do not require implausible rates of change. Significantly, during the periods of population expansion, the annual growth rates do not exceed the firmly established rates seen over sustained periods between the mid-sixteenth and mid-eighteenth centuries, and are well below the rates observed from the second half of the eighteenth century (Wrigley and Schofield, 1989).

1.1.2.4 Population trends, 1300-1377

Next, Hallam's (1988) methodology is extended to the period after 1315, again using estimates of manorial population from diverse sources (Table 1.1.04B). For this period, although there are fewer manors with data than for the pre-1315 period, there is a clear improvement in another dimension, since use can now be made of estimates for particular manors which contain a time-series element taken from a single source, rather than comparing one-off estimates from different sources. This is illustrated by Figure 1.1.01, derived from data assembled by Poos (1991) and charted by Smith (1988: 193), which tracks trends in numbers of adult males on four Essex manors. Note, even within this one county the divergence in trends between High Easter and Great Waltham on one hand and Margaret Roding and Chatham Hall on the other. To capture national trends it is therefore important to ensure as wide a geographical spread of manors as possible, weighted by the relative demographic importance of the counties in which the manors were located.

Figure 1.1.01 about here

Linking up with the time series for the period 1086-1315 requires extending the chronology back to 1300 so as to capture the growth of population to its peak in 1315 on the eve of the Great Famine. The estimates given in Table 1.1.04B confirm that the famine led to a substantial drop in the population and endorse Russell's (1948) belief and the evidence

assembled by Campbell (2010: 295-7) that in aggregate the population bounced back strongly after 1322 and continued, with certain notable exceptions, to rise until the first outbreak of plague in 1348-9. This contrasts with the substantially greater famine losses on the four Essex manors charted in Figure 1.1.01 and the absence of any post-famine bounce back on these same manors, possibly due to net out-migration of young adult males to London. This is a further reminder of the need to take account of divergent trends in different regions and between country and town.

The Black Death, which first struck in 1348-49 and was accompanied and reinforced by inclement weather and serious harvest failure, had a catastrophic effect, reducing the population by around 46 per cent within the space of just 3 years. This is consistent with estimates which reckon the excess mortality of these years at 40 per cent or greater (Hatcher, 1994: 8-9). Although such a catastrophic decline was almost certainly followed by an immediate rebound, further national outbreaks of plague in 1361-62, 1369 and 1375 progressively eroded the population's capacity to replace itself and ensured that by 1377 nearly half of the population had been wiped out (Table 1.1.04B; Hatcher, 1977: 25). Furthermore, it is widely accepted that the population decline was fairly evenly spread across the country, affecting both core and periphery alike, as successive plagues penetrated the furthest reaches of the realm and migration redistributed the survivors.

1.1.2.5 Population trends, 1377-1541

Table 1.1.04C tracks the path of population from 1377 to 1541. The manorial evidence suggests that numbers continued to erode between 1377 and 1400 and that decline was not finally arrested until the middle years of the fifteenth century when the pronounced post Black Death inflation of the real wage rates of building and farm labourers finally abated (Figure 1.1.02). One way of understanding this trend would be if the later plague outbreaks, in conjunction with other diseases, disproportionately affected younger age groups so that

heightened infant and child mortality rates offset any gains in fertility (Hatcher, 1977: 58-62; Razi, 1980: 134-5, 150-1). This punitive demographic regime seems to have maintained the population in a low-pressure equilibrium for several successive generations, preventing any sustained recovery notwithstanding the powerful Malthusian incentives of resource abundance and unprecedentedly high real wage rates.

The period from the 1450s to the advent of parish registration of baptisms, marriages and burials in 1538 is very much a demographic Dark Age. The manorial sources ossify and cease to be of much value and trust therefore has to be placed in the record of specific well-recorded but neither socially nor geographically representative groups: tenants-in-chief of the Crown, certain monastic communities, scholars at Winchester School, and the growing numbers of will makers. Although Smith (2012) argues that bouts of high mortality depressed adult life expectancy and thwarted any return to positive replacement rates until well into the reign of Henry VIII (r. 1509-47), there are some serious problems with this line of argument. First, population needed to recover at some point to reach Wrigley and Schofield's (1989) firmly grounded estimate of 2.83 million by 1541, by which time the population was growing fast at 0.64 per cent per annum. If demographic recovery was postponed until the second quarter of the sixteenth century, then the rate of population growth required to reach a total of 2.85 million by 1541 becomes implausibly high. Nor is it realistic to suppose that growth accelerated from zero to 1 per cent within such a narrow interval of time. Second, after a long period of stability, real wage rates of both building and farm labourers (Allen, 2001; Munro, no date; Clark, 2007) were trending decisively down from the 1510s (Figure 1.1.02), which implies that life expectancy at birth had been rising from the 1490s, increasing the cohort of young adults entering the labour market from the 1510s. Third, while the susceptibility to potentially deadly infectious diseases of urban groups leading a communal life and sharing dormitory accommodation is not to be doubted (Hatcher, 1986; Harvey, 1993; Hatcher and

others, 2006), there is nonetheless good evidence that other social and regional groups had experienced a return to positive replacement rates before the close of the fifteenth century.

Thrupp (1965), in a pioneering study, employed the wills of relatively humble people to chart trends in male replacement rates during the latter part of the fifteenth century when she believed 'replacement rates may have begun to stay on an upward curve' (1965: 114). In the two archdeaconries of Essex and St Albans she identified steadily rising numbers of sons per male testator from the mid fifteenth century, which, by the 1460s in Barnet and 1480s in Essex, had become clearly positive. Wills proved in the consistory court of Norwich reveal a similar improvement in replacement rates in the 1470s and more marked rise in the 1480s, which was especially pronounced among better of testators (Gottfried, 1978: 204-13). These results chime with the shift in the 1470s to consistently positive replacement rates among a national sample of tenants-in-chief of the Crown, as calculated by Hollingsworth (1969) from information on death and inheritance contained in *inquisitiones post mortem* (Table 1.1.05). Lag effects between birth and inheritance mean that the improvement in survival rates had probably begun some years earlier. Quinquennial population growth rates derived from these replacement rates became persistently positive from the early1460s, with positive growth clearly outweighing negative growth during the 1440s and 1450s.

Table 1.1.05 about here

Although materially privileged tenants-in-chief clearly constituted a skewed sample of the population as a whole, self evidently they are demographically less unrepresentative than communities of Benedictine monks in Durham, Canterbury and Westminster or schoolboys at Winchester. Consequently, it is difficult to interpret the upturn in replacement rates for tenants-in-chief and some other social groups as anything other than a clear signal that the negative demographic pressures which had prevailed for a century following the Black Death

were at last easing. Combined with the indirect evidence of real wage rates and the high growth rates needed for the population to reach its 1541 population level, the case for a return to population growth from the 1470s, and maybe earlier, is strong. Plainly recovery was not uninterrupted, and in 1457, 1471, 1485 and the early 1500s death rates undoubtedly soared (Smith, 2012: 61-2), but during the sixteenth century equally serious mortality crises failed to halt the upward trend in numbers once the momentum of growth had become firmly established. In this transition from stagnation to growth some regions led and others lagged, although more is currently known about regions, places and communities of demographic deficit than those of surplus. The southwest, west midlands, northwest and immediate Home Counties were all economically and demographically more dynamic than eastern England and the east midlands (Table 1.1.09 and Figure 1.1.03C). The countryside was also significantly healthier than towns and already London's growth was contingent upon a net inflow of migrants.

1.1.3 New population estimates, 1086-1541

Having assembled the main building blocks, they are now put together to produce a new consistent chronology of English medieval population covering the period 1086-1541. The first step is to use the 1377 'best estimate' benchmark from Table 1.1.02 to calibrate the level of population between 1086 and 1450 using the time series from Table 1.1.04. The second step is then to check the 1086 population value thus obtained against the benchmark value from Table 1.1.01. The third step is to check the credibility of the implied population growth rate between 1450 and 1541, and the consistency with other benchmark population estimates for the early modern period, including those of Cornwall (1970) and Campbell (1981) for the 1520s. This produces the population estimates presented in Table 1.1.06.

Table 1.1.06 about here

The 'best estimate' of population in 1377 from Table 1.1.02 is 2.50 million. Projecting backwards with the time series from Table 1.1.04B produces a peak medieval population of 4.81 million in 1348, and a slightly lower value of 4.69 million in 1315. The Great Famine shows up as a notable negative shock, with the population falling by 12 per cent to 4.12 million by 1325. The decline during and following the Black Death was even more catastrophic: the population shrank from 4.81 million in 1348 to 2.60 million by 1351 and then 2.50 million by 1377, an aggregate reduction of 48 per cent. Projecting back further in time by splicing the series from Table 1.1.04A to the 1315 benchmark from Table 1.1.04B yields a population level of 1.71 million in 1086 as shown in the first column of Table 1.1.06. The net increment between 1086 and 1315 was thus 2.74-fold, which is consistent with the growth of at most threefold noted earlier. Note that the time-series projection of 1.71 million for 1086 falls between the Darby II estimate of 1.60 million and the Harvey benchmark of 1.87 million given in Table 1.1.01, but is 54 per cent greater than the 1.11 million proposed by Russell (1948). Projecting forwards from 1377 reveals a further fall in the population to a level of just 1.90 million by 1450 (just 11 per cent greater than the estimated Domesday total and 60 per cent below the pre Black Death maximum), after which it recovered to the level of 2.83 million in 1541 established by Wrigley and others (1997).

Also included in Table 1.1.06 is Cornwall's (1970: 39) benchmark for 1522 of 2.35 million, which is also broadly consistent with the figure of 1.90 million for 1450 and the Wrigley and others (1997) estimate of 2.83 million for 1541. Growth from, say, 2.00 million in 1475 to 2.35 million by 1522 would have required a rate of 0.34 per cent a year, trebling to almost 1.00 per cent between 1522 and 1541. Cornwall's estimate was based on the 1522 Muster Rolls with additional information from the 1524 and 1525 Lay Subsidies. Although it is above Campbell's (1981) more carefully considered central figure of 1.84 million (requiring an unrealistically high annual growth rate of 2.3 per cent to reach 2.83 million by 1541), it is

well below his maximum figure of 2.92 million. Additionally, Cornwall (1970: 33) provided a benchmark figure for 1545 based on a comparison between the chantry certificates and the 1377 poll tax returns. The idea was taken from Russell (1948), and by disregarding the least reliable parish estimates, Cornwall arrived at a figure of 2.80 million in 1545, which is very close to the Wrigley and others (1997) figure of 2.91 million. Notwithstanding that significant margins of error surround all these figures, including that of Wrigley and others (1997), all imply a marked upturn in the rate of English population growth around 1520 for reasons whose demographic explanation remains obscure.

1.1.4 Distribution of the population by county

An important issue when considering the path of medieval population and the credibility of alternative estimates concerns the changing regional distribution of the national total across counties. In particular, it is important to be able to link up the known distribution of the population across counties in the key benchmark years of 1086, 1290, 1377 and 1600, without requiring implausible growth rates at the county level. This can be checked using the data set out in Tables 1.1.07, 1.1.08 and 1.1.09 and Figure 1.1.03. The county population shares derived from standard sources and given in Table 1.1.07 provide a starting point. These county shares are then applied to the corresponding benchmark estimates of the national population given in Table 1.1.06 to produce the county population levels given in Table 1.1.08. Finally, from these population levels are derived the county population annual growth rates given in Table 1.1.09, from which Figure 1.1.03 is drawn.

Tables 1.1.07, 1.1.08 and 1.1.09 about here

Figure 1.1.03 about here

Looking first at the period 1086-1290, in Figure 1.1.03A, the population growth rate was slightly above 1.0 per cent for some northern counties, but this is not unreasonable during the recovery from the very low levels in the aftermath of the post-Conquest Norman reprisals in this region. Note that other parts of the geographical periphery, particularly in the southwest, grew more slowly during this period. Growth was significantly stronger in a wedge of more populous counties in eastern England and the east midlands. Turning to the period 1290-1377 in Figure 1.1.03B, population declined in all core counties and in all peripheral counties apart from Cornwall, which, even after allowance for the omission of tin miners in 1290, uniquely appears to have continued to expand its population. The northern counties, which had shown the fastest growth between 1086 and 1290, displayed the greatest rate of decline between 1290 and 1377 partly due to the region's exposure to the prolonged military conflict between England and Scotland, with its raids and counter raids. Otherwise, it was often the most populous counties that sustained the greatest relative losses. From 1377 to 1600, the geographical periphery once again tended to show faster growth than the core, this time in the southwest as well as the north, as can be seen in Figure 1.1.03C. The counties around London also displayed above average demographic dynamism. To a significant extent it was the expanding populations of these emergent regions that drove the sixteenth-century demographic recovery. Comparing 1600 with 1086 (Figure 1.1.03D) reveals, unsurprisingly, that net gains were often greatest in counties which had been most thinly peopled at the time of Domesday, including those closest to, and furthest from, London.

1.1.5 English population, 1541-1700

On 5 September 1538, Henry VIII's vicar general, Thomas Cromwell, ordered all Anglican parishes to maintain a register of baptisms, marriages and burials, thereby creating an invaluable demographic record of the nation's population. These are the data used by the Cambridge Group for the History of Population and Social Structure to reconstruct the

population history of England from 1541 until 1840, when civil registration became effective (Wrigley and Schofield, 1989: 15). The Cambridge Group's study was based on a large sample of 404 parishes, using local volunteers to gather the data. Priority was given to the best, longest and earliest surviving registers but care was also taken to ensure the sample was geographically representative and included a full range of agricultural, industrial and commercial parishes (Wrigley and Schofield, 1989: 40, 47). The sample was found to be biased towards large parishes, but this was redressed by dividing it into size classes and weighting them in line with the national proportions of those classes (Wrigley and Schofield, 1989: 49-50). Correction was made for two sources of under-registration. First, unregistered deaths of un-baptised infants were estimated from family reconstitution studies. Second, an allowance was made for non-conformity, which is known with accuracy for the nineteenth century, and more speculatively before 1800 from trends in non-conformist registers (Wrigley and Schofield, 1989: 89-102).

The Cambridge Group developed the technique of back projection using 5-year steps to interpolate new national population totals at quinquennial intervals spanning the period 1541-1871 from the parish register information. The known population and age-structure given in the 1871 census is taken as the starting point. Working back from 1871 to 1866, for example, each cohort in the 1871 census was 5 years younger in 1866, and its size in 1866 is found by adding back an estimate of the number who died, based on age-specific mortality rates taken from life tables. In a closed population, the procedure would be relatively straightforward, but the existence of substantial migration flows complicates the analysis. The method deduces migration flows from inconsistencies between the population age structure and the recorded flows of births and deaths. For the period back to 1801, census totals are available every decade, but for earlier years the method is totally reliant on the projections and any errors become retrospectively cumulative. Although the back projection procedure was criticised by

Lee (1985) as a method of deriving reliable population totals, sensitivity analysis subsequently conducted by Oeppen (1993) suggests that the estimates of Wrigley and Schofield (1989) are robust. Some relatively minor modifications were, however, made in Wrigley and others (1997) following completion of the Cambridge Group's family reconstitution studies. These revised 1997 quinquennial estimates have now acquired the status of orthodoxy and have here been interpolated using Wrigley and Schofield (1989) to obtain annual totals.

Table 1.1.10 about here

Table 1.1.10 presents estimates of English population for five benchmark years from 1541 to 1700. The recovery of the population which had begun in the final decades of the fifteenth century was maintained until the mid-seventeenth century, by which time the population had risen to a new peak of almost 5.4 million. Growth was fastest in the middle years of the sixteenth century but then slowed to less than 0.5 per cent per year during the first half of the seventeenth century (Table 1.1.11). Thereafter, as mortality rose, emigration increased and fertility declined, numbers drifted gently downwards for the remainder of the century, to 5.2 million at its close, thereby giving the economy much needed demographic breathing space.

1.1.6 British population, 1700-1870

For the period 1700-1870, the territory under consideration is the whole of Great Britain including Wales and Scotland, but excluding Ireland, which did not become part of the United Kingdom until 1801. From 1801 onwards, annual data on the population of England, Wales and Scotland are available from Mitchell (1988: 9). Prior to 1801, as noted earlier, the population of England has been reconstructed firmly by Wrigley and Schofield (1989) and Wrigley and others (1997). Although annual estimates are not available for Scotland and Wales, there is scattered information to fill in the gaps. For Scotland, population estimates for

1700, 1750 and 1801 have been interpolated using the population of England (Schofield, 1994: 93). Corresponding estimates for Wales have been extrapolated from the 1801 ratio of the population of Wales to that of England. The resulting aggregate estimates for Great Britain are reported in Table 1.1.10.

Table 1.1.10 about here

The first half of the eighteenth century (following Union with Scotland in 1707) saw a return to population growth, which gathered pace during the second half of the century. Growth peaked at around 1.5 per cent per year during the first three decades of the nineteenth century, before slowing down as Britain entered its demographic transition, as falling birth rates followed falling death rates and life expectancy at birth steadily improved. By 1871 England's population had risen to 21.3 million and that of Great Britain to 25.84 million and both were still rising. England was almost four times more populous than in 1650 and over four times more populous than in 1315/1348.

1.1.7 Conclusions

Table 1.1.11 provides a summary of population growth rates in England 1270-1700 and Great Britain 1700-1870. Growth rates are presented between decadal averages, reflecting a periodisation that will be useful later in analysing economic growth, as well as capturing the main turning points in population trends. At the outset of the series England supported a population of approximately 4.37 million and the great demographic boom that had brought about an increase of more than two-and-a-half fold since 1086 was almost at an end. England's population was already stagnating by the time the Great Famine struck in 1315-22, although it was the Black Death a generation later that proved to be the decisive demographic turning point. Four successive plague epidemics reduced the population by almost half between 1348 and 1377, shrinking it to a relatively securely documented 2.5 million.

Numbers continued to dwindle until the mid-fifteenth century when decline finally bottomed out and hitherto rising real wage rates reached a plateau and stabilised for the next 60 years. The low-level equilibrium thereby established persisted until the final decades of the fifteenth century when, in defiance of periodic surges in disease mortality, signs of incipient recovery become apparent.

From early in the sixteenth century, as real wage rates trended downwards once again, numbers were clearly rising strongly and in the second quarter of the century annual growth rates may have reached 1 per cent. For the next 100 years, although disease and dearth continued to levy a periodic toll on the population, positive growth of at least 0.5 per cent a year persisted. By 1625 the medieval peak of 4.8 million had been exceeded and in the 1650s, when growth finally ceased, the population had risen to almost 5.4 million. For the next half century the population stagnated and by 1700 England's population had dwindled slightly to 5.2 million with a further million in Wales and Scotland. The eighteenth century brought a return to positive growth and acceleration to hitherto unprecedented rates of increase. These reached a historical maximum of around 1.5 per cent in the first three decades of the nineteenth century by which time the population of Great Britain was fast approaching 20 million. Although growth then again slowed the scale of subsequent absolute gains in numbers remained substantial, elevating the population of Great Britain to 37 million by the close of the century.

Table 1.1.11 about here

There is little about this chronology after 1541 that is controversial. The eighteenth-century Welsh and Scottish estimates are capable of refinement but any revisions are unlikely to have a significant impact on the aggregate estimates for Great Britain. For England, the post-Commonwealth parish register dataset is fuller and more reliable than the pre Civil War

dataset and the evidential basis of the Cambridge Group's estimates narrows as it goes back in time. Margins of error on their back-projection results similarly widen. Nevertheless, the broad contours of their population reconstruction remain undisputed and as yet there are no alternative estimates that might carry greater conviction. For the time being, therefore, the post-1541 population estimates stand unchallenged.

Before 1541 there is no such consensus. This chapter has therefore constructed new estimates of English medieval population from the available time-series and cross-sectional evidence, based upon realistic and transparent assumptions and taking account of geographical inconsistencies of coverage and variations in trends. These estimates have the merits that they are consistent across time, geographically representative, chronologically reconcilable with the Cambridge Group's post-1541 estimates, compatible with the course of real wage rates, and historically credible. Undoubtedly some historians will claim that their absolute level is consistently too low. Yet the case for a substantially larger medieval population at peak before the Black Death founders on the difficulty, without resort to special pleading (Stone, 2006) or unrealistic assumptions (Clark, 2007: 118-27), of demonstrating how a population in excess of 4.8 million could have been fed, given what is known about prevailing patterns of land use, crop and livestock mixes, grain yields, rates of food extraction and the country's socio-economic profile as reconstructed in chapters 1.2, 1.3 and 2.3. The strength of the pre-Black Death population estimate advanced here is that the numbers proposed were supportable, just, by the estimated output capacity of the economy. All other estimates then follow from this within the constraints set by the available evidence and the need to link up with the post-1541 estimates established by Wrigley and others (1997). There is undoubtedly a great deal more data that might be gathered or more rigorously analysed that would improve and refine this picture. This applies above all to the demographic Dark Age between c.1450 when the manorial records effectively end and 1540 when the parish records

commence. It was across this documentary watershed that one demographic cycle dominated by decline ended and a new cycle characterised by growth began.

TABLE 1.1.01: Alternative English population estimates, 1086 (thousands except where otherwise specified)

	Russell's estimate	Darby's estimate (I)	Darby's estimate (II)	Harvey's estimate
Recorded rural households	268.3	268.3	268.3	268.3
Omissions rate (%)	*0.0*	*5.0*	*5.0*	*25.0*
Allowance for omissions	0.0	13.4	13.4	67.1
Tenants-in-chief	1.1	1.1	1.1	1.1
Under-tenants	6.0	6.0	6.0	6.0
Northern counties	6.8	6.8	6.8	6.8
Total rural households	282.2	295.6	295.6	349.3
Household multiplier (persons)	3.5	4.5	5.0	5.0
Total rural population	987.7	1,330.2	1,478.0	1,746.5
Urban population	117.4	120.0	120.0	120.0
TOTAL POPULATION	1,105.1	1,450.2	1,598.0	1,866.5

Sources and notes: derived from Russell (1948: 54); Darby (1977: 63, 89); Harvey (1988: 48-9). For ease of comparison, there are two very small adjustments to the original estimates. First, there is a slight discrepancy with Darby (I) because Darby did not allow his total for northern counties to vary with the household multiplier. Second, Russell's urban population includes clergy.

TABLE 1.1.02: Alternative English population estimates, 1377

	Russell's estimate	Postan's estimate	'Best estimate'
Laity	1,355,555	1,355,555	1,355,555
Clergy	30,641	30,641	30,641
Allowance for Cheshire, Durham & mendicant friars	31,994	31,994	31,994
ADULT TOTAL	1,417,380	1,417,380	1,417,380
% share of population under 15 years	*33.3%*	*45.0%*	*37.5%*
Allowance for children	708,690	1,159,675	850,428
TOTAL INCLUDING CHILDREN	2,126,070	2,577,055	2,267,808
Assumed % rate of under-enumeration	*5%*	*25%*	*10%*
Allowance for under-enumeration	106,303	644,264	226,781
TOTAL POPULATION	2,232,373	3,221,319	2,494,589

Sources: Russell (1948: 146); Postan (1966: 562).

TABLE 1.1.03: Hallam's estimated English population trends, 1086-1317 (1086 = 100)

	1086	1149	1230	1262	1292	1317
Eastern England	100.0	165.7	299.3	368.3	416.2	433.7
Southeast England	100.0	—	—	259.5	260.3	382.0
East midlands	100.0	160.5	272.7	272.7	211.6	255.4
Southern England	100.0	168.8	218.5	255.1	316.2	305.7
West midlands	100.0	209.2	211.6	252.8	233.7	317.7
Southwest England	100.0	—	—	—	—	190.3
Northern England	100.0	—	—	781.1	1,380.8	575.9
The Welsh Marches	100.0	—	—	—	378.2	266.5
TOTAL ENGLAND	100.0	171.2	248.0	309.9	326.0	315.1

Sources and notes: Hallam (1988: 591-3). Eastern England = Lincs., Norfolk, Suffolk, Essex, Cambs.. Southeast England = Middx, Surrey, Sussex, Kent. East midlands = Notts., Leics., Rutland, Northants., Hunts., Beds., Herts., Bucks.. Southern England = Berks., Hants., Wilts., Dorset, Somerset. West midlands = Derby., Staffs., Warks., Worcs., Glos., Oxon.. Southwest England = Devon, Cornwall. Northern England = Yorks.. The Welsh Marches = Hereford, Salop., Cheshire.

TABLE 1.1.04: Estimated English population trends and % annual growth rates, 1086-1450

A. 1086-1315 (1086 = 100)

Year	Indexed population level	Period	*% annual growth rate*
1086	100.0		
		1086-1190	*0.58*
1190	181.6		
		1190-1220	*0.83*
1220	232.7		
		1220-1250	*0.21*
1250	247.9		
		1250-1279	*0.16*
1279	259.4		
		1279-1290	*0.65*
1290	278.5		
		1290-1315	*-0.05*
1315	274.8		

B. 1300-1377 (1300 = 100)

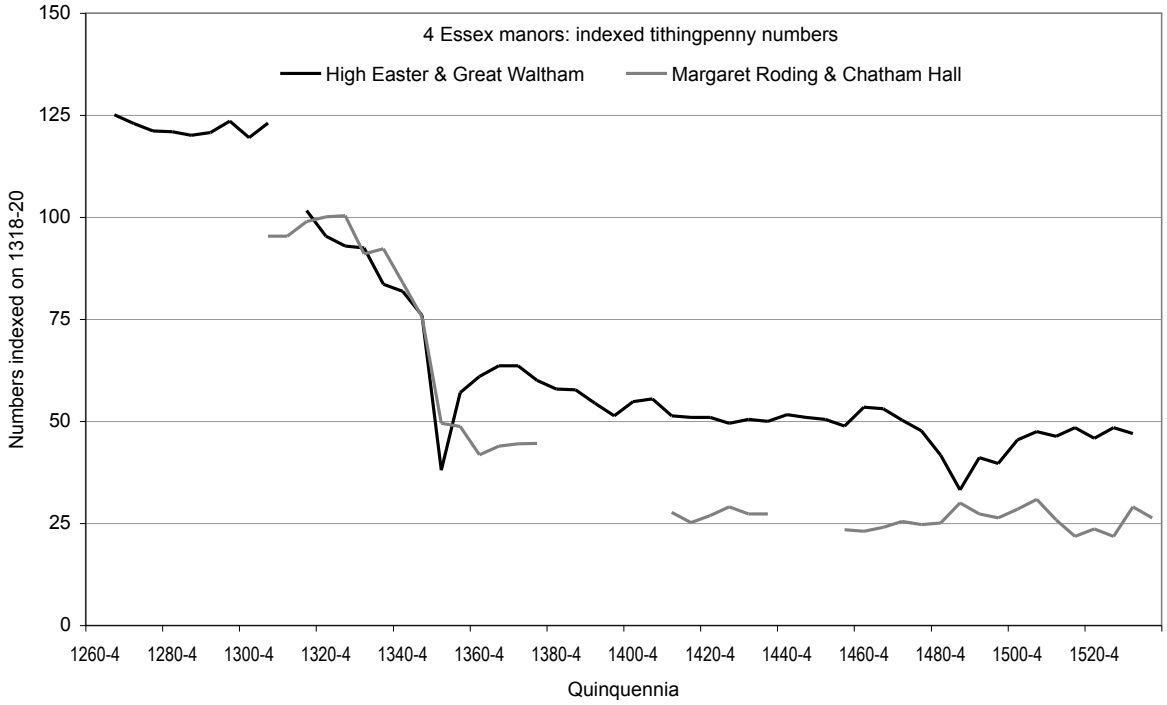
Year	Indexed population level	Period	*% annual growth rate*
1300	100.0		
		1300-1315	*0.52*
1315	108.1		
		1315-1325	*-1.30*
1325	94.9		
		1325-1348	*0.68*
1348	111.0		
		1348-1351	*-18.53*
1351	60.0		
		1351-1377	*-0.16*
1377	57.5		

C. 1377-1541 (1377 = 100)

Year	Indexed population level	Period	*% annual growth rate*
1377	100.0		
		1377-1400	*-0.79*
1400	83.3		
		1400-1430	*-0.10*
1430	80.8		
		1430-1450	-0.29
1450	76.2		
		1450-1522	0.29
1522	94.0		
		1522-1541	1.02
1541	112.8		

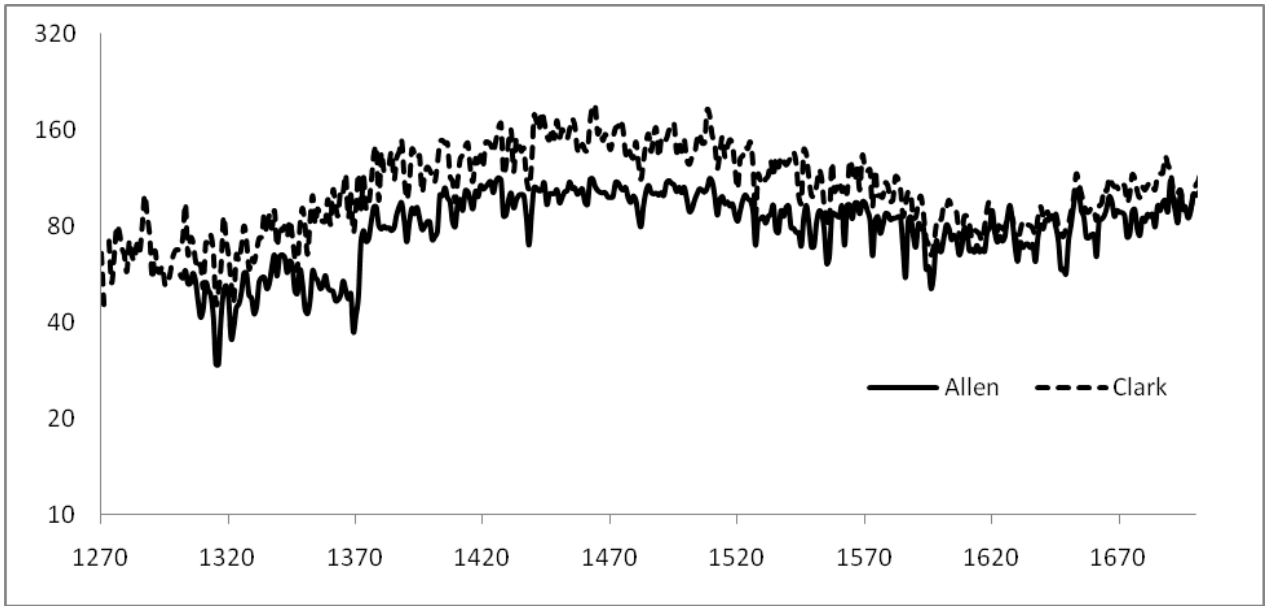
Sources: derived from data on manorial trends as described in the text, apart from estimates for 1522 from Cornwall (1970: 39) and for 1541 from Wrigley and others (1997).

FIGURE 1.1.01: Trends in numbers of adult males on four Essex manors



Source: derived from data underlying Poos (1991: 96-103).

FIGURE 1.1.02: Indexed daily real wage of an unskilled building worker (1700 = 100, log scale)



Sources: Allen (2001); Clark (2005).

TABLE 1.1.05: Hollingsworth's replacement rates (and derived % annual growth rates) of male tenants-in-chief in fifteenth-century England

Period	Replacement rate	Period	*% annual growth rate*
		1385-89	*-0.375*
		1390-94	*-0.439*
		1395-99	*-0.866*
		1400-04	*0.678*
1401-05	0.887	1405-09	*-11.28*
1406-10	0.869	1410-14	*-0.628*
1411-15	0.758	1415-19	*-0.575*
1416-20	0.805	1420-24	*-0.180*
1421-25	0.697	1425-29	*-0.044*
1426-30	0.818	1430-34	*0.697*
1431-35	0.832	1435-39	*0.697*
1436-40	0.944	1440-44	*-0.173*
1441-45	0.986	1445-49	*0.349*
1446-50	1.250	1450-54	*1.097*
1451-55	1.250	1455-59	*-0.134*
1456-60	0.946	1460-64	*0.984*
1461-65	1.118	1465-69	*0.117*
1466-70	1.418	1470-74	*0.614*
1471-75	0.958	1475-79	*1.475*
1476-80	1.370	1480-84	*1.102*
1481-85	1.038		
1486-90	1.217		
1491-95	1.603		
1496-1500	1.423		

Sources and notes: Hollingsworth (1969: 379). The replacement rate is the ratio between the estimated number of sons and the deceased male tenants-in-chief recorded in the *inquisitiones post mortem* (IPM) preserved in The National Archives (formerly Public Record Office), London. The annual growth rate is calculated from the replacement rate by assuming that the increase took place over a generation lasting 32 years, with each observation lagged half a generation (Hollingsworth, 1969: 376).

TABLE 1.1.06: Estimated English population totals, 1086-1541 (millions)

Year	Total population	Year	Total population
1086	1.71	1348	4.81
1190	3.10	1351	2.60
1220	3.97	1377	2.50
1250	4.23	1400	2.08
1279	4.43	1430	2.02
1290	4.75	1450	1.90
1315	4.69	1522	2.35
1325	4.12	1541	2.83

Sources: benchmark years 1086-1450 from Table 1.1.04, with absolute level determined by the 'best estimate' for 1377 from Table 1.1.02. Benchmarks for 1522 from Cornwall (1970: 39) and for 1541 from Wrigley and others (1997).

TABLE 1.1.07: Estimated English county population % shares 1086, 1290, 1377 and 1600

County	1086	1290	1377	1600
Bedfordshire	*1.27*	*1.35*	*1.47*	*1.05*
Berkshire	*2.24*	*1.29*	*1.64*	*1.38*
Buckinghamshire	*1.77*	*1.87*	*1.78*	*1.36*
Cambridgeshire	*1.82*	*2.89*	*2.12*	*1.76*
Cheshire	*0.56*	*0.76*	*1.07*	*1.80*
Cornwall	*1.73*	**0.73*	*2.48*	*2.50*
Cumberland	*0.54*	*1.27*	*0.91*	*1.84*
Derbyshire	*0.95*	*1.79*	*1.76*	*1.70*
Devon	*5.70*	*3.11*	*3.45*	*6.28*
Dorset	*2.72*	*2.06*	*2.48*	*1.82*
Durham	*0.45*	*1.59*	*0.98*	*1.86*
Essex	*5.10*	*3.53*	*3.68*	*3.76*
Gloucestershire	*3.08*	*3.20*	*3.28*	*2.46*
Hampshire	*3.85*	*1.98*	*2.83*	*2.53*
Herefordshire	*1.87*	*1.53*	*1.21*	*1.51*
Hertfordshire	*1.45*	*1.78*	*1.44*	*1.41*
Huntingdonshire	*0.94*	*1.39*	*1.02*	*0.67*
Kent	*4.42*	*3.44*	*4.30*	*3.69*
Lancashire	*0.67*	*1.28*	*1.73*	*4.41*
Leicestershire	*2.24*	*1.48*	*2.45*	*1.53*
Lincolnshire	*8.21*	*8.13*	*6.88*	*4.21*
Middlesex	*2.34*	*1.63*	*2.50*	*6.81*
Norfolk	*8.68*	*10.25*	*7.07*	*4.16*
Northamptonshire	*2.73*	*3.06*	*3.02*	*2.21*
Northumberland	*0.72*	*3.12*	*1.22*	*1.77*
Nottinghamshire	*1.84*	*1.48*	*2.09*	*1.90*
Oxfordshire	*2.29*	*1.91*	*1.98*	*1.63*
Rutland	*0.27*	*0.50*	*0.43*	*0.28*
Shropshire	*1.63*	*2.41*	*1.94*	*1.92*
Somerset	*4.57*	*3.18*	*4.06*	*4.11*
Staffordshire	*1.06*	*1.19*	*1.63*	*1.88*
Suffolk	*6.65*	*4.75*	*4.52*	*3.36*
Surrey	*1.45*	*1.72*	*1.30*	*2.06*
Sussex	*3.88*	*2.60*	*2.62*	*2.48*
Warwickshire	*2.17*	*1.83*	*2.19*	*1.59*
Westmorland	*0.28*	*0.71*	*0.53*	*1.03*
Wiltshire	*3.72*	*3.36*	*3.31*	*2.80*
Worcestershire	*1.55*	*1.27*	*1.16*	*1.59*
Yorkshire, E.R.	—	*2.44*	*3.07*	*1.62*
Yorkshire, N.R.	—	*3.44*	*2.92*	*2.47*
Yorkshire, W.R.	—	*2.68*	*3.48*	*4.80*
Yorkshire	*2.60*	*(8.56)*	*(9.47)*	*(8.89)*
ENGLAND	100.00	100.00	100.00	100.00

Sources and notes: * probably an under-estimate because stannary workers (i.e. tin miners) are excluded. County population shares for 1086 from Russell (1948: 53-54). Note that the shares from Darby ((1977: 336, 364-368)) would be the identical, since they are based on the same underlying data but with different household multipliers. County population shares for 1290 and 1377 from Campbell (2008: 926) and for 1600 from Wrigley (2009: 721).

TABLE 1.1.08: Estimated English county population totals 1086, 1290, 1377 and 1600

County	1086	1290	1377	1600
Bedfordshire	21,695	64,194	36,771	43,059
Berkshire	38,232	61,498	41,081	56,889
Buckinghamshire	30,162	88,631	44,604	56,059
Cambridgeshire	31,123	137,373	52,885	72,492
Cheshire	9,589	36,035	26,757	73,896
Cornwall	29,532	*34,914	61,964	102,892
Cumberland	9,265	60,567	22,633	75,687
Derbyshire	16,249	84,852	43,912	69,791
Devon	97,221	147,860	86,239	258,587
Dorset	46,375	98,113	61,904	74,961
Durham	7,732	75,490	24,587	76,483
Essex	87,005	167,660	92,053	154,882
Gloucestershire	52,565	152,058	81,923	101,256
Hampshire	65,702	94,062	70,736	104,197
Herefordshire	31,861	72,502	30,230	62,054
Hertfordshire	24,742	84,529	36,113	58,104
Huntingdonshire	16,004	66,186	25,616	27,627
Kent	75,388	163,636	107,482	151,713
Lancashire	11,459	60,962	43,172	181,622
Leicestershire	38,167	70,356	61,163	63,140
Lincolnshire	140,176	386,202	171,965	173,199
Middlesex	39,851	77,399	62,476	280,063
Norfolk	148,085	486,920	176,844	171,163
Northamptonshire	46,611	145,582	75,393	91,075
Northumberland	12,300	148,084	30,389	72,923
Nottinghamshire	31,390	70,520	52,221	78,148
Oxfordshire	39,003	90,759	49,424	66,909
Rutland	4,642	23,655	10,837	11,371
Shropshire	27,895	114,640	48,502	78,958
Somerset	78,022	151,003	101,376	168,984
Staffordshire	18,030	56,715	40,658	77,559
Suffolk	113,452	225,770	113,106	138,295
Surrey	24,710	81,629	32,613	84,804
Sussex	66,135	123,415	65,437	102,003
Warwickshire	37,107	86,829	54,714	65,455
Westmorland	4,807	33,777	13,358	42,199
Wiltshire	63,470	159,857	82,847	115,163
Worcestershire	26,376	60,470	29,105	65,614
Yorkshire, E.R.	—	115,777	76,760	66,520
Yorkshire, N.R.	—	163,634	73,099	101,596
Yorkshire, W.R.	—	127,371	87,049	197,498
Yorkshire	44,304	(406,782)	(236,907)	(365,615)
ENGLAND	1,706,436	4,751,489	2,500,000	4,114,891

Sources and notes: * probably an under-estimate because stannary workers (i.e. tin miners) are excluded. County population totals obtained by applying the shares given in Table 1.1.07 to the national population totals given in Table 1.1.06.

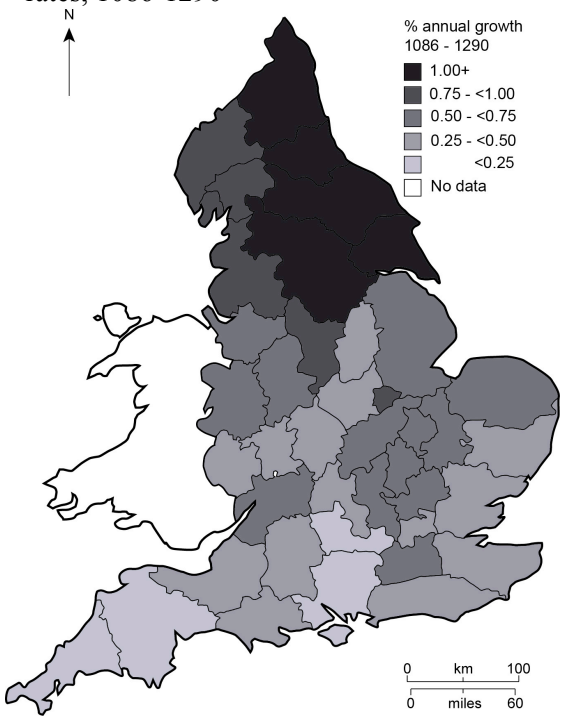
TABLE 1.1.09: Estimated English county population % annual growth rates 1098-1290, 1290-1377 and 1377-1600

County	1086-1290	1290-1377	1377-1600
Bedfordshire	*0.53*	*-0.64*	*0.07*
Berkshire	*0.23*	*-0.46*	*0.15*
Buckinghamshire	*0.53*	*-0.79*	*0.10*
Cambridgeshire	*0.73*	*-1.09*	*0.14*
Cheshire	*0.65*	*-0.34*	*0.46*
Cornwall	**0.08*	***0.66*	*0.23*
Cumberland	*0.92*	*-1.13*	*0.54*
Derbyshire	*0.81*	*-0.75*	*0.21*
Devon	*0.21*	*-0.62*	*0.49*
Dorset	*0.37*	*-0.53*	*0.09*
Durham	*1.12*	*-1.28*	*0.51*
Essex	*0.32*	*-0.69*	*0.23*
Gloucestershire	*0.52*	*-0.71*	*0.10*
Hampshire	*0.18*	*-0.33*	*0.17*
Herefordshire	*0.40*	*-1.00*	*0.32*
Hertfordshire	*0.60*	*-0.97*	*0.21*
Huntingdonshire	*0.70*	*-1.09*	*0.03*
Kent	*0.38*	*-0.48*	*0.15*
Lancashire	*0.82*	*-0.40*	*0.65*
Leicestershire	*0.30*	*-0.16*	*0.01*
Lincolnshire	*0.50*	*-0.93*	*0.00*
Middlesex	*0.33*	*-0.25*	*0.68*
Norfolk	*0.59*	*-1.16*	*-0.01*
Northamptonshire	*0.56*	*-0.75*	*0.08*
Northumberland	*1.23*	*-1.80*	*0.39*
Nottinghamshire	*0.40*	*-0.34*	*0.18*
Oxfordshire	*0.41*	*-0.70*	*0.14*
Rutland	*0.80*	*-0.89*	*0.02*
Shropshire	*0.70*	*-0.98*	*0.22*
Somerset	*0.32*	*-0.46*	*0.23*
Staffordshire	*0.56*	*-0.38*	*0.29*
Suffolk	*0.34*	*-0.79*	*0.09*
Surrey	*0.59*	*-1.05*	*0.43*
Sussex	*0.31*	*-0.73*	*0.20*
Warwickshire	*0.42*	*-0.53*	*0.08*
Westmorland	*0.96*	*-1.06*	*0.52*
Wiltshire	*0.45*	*-0.75*	*0.15*
Worcestershire	*0.41*	*-0.84*	*0.37*
Yorkshire, ER	—	*-0.47*	*-0.06*
Yorkshire, NR	—	*-0.92*	*0.15*
Yorkshire, WR	—	*-0.44*	*0.37*
Yorkshire	*1.09*	*-0.62*	*0.19*
ENGLAND	*0.50*	*-0.74*	*0.22*

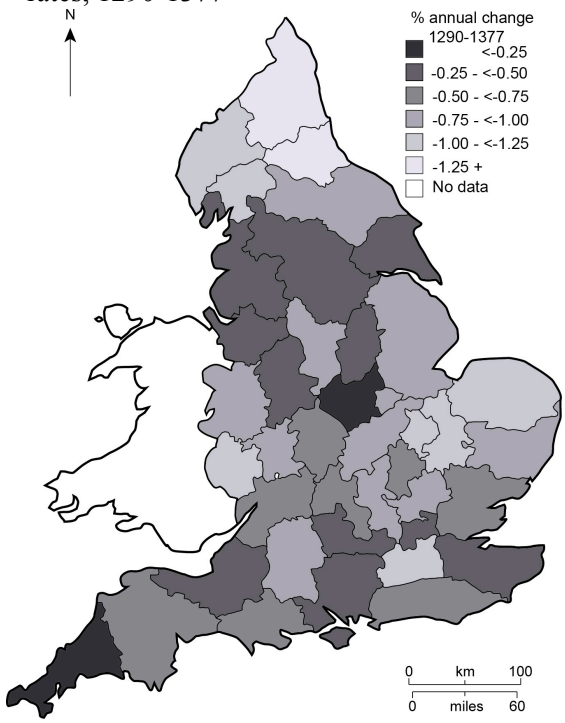
Sources and notes: * probably an under-estimate because stannary workers (i.e. tin miners) are excluded in 1290; ** probably an over-estimate because stannary workers (i.e. tin miners) are excluded in 1290. Growth rates calculated on a logarithmic basis from the estimated county population totals given in Table 1.1.08.

FIGURE 1.1.03: English county population trends, 1086-1600

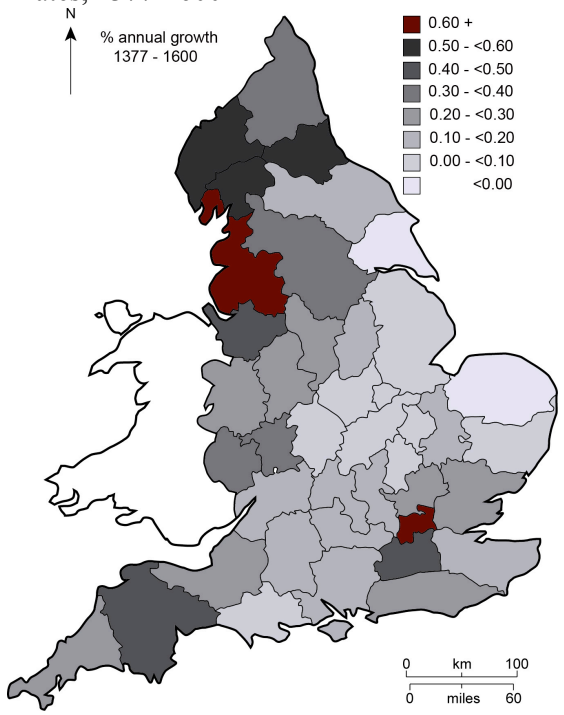
A) English county populations annual growth rates, 1086-1290



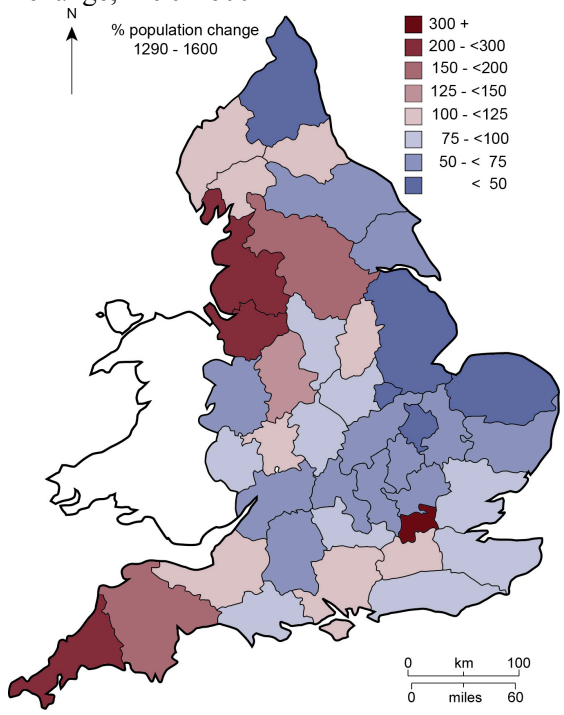
B) English county populations annual growth rates, 1290-1377



C) English county populations annual growth rates, 1377-1600



D) English county populations % aggregate change, 1290-1600



Source: derived from Tables 1.1.08 and 1.1.09.

TABLE 1.1.10: Estimated total English and British populations, 1541-1700 and 1700-1870 (millions)

Year	Total English population	Year	Total British population
1541	2.83	1700	6.21
1560	3.02	1750	7.22
1600	4.11	1800	10.61
1650	5.31	1850	20.65
1700	5.20	1870	25.84

Sources: Wrigley and others (1997); Wrigley and Schofield (1989); Mitchell (1988).

TABLE 1.1.11: Estimated population % annual growth rates, 1270-1870

Period	England	Great Britain
1270/79 – 1300/09	*0.23*	
1300/09 – 1340/48	*-0.02*	
1340/48 - 1400/09	*-1.33*	
1400/09 - 1450/59	*-0.14*	
1450/59 - 1553/59	*0.48*	
1553/59 - 1600/09	*0.67*	
1600/09 - 1650/59	*0.45*	
1650/59 - 1691/1700	*-0.08*	
1700/09 - 1760/69		*0.34*
1760/69 - 1780/89		*0.74*
1780/89 - 1801/10		*1.09*
1801/10 - 1830/39		*1.44*
1830/39 - 1861/70		*1.17*
1270/79 - 1691/1700	*0.04*	
1700/09 – 1830/39		*0.76*
1700/09 - 1861/70		*0.84*

Sources and notes: derived from data underlying Tables 1.1.06, 1.1.08 and 1.1.09.

APPENDIX 1.1.01: List of manors included in the population estimates

A. 1086-1190 (17 manors)

County	Manors
Berks.	Ashbury
Dorset	Sturminster Newton
Essex	Beauchamp
Glos.	Adlestrop, Bishop's Cleve, Broadwell, Pucklechurch, Willersey
Northants.	Badby
Warks.	Abbot's Salford, Sambourn
Wilts.	Badbury, Christmalford, Grittleton, Doverham, Nettleton, Winterbourne Monkton

B. 1086-1220 (46 manors)

County	Manors
Beds.	Caddington
Cambs.	Balsham, Ditton (Horningsea), Doddington (March), Downham, Gransden, Hardwick, Linden End, Littleport, Shelford, Stretham, Thriplow, Wilburton, Wisbech
Essex	Barking, Beauchamp, Chingford, Hadstock, Littlebury, Runwell, Tidwoldingham, Tillingham, Wickam
Herts.	Luffenhall, Sandon
Hunts.	Bluntisham, Colne, Somersham
Middx.	Drayton
Norfolk	Dereham, Feltwell, Northwold, Pulham, Shipdam, Upwell (Outwell), Walsoken, Walton
Northants.	Harlestone
Suffolk	Barking, Brandon, Glemsford, Hartest, Hitcham, Rattlesden,Wetheringsett
Surrey	Barnes

C. 1086-1250 (105 manors)

County	Manors
Beds.	Barton, Cranfield, Shillington (Pegsdon)
Cambs.	Balsham, Burwell, Chatteris, Ditton (Horningsea), Downham, Ely, Girton, Gransden, Hardwick, Linden End, Littleport, Shelford, Stretham, Thriplow, Wilburton, Willingham
Essex	Hadstock, Havering, Littlebury, Rettendon
Hunts.	Bluntisham, Brington, Broughton, Colne, Hemingford Abbots, Holywell, Old Weston, Slepe, Somersham, Upwood, Warboys, Wistow
Lincs.	Spalding
Norfolk	Brancaster (Burnham, Depedale), Dereham, Feltwell, Northwold, Pulham, Ringstead (Holm), Upwell (Outwell), Walsoken, Walton
Oxon.	Adderburry, Baldon, Crowmarsh, Rousham, Salford
Som.	Ashcott, Baltonsborough, Butleigh, Ditcheat, Doulting, East Pennard, High Ham, Marksbury, Mells, Mere, Othery, Pilton, Shapwick, Street, Walton, Wrington
Staffs.	Alrewas

Suffolk	Barking, Bramford, Brandon, Glemsford, Hartest, Hitcham, Rattlesden, Wetheringsett
Sussex	Aldingbourne, Bishopstone, Boxgrove, Denton, Ferring, Mundham (Kipson Bank, Hunston), Preston, Selsey, Sidlesham, Walberton (Barnham, Abington)
Worcs.	Alston and Packington, Blackwell, Cleeve, Cropthorne, Grimley (with Knightwick), Hallow, Harvington, Overbury, Phepson, Shipston, Stoke, Wolverley cum Eymore
Yorks.	Asenby, Leeds, Linton, Pocklington, Rowley, Skirpenbeck, Spofforth, Tadcaster

D. 1086-1279 (168 manors)

County	Manors
Beds.	Biggleswade, Bletsoe, Clapham, Easton, Felmersham, Oakley, Odell, Pavenham, Podington, Stagsden, Stevington, Symington, Thurleigh, Woburn
Bucks.	Dodford, Edgcott, Foxcott, Gayhurst, Haversham, Lamport, Lathbury, Leckhampstead Magna, Leckhampstead Parva, Maids Moreton, Marlow, Ravenstone, Stewkley, Thornborough, Thornton, Turweston, Water Stratford, Westbury, Weston Turville
Cambs.	Bottisham, Chippenham, Comberton, Conington, Elsworth, Eversden, Gamlingay, Girton, Great (Little) Abington, Hildersham, Histon, Horseheath, Knapwell, Lolworth, Orwell, Rampton, Silverley, Swavesey, Thriplow, Waterbeach (Landbeach)
Devon	Axminster
Glos.	Badgeworth, Brimpsfield, Campden, Hatherop, Prestbury, Sevenhampton, Bagworth
Herts.	Little Hadham
Hunts.	Barham, Broughton, Buckden, Bythorn, Catworth, Dillington, Ellington, Fleeton, Giddings, Hemingford Abbots, Hemingford Grey, Holywell, Horton cum Whitton, Old Weston, Sawtry, Slepe, Stukeley, Warboys
Leics.	Knighton, Leicester, Thurmaston
Lincs.	Dunholme, Howell, Louth, Marton, Nettleham, Normanby, Norton, Sleaford, Spalding, Stow St. Mary
Norfolk	Banham, Hindolveston
Northants.	Kilsby
Notts.	Barnby-in-the-Willows, Coddington, Collingham, Newark-upon-Trent
Oxon.	Alwoldesberie, Baldon, Banbury, Begbrook, Bladon, Bucknell, Checkendon, Chinnor, Chislehampton, Cropredy, Crowmarsh Gifford, Cuddesdon, Dorchester-on-Thames, Draycott, Drayton, Easington, Fritwell, Fulbrook, Grafton, Heyford Warren, Horsepath, Ipsden, Lillingstone Lovell, Mapledurham Chauzy, Mixbury, Pyrton, Rousham, Salford, Taynton, Thame, Warpsgrove
Rutland	Liddington
Salop.	Cheswardine
Staffs.	Harbourne (Smethwick), Winnington
Warks.	Ashow, Brandon, Burton Dassett, Coundon, Honington, Kenilworth, Oxhill, Priors Hardwick, Ratley and Upton, Stoneleigh, Walsgrave on Sowe, Wormleighton
Wilts.	Bishopstrow, Brigmerston, Calstone Wellington, Compton Chamberlayne, Stratton St Margaret, Sutton Mandeville, Swallowcliffe, Whadden, Widhill (Groundwell), Winterslow
Worcs.	Fladbury, Hanbury, Hartlebury, Ripple
Yorks.	Aldbrough, Barnby, Danby-in-Cleveland, Gilling, Hutton Mulgrave, Lythe, Skelton

E. 1086-1290 (27 manors)

County	Manors
Essex	Feering, Kelvedon Churchall
Glos.	Haresecombe
Hunts.	Broughton
Lincs.	Digby, Frieston, Pinchbeck Town, Ruskington, Spalding Town, Stowe
Norfolk	Martham
Nottis.	Radcliffe upon Soar (Kingston), Tuxford
Som.	Compton Dundon, Stoke under Hamdon
Staffs.	Betley, Cradley
Sussex	East Lavant, Tangmere, West Tarring, Willingham
Warks.	Middleton
Wilts.	Elcombe
Worcs.	Halesowen
Yorks.	Bridge Hewick, Danby, Garton on the Wolds, Gilling

F. 1086-1315 (59 manors)

County	Manors
Berks.	Englefield, Swallowfield
Bucks.	Ardington, Avington, Chilton, Ilsley, South Moreton, Speen
Cornwall	Braddock
Devon	Carswell Regis, Deptford, Sutton Walerland
Essex	Chickney
Glos.	Chedworth, Dean, Dyrham, Hull and Nympfield, Thornbury
Herts.	Ashwell
Hunts.	Broughton
Middx.	Hendon
Norfolk	Barney, Binham
Northants.	Titchmarsh
Oxon.	Caversham, Ducklington, Emington, Garsington, Hardwick, Mapledurham Chauzy, Rutherford
Rutland	Ridlington
Salop.	Acton Burnell, Euden Burnell
Som.	Baltonsborough
Staffs.	Wigginton
Sussex	Bignor
Warks.	Claverdon, Coldfield, Kingsbury, Middleton, Sherborne
Wilts.	Grimstead, Newton Toney, Stourton, Stratford Toney, Wardour, Wilsford (Lake), Wootton Rivers
Worcs.	Acton Beauchamp, Comberton, Elmley, Inkberrow, Naunton Beauchamp, Pirton, Salwarpe, Tenbury, Wadborough, Newynton

G. 1300-1315 (11 manors)

County	Manors
Bucks.	Great Horwood
Essex	Chatham, Great Waltham, High Easter
Huntis.	Broughton, Godmanchester
Leics.	Kibworth Harcourt
Northants.	Brigstock
Som.	Taunton
Wilts.	Cherhill
Worcs.	Halesowen

H. 1300-1325 (12 manors)

County	Manors
Bucks.	Great Horwood, Newton Longville
Essex	Chatham, High Easter
Huntis.	Broughton, Godmanchester, Holywell, Warboys
Leics.	Kibworth Harcourt
Northants.	Brigstock
Som.	Taunton
Worcs.	Halesowen

I. 1300-1348 (12 manors)

County	Manors
Bucks.	Great Horwood, Newton Longville
Essex	Chatham, Great Waltham, High Easter
Hunts.	Godmanchester, Holywell
Leics.	Kibworth Harcourt
Norfolk	Coltishall
Northants.	Brigstock
Som.	Taunton
Worcs.	Halesowen

J. 1300-1351 (8 manors)

County	Manors
Bucks.	Great Horwood, Newton Longville
Essex	Chatham, Great Waltham, High Easter
Huntis.	Godmanchester
Leics.	Kibworth Harcourt
Worcs.	Halesowen

K. 1300-1377 (11 manors)

County	Manors
Bucks.	Akeley, Great Horwood, Newton Longville
Essex	Chatham, Great Waltham, High Easter
Hunts.	Godmanchester, Holywell, Warboys
Leics.	Kibworth Harcourt
Worcs.	Halesowen

L. 1377-1400 (13 manors)

County	Manors
Bucks.	Akeley, Great Horwood, Newton Longville
Essex	Berden, Chatham, Great Waltham, High Easter, Writtle
Hunts.	Godmanchester, Holywell, Warboys
Leics.	Kibworth Harcourt
Worcs.	Halesowen

M. 1377-1430 (8 manors)

County	Manors
Bucks.	Great Horwood, Newton Longville
Essex	Great Waltham, Hatfield Broadoak, High Easter, Writtle
Hunts.	Holywell, Warboys

N. 1377-1450 (7 manors)

County	Manors
Bucks.	Great Horwood, Newton Longville
Essex	Great Waltham, High Easter, Writtle
Hunts.	Holywell, Warboys

APPENDIX 1.1.02: List of sources for the manors included in the population estimates

A. 1086-1250

County	Manor	Source
Essex	Havering	McIntosh (1986)
Oxon.	Adderburry	Russell (1948)

B. 1086-1279

County	Manor	Source
Devon	Axminster	Russell (1948)
Herts.	Little Hadham	Russell (1948)
Notts.	Collingham	Russell (1948)
Oxon.	Crowmarsh Gifford, Drayton	Russell (1948)
Salop.	Cheswardine	Russell (1948)

C. 1086-1290

County	Manor	Source
Lincs.	Stowe	Russell (1948)
Norfolk	Martham	Campbell (1980)
Warks.	Middleton	Russell (1948)

D. 1086-1315

County	Manor	Source
Berks.	Englefield	Russell (1948)
Bucks.	Ardington, Avington, Ilsley, Speen	Russell (1948)
Cornwall	Braddock	Russell (1948)
Devon	Carswell Regis, Deptford, Sutton Walerland	Russell (1948)
Glos.	Dean, Thornbury	Russell (1948)
Oxon.	Mapledurham Chauzy, Rutherford	Russell (1948)
Salop.	Acton Burnell, Euden Burnell	Russell (1948)
Warks.	Claverdon, Coldfield, Kingsbury, Middleton	Russell (1948)
Worcs.	Newynton	Russell (1948)

E. 1300-1315

County	Manor	Source
Bucks.	Great Horwood	Poos (1991)
Essex	Chatham, Great Waltham, High Easter	Poos (1991)
Hunts.	Broughton	Britton (1977)
	Godmanchester	Raftis (1990)
Leics.	Kibworth Harcourt	Raftis (1990)
Northants.	Brigstock	Bennett (1987)
Som.	Taunton	Titow (1961)

F. 1300-1325

County	Manor	Source
Bucks.	Great Horwood, Newton Longville	Poos (1991)
Essex	Chatham, High Easter	Poos (1991)
Hunts.	Broughton	Britton (1977)
	Godmanchester	Raftis (1990)
	Hollywell	DeWindt (1972)
	Warboys	Raftis (1974)
Leics.	Kibworth Harcourt	Poos (1991)
Northants.	Brigstock	Bennett (1987)
Som.	Taunton	Titow (1961)

G. 1300-1348

County	Manor	Source
Bucks.	Great Horwood, Newton Longville	Poos (1991)
Essex	Chatham, Great Waltham, High Easter	Poos (1991)
Hunts.	Godmanchester	Raftis (1990)
	Holywell	DeWindt (1972)
Leics.	Kibworth Harcourt	Poos (1991)
Norfolk	Coltishall	Campbell (1984)
Northants.	Brigstock	Bennett (1987)
Som.	Taunton	Poos (1991)

H. 1300-1351

County	Manor	Source
Bucks.	Great Horwood, Newton Longville	Poos (1991)
Essex	Chatham, Great Waltham, High Easter	Poos (1991)
Hunts.	Godmanchester	Raftis (1990)
Leics.	Kibworth Harcourt	Poos (1991)

I. 1300-1377

County	Manor	Source
Bucks.	Akeley, Great Horwood, Newton Longville	Poos (1991)
Essex	Chatham, Great Waltham, High Easter	Poos (1991)
Hunts.	Godmanchester	Raftis (1990)
	Holywell	DeWindt (1972)
	Warboys	Raftis (1974)
Leics.	Kibworth Harcourt	Poos (1991)

J. 1377-1400

County	Manor	Source
Bucks.	Akeley, Great Horwood, Newton Longville	Poos (1991)
Essex	Berden, Chatham, Great Waltham, High Easter, Writtle	Poos (1991)

Hunts.	Godmanchester	Raftis (1990)
	Holywell	DeWindt (1971)
	Warboys	Raftis (1974)
Leics.	Kibworth Harcourt	Poos (1991)

K. 1377-1430

County	Manor	Source
Bucks.	Great Horwood, Newton Longville	Poos (1991)
Essex	Great Waltham, Hatfield Broadoak, High Easter, Writtle	Poos (1991)
Hunts.	Hollywell	DeWindt (1972)
	Warboys	Raftis (1974)

L. 1377-1450

County	Manor	Source
Bucks.	Great Horwood, Newton Longville	Poos (1991)
Essex	Great Waltham, High Easter, Writtle	Poos (1991)
Hunts.	Holywell	DeWindt (1972)
	Warboys	Raftis (1974)

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