The Surprising Wealth of Pre-industrial England

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Occupations listed in wills reveal that as early as 1560 effectively only 60% of the English engaged in farming. Even by 1817, well into the Industrial Revolution, the equivalent primary share, once we count in food and raw material imports, was still 52%. By implication, incomes in pre-industrial England were close to those of 1800. Urbanization rates are not a good guide to pre-industrial income levels. Many rural workers were engaged in manufacturing, services and trade. The occupation shares also imply pre-industrial England was rich enough in 1560 to rank above the bottom fifth of countries in 2007.

A Farewell to Alms (Clark, 2007) argued that England in 1800 was no richer than in most of its history since 1200, and even more surprisingly, no richer than the average hunter-gatherer society. It was also claimed that England in the years 1200-1800 had incomes per person 2-4 times higher than most of the countries in sub-Saharan Africa now. These claims have been controversial. The mass opposed opinion has been that incomes in England grew very substantially between 1200 and 1800, so that by 1800 England had achieved income levels far in advance of its earlier pre-industrial levels, and far in advance of the typical pre-industrial society: see Allen, 2009, Broadberry, Campbell et al., 2008, de Vries, 2008, Maddison, 2007, Mokyr, 2010, Persson, 2008, Wrigley, 1985. By implication most pre-industrial societies, and England in particular before 1600, were at income levels of the poorest modern countries such as Burundi or Tanzania.

This paper, using occupation statements in men's wills, shows that the share of the population employed in farming in England from 1560 on is completely consistent with the high levels of income estimated in Clark (2007) and Clark (2010a). The farm shares estimated by the proponents of a poor pre-industrial England, based mainly on urbanization rates, are too high for the pre-industrial period. Many people in the pre-industrial rural

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England were engaged in non-farm occupations, including services, retailing and manufacturing. Further the decline in the farm share by 1800 in part owed not to a rise in income, but to the beginning of large scale imports into England of food and raw materials in response to rapid population growth, and the rise of manufacturing as a mainstay of the economy. The *effective* farm share in 1800 is little below that of pre-industrial England.

The Debate on the Pre-Industrial Incomes

A Farewell to Alms argued England was a rich pre-industrial society on two grounds. The first is the extraordinarily real wages of early England, compared to those of 1800. Figure 1, for example, shows the estimated real day wages of workers in England from 1200 to 1800 (composed as an average of building and farm day wages). The wage data suggests that real wages in the 1200s to 1790s exceeded those of 1800 in about half the decades.

The second argument for the wealth of early England comes from combining the wage data with information on total land rents, house rents, and other property returns to estimate all income per person, as is also shown in figure 1. This broader measure confirms that in many decades pre-industrial England had higher estimated incomes than around 1800 and the early Industrial Revolution (Clark, 2010a). These national income estimates were premised on the farm employment share being 60 percent before 1680.

In the face of this wage and income evidence the proponents of rising living standards 1200-1800 have pointed to other indicators that pre-industrial England must have been poor. The most important of these is the low urbanization rates. In 1500 only 5 percent of people were in towns of more than 5,000. But urbanization increased steadily thereafter. By 1800 it had risen on this measure to 28 percent.[2] This low early urbanization, it is argued, implied a high farm employment share, 70-80 percent. Table 1 shows some estimates of the farm shared in employment in England. Before 1688 these are based only on urbanization rates. Such estimates are much greater than the direct estimates of farm shares after 1688. They suggest that the farm employment declined from nearly 80 percent in 1300 to only 40 percent by 1817.[3]

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[2] Wrigley, 1985, table 2, 688.

[3] A second argument made by de Vries, 2008, is based on an apparent increase in the material goods of people 1600-1750, as revealed by probate inventories. The strength of this evidence is examined in Clark, 2010.

Figure 1: Real Wages and Real Income by Decade, England, 1200s-1790s
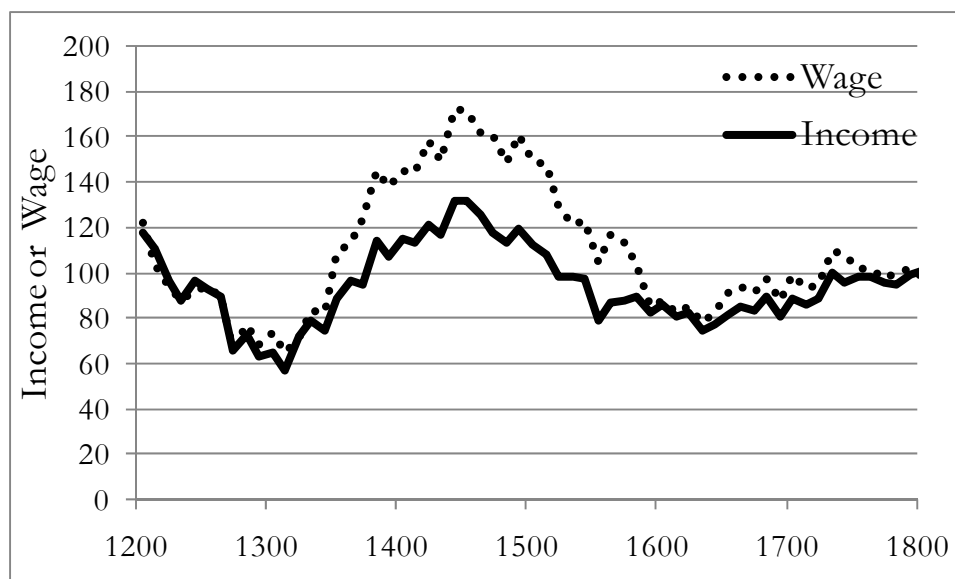
Note: 1790-1809 = 100 for both series. Source: Clark, 2010a, figures 8, 9.

Table 1: Estimated agricultural employment shares, England 1300-1817

Year	Lindert, 1985 (men)	Wrigley, 1985	Shaw-Taylor and Wrigley, 2008	Broadberry et al., 2009
1811/17	.29	-	.40	-
1800	.25	.36	-	-
1750/5	.40	.46	.47	-
1725	-	-	.47	-
1700	.37	.55	-	.54
1688	.37	-	-	-
1670	-	.60	-	-
1600	-	.70	-	.70
1520/30	-	.76	-	.75
1380	-	-	-	.76
1300	-	-	-	.79

Sources: Lindert, 1980, table 3, Broadberry et al., 2009, Table 18, Wrigley, 1985, Shaw-Taylor and Wrigley, 2008, figure 12.

How do farm shares relate to income? Engel's Law, one of the best observed empirical regularities in economics, is that the elasticity of food demand with income is below 1. Using this elasticity, we can estimate parametrically the link between incomes and farm shares. If $0 < \epsilon < 1$ is the income elasticity of the demand for farm output, then

$$ln(c_t) = \epsilon ln(y_t) \tag{1}$$

where c_t is real farm output per person, and y_t real income per person. Assume the share of employment in farming and fishing, θ_t, is $\theta_t = (c_t/y_t)$.[4] Then from (1)

$$ln(\theta_t) = (\epsilon - 1)ln(y_t) \tag{2}$$

And
$$ln(y_t) = \frac{1}{(\epsilon-1)} ln(\theta_t) \tag{3}$$

Figure 2 shows for 2007 the relationship between real income per person and the share of the population employed in farming, for countries where the share employed in farming was less than 30%, both shown on a log scale to correspond to this expression. For these countries there is indeed a linear relationship between the logarithms of income and farm employment shares. The R^2 of the fit is 0.59, which is good considering the errors involved in estimating both income and the farm share, and the fact that some of these countries are net food exporters, others net food importers. In the poorest countries 80-85 percent of the population is employed in farming. Thus England with an estimated farm share for 1600 and earlier of 70-79 percent would rank amongst the poorest countries of the modern world. Table 2 shows the income level implied by each farm share (in 2005 $) from the fitted line in figure 2, as well as a country in 2007 that had that income level.

The estimated value of $\frac{1}{(\epsilon-1)}$ from the 53 observations in figure 2 is -1.854, with a standard error of 0.216. This implies a value of ϵ, the income elasticity of demand for farm products, of 0.46 for the poorer third or modern societies. This estimate fits well with the finding that in mid nineteenth century England the elasticity of demand for food for poorer working families was 0.6.[5] From equation (3) we also see that for any two years 1 and 0,

[4] Assuming labor productivity is the same in the farm sector as the non-farm sector.
[5] Clark, Huberman, and Lindert, 1995, 224. This estimate is based mostly on farm families in the 1860s, among the poorest families in England in these years.

Table 2: Farm employment shares and income, 2007

Farm Share	Income per person (2005 $)	Example of country at this income level, 2007
0.40	4,468	Philippines
0.45	3,592	Honduras
0.50	2,954	Tajikistan
0.55	2,476	Guyana
0.60	2,107	Uzbekistan
0.65	1,817	Sierra Leone
0.70	1,583	Haiti
0.75	1,393	Benin
0.80	1,236	Uganda

Figure 3: Income versus farm employment shares, 2007
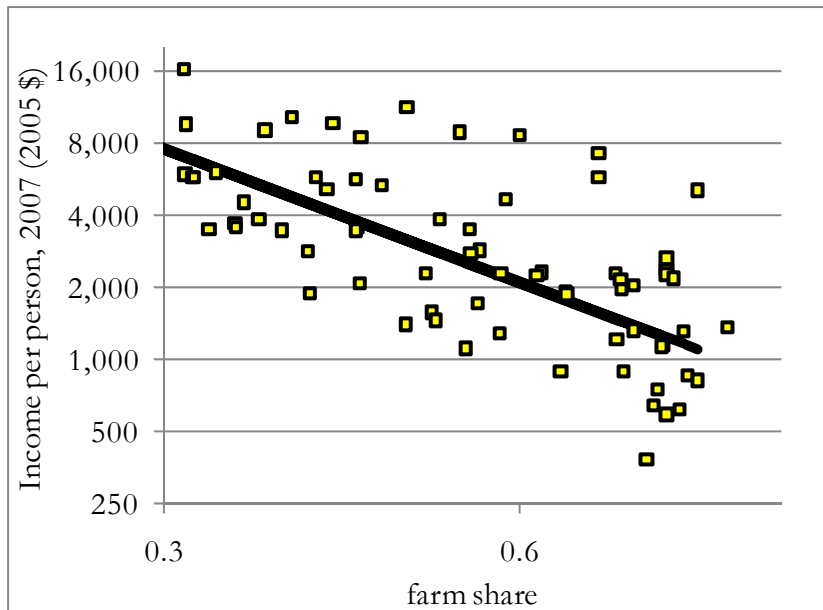
Source: Incomes, Penn World tables, 6.3; share agriculture in most countries from the International Labor Organization.

$$\frac{y_1}{y_0} = \left(\frac{\theta_1}{\theta_0}\right)^{\frac{1}{\epsilon-1}} = \left(\frac{\theta_1}{\theta_0}\right)^{-1.854} \tag{4}$$

If England declined from a 75 percent share in farming in 1500 to a share of 0.40 in 1817, this would imply a rise in real incomes of 3.2 fold. In terms of real incomes in the 300 years leading up to the Industrial Revolution England is implied to have risen from the level of Benin in 2007 to that of the Philippines. Yet Figure 1 suggests that estimated real incomes in England in 1500 were as high as those of 1800. Either the income estimates or the farm share estimates are wrong.

We also show that for the application of Engel's law to estimating income they are too low for 1790 and later because of imports of food and raw materials. Define φ as net food and raw material imports as a share of national income. Then in the presence of food and raw material imports the relationship of real income to primary sector employment shares becomes,

$$\frac{y_1}{y_0} = \left(\frac{\theta_1+\varphi_1}{\theta_0+\varphi_0}\right)^{\frac{1}{\epsilon-1}} = \left(\frac{\theta_1+\varphi_1}{\theta_0+\varphi_0}\right)^{-1.854} \tag{5}$$

Since φ went from about -1 percent of national income in 1560, to +10 percent in 1790-1810 the *effective* share employed in farming went from no more than 61 percent in 1560 to 52 percent by 1800, a much more modest decline. Real incomes were close to those the wage and GDP estimates imply for pre-industrial England. By implication pre-industrial England was richer than many countries now.

Wills as a source on pre-industrial occupations

A largely unexploited source for the distribution of English occupations over time are statements of occupation by testators in wills.[6] After 1695 parish registers of baptisms, marriages and deaths begin to more frequently record occupations, and as a census of the whole adult population are a preferred way of estimating the occupational structure of the population (Lindert, 1980, Kitson, 2007, Shaw-Taylor and Wrigley, 2008). But before 1695 parish records rarely note occupations. The only sporadically available sources before 1695 are thus muster rolls and tax lists. Wills, however, indicate occupations for a substantial

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[6] Evans, 2000, pioneers in looking at occupations in rural Cambridge between 1551 and 1800 using wills.

number of testators from the 1540s onwards. Further indexers of will archives often list these occupations, making large numbers of such statements available for analysis.

Figure 3, for example, shows the estimated fraction of adult men dying in Essex 1540-1857 who left probated wills in the various ecclesiastical courts covering Essex.[7] This is the number of surviving wills in each decade, divided by the estimated number of adult men dying in Essex in each decade.[8] From 1550-1629 on average 30 percent of Essex men left a probated will. This proportion fell substantially and by the 1850s was only 10 percent.[9]

Figure 3 also shows the proportion of adult men leaving wills stating their occupations. This peaks at close to 30 percent in the early seventeenth century, but is generally about 10 percent of men. Thus English wills provide a rich sample of occupations of men in England from around the 1540s to the 1850s.[10]

Though they cover a substantial fraction of the pre-industrial male population wills are potentially biased as a source of the sectoral distribution of occupations in that they were made disproportionately by richer men. If an economic sector had more assets per worker than the economy as a whole it will tend to be overrepresented in will occupations. Thus in 1841 when we can compare the distribution of occupations in wills in Essex with those in the census, shoemakers (little capital) are under counted and millers (much capital) are over counted. Wills will reveal the share in farming if the capital intensity of farming is roughly the same as in the non-farm sector. Fortunately, as we will see below, this appears to be the case in all periods 1540-1858. Indeed the worry is more that will occupations over sample the farming sector. Nigel Goose and Nesta Evans claim that in the sixteenth and seventeenth centuries will making was relatively less frequent among men in larger towns (Goose and Evans, 2000, 44-5).

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[7] We concentrate below on male wills, even though there are large numbers of women's wills also. This is because few women's wills record occupations, and of those that do over 80% record "spinster" which could refer either to their occupation, or their marital status.

[8] This is calculated on the following assumptions. There were equal numbers of men and women born. Wills were only made by adults, and the proportion of men reaching adulthood was 0.6. The crude death rate, and population trends for Essex was the same as for England as a whole for the years before 1760 (Wrigley et al., 1998, p. 614). The population of Essex in 1675, based on the hearth tax returns, was 140,000.

[9] As the share of men making wills declined, their average status increased, which is why people seem so much richer at death in probate inventories.

[10] The share of men leaving wills in early 17th century Suffolk is even greater than in Essex.

Figure 3: Proportion of Men with Surviving Wills and Occupations, Essex 1540-1858
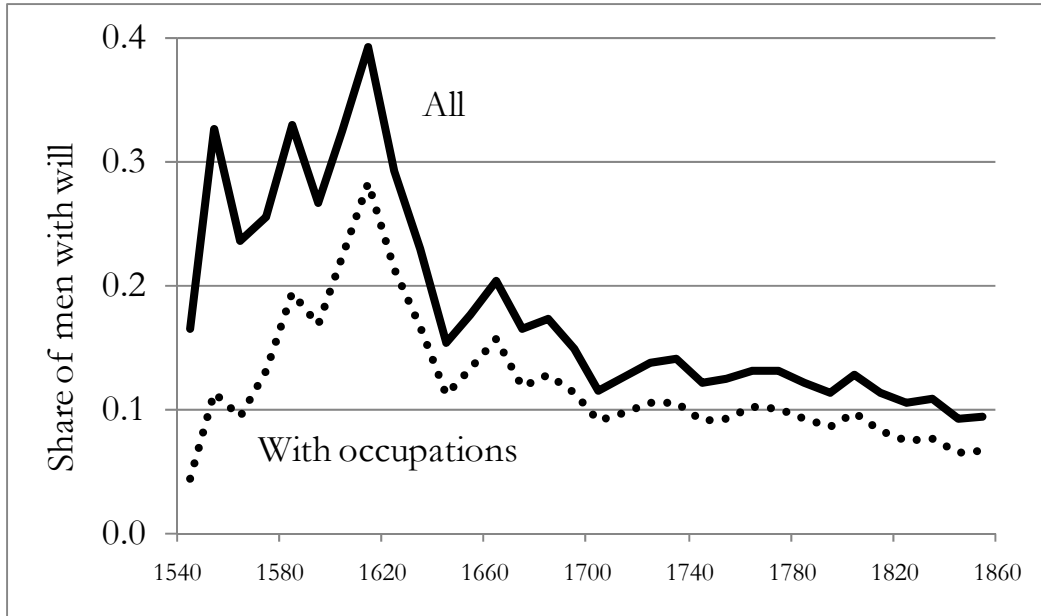
Source: See text.

How Representative were Wills of the farming employment share?

The first test of whether male will occupations will accurately represent the farm share comes from looking at whether they are generated proportionately to population in rural and urban areas. Suppose the proportion of men making wills differed between the farm and non-farm sectors. Suppose the fraction of the population reporting an occupation in a will was ω_f for those in farming, and ω_{nf} for in non-farm occupations – manufacturing, commerce, education and trade. Suppose also $\omega_f < \omega_{nf}$. In that case the proportion of wills generated in completely rural parishes, relative to population, would be, at ω_f, lower than the proportion in completely urban parishes, ω_{nf}. In general suppose that the true fraction of a parish in farm occupations was ϕ. Then the overall rate of will occupation reporting per person will be

$$\phi\, \omega_f \;+\; (1\text{-}\,\phi)\, \omega_{nf} \;=\; \omega_{nf} \;+\; \phi(\omega_f \,-\, \omega_{nf})$$

If $\omega_f < \omega_{nf}$ then the more rural the parish (the greater is ϕ), the lower the frequency of will occupations reported per person. Thus the test of whether will occupations tend to over or understate the share in agriculture is the frequency of such occupation reports relative to populations in rural and urban areas. If rural populations produce as many will occupation reports as urban ones, then wills must be correctly reporting the share of the population in farming. If will frequencies were higher in rural than in urban areas, then wills overstate the farming share. Only if will frequencies were lower in rural areas would wills understate the share in farming.

The evidence reviewed below for England from 1540 to 1841 is that will occupations tend, if anything, to modestly over report the rural population in all periods, and thus are biased towards reporting too many farm occupations. Figure 4, for example, shows the fraction of the population in Essex by parish population densities in 1841 from the most occupations by the same parish population densities. The correspondence is close. In Surrey the wills with occupations are somewhat more heavily drawn in 1841 from the more rural parishes (figure 5). But wills report the occupations of men typically aged 50-65, and in Surrey the urban areas had grown very recently, so that rural areas contained disproportionately more old people. Such biases should be absent before the Industrial Revolution and the large population movements between rural and urban areas that accompanied it.

The distribution of will occupations versus population was also close in 1801. In Essex, for example, the distribution of will occupation reports (1780-1819) still echoes the split of the population between rural and urban areas reported in the census of 1801, as seen in figure 6.

One earlier measure we have of parish populations, and population densities, is the Hearth Tax of 1662-89. The Hearth Tax was an assessment collected on every fire hearth or stove. The records list both the numbers of hearths, and of houses, in each parish. We can thus measure parish population density 1662-89 either through the number of houses per acre, or through the number of hearths per acre (the average house had 2.6 hearths). Hearths per acre is preferred to counting houses per acre since richer houses would have multiple hearths, which would better represent their likely large population of servants. For example, Ampton in Suffolk in 1674 had just 8 houses. But one of these, that of Sir Algernoone May, had 21 hearths, so that the parish had 38 hearths, which likely better correlates with its true population.

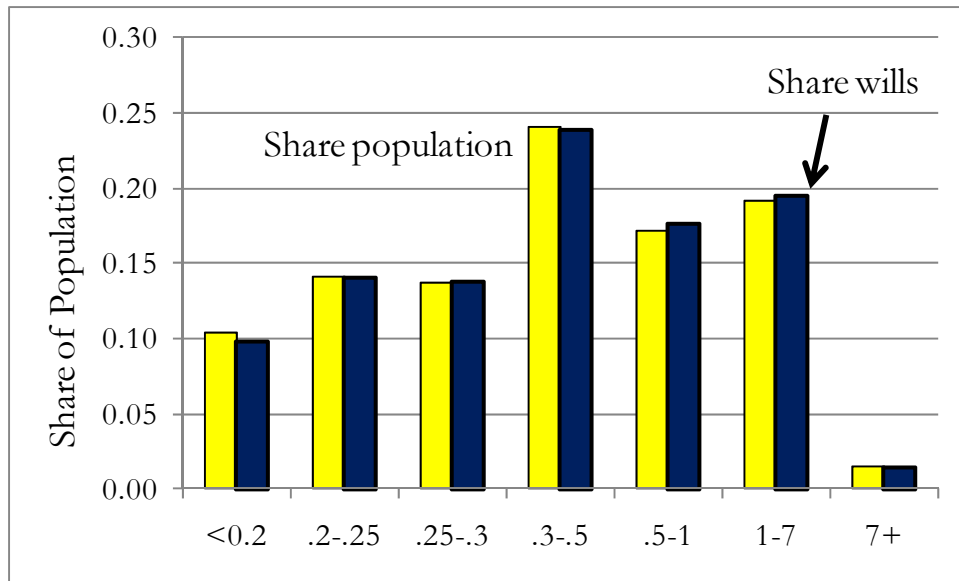**Figure 4: Census and Will population distributions, Essex, 1841.**

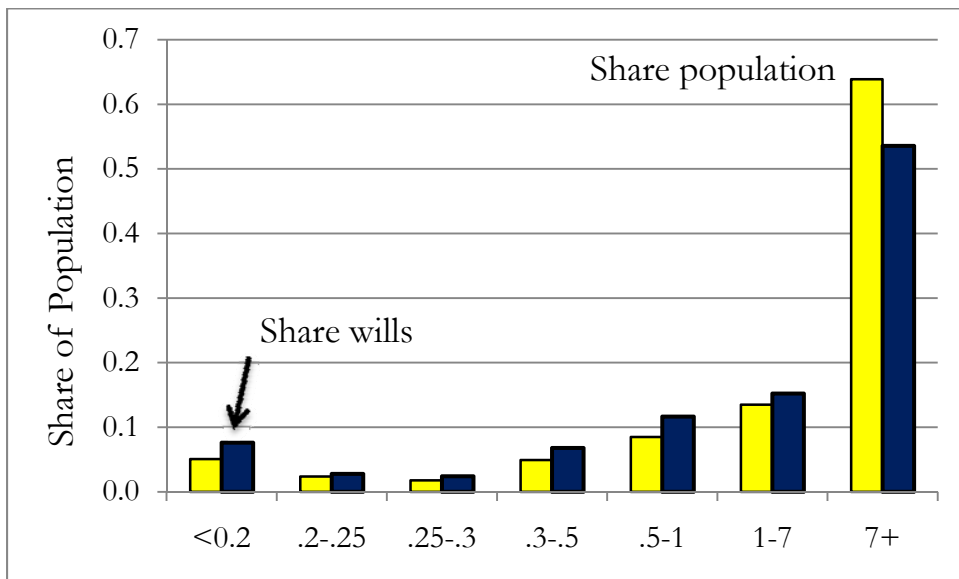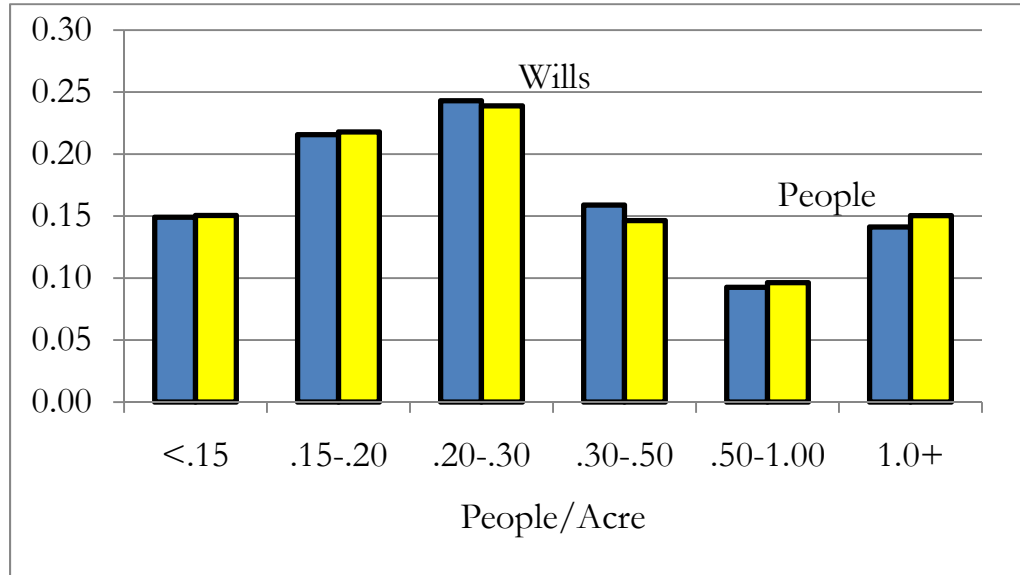**Figure 5: Census and Will population distributions, Surrey, 1841.**

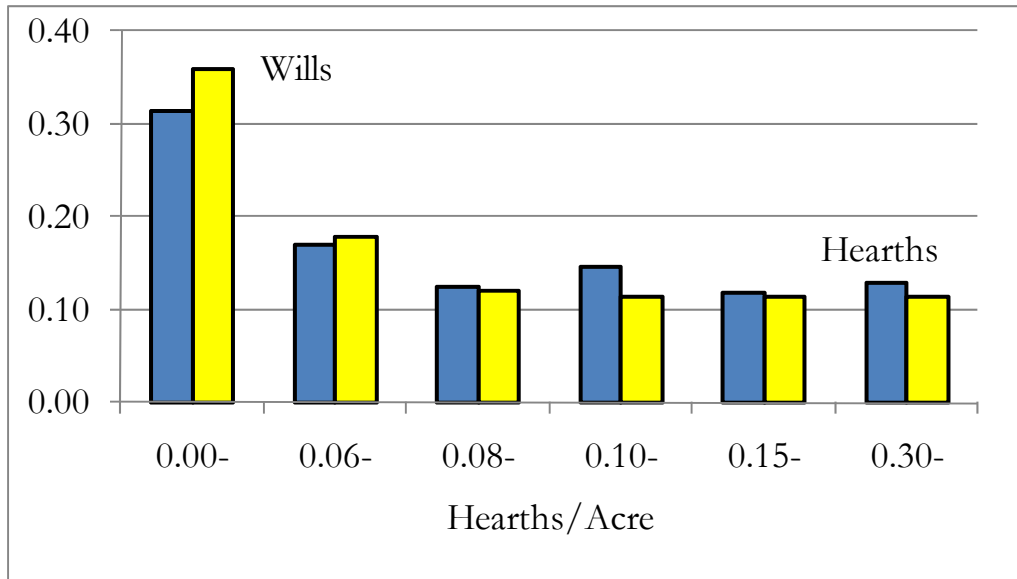**Figure 6:** The Distribution of Wills versus People, Essex, 1801

Note: The wills are from the years 1781-1822.

Parishes were divided into six groups based on the number of hearths per acre: from the most rural with 0.00-0.06 hearths per acre, to the most urban with more than 0.3 hearths per acre. Figure 7 shows for Essex the distribution of population across parishes of the various levels of hearths per acre in 1670, compared to the distribution of wills reporting occupations in 1650-1699.[11] In 1670 the wills tended to modestly oversample occupations in rural areas. A similar pattern is revealed in Suffolk circa 1675. Figure 8 shows the distribution of parishes across different population densities in Suffolk as revealed by hearths rural parishes with less than 0.2 people per acre, to the most urban with more than 7 people per acre. Also shown are the fractions of all male wills in Essex 1825-1858 recording per acre in 1675, versus the distribution of occupation reports from wills across the same population density gradient. As in Essex, in Suffolk will occupations tended to be drawn slightly more heavily from the most rural parishes.

We get an even earlier estimated parish population density for Suffolk from the records of the Lay Subsidy of 1524. These lists of taxpayers by parish, which included as well as property holders also wage earners earning at least £1 per year, allow an approximation to

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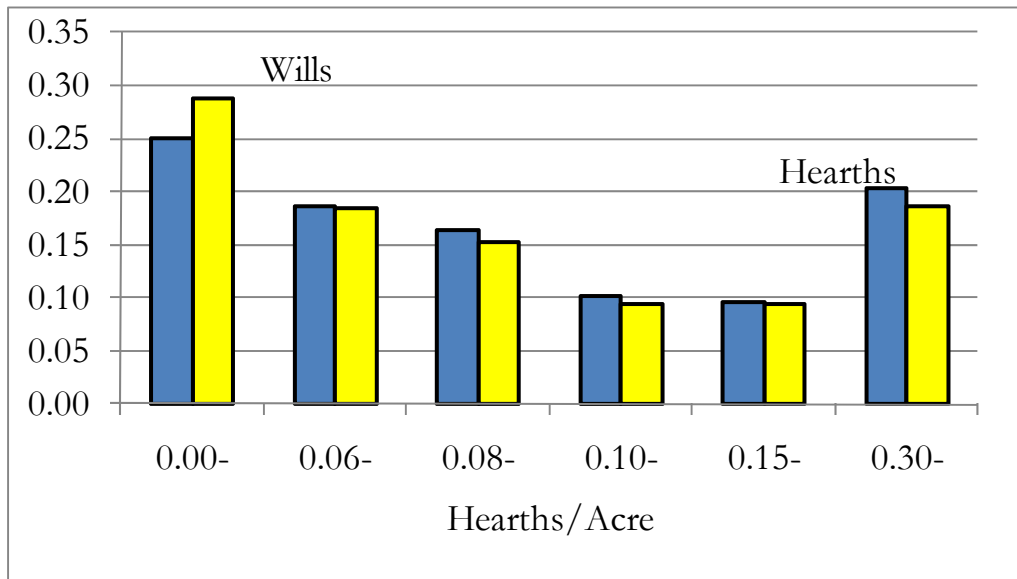
[11] The hearth totals by parish are from Ferguson, C., French, H., Thornton, C.. & Wareham, A., eds. 2011 (forthcoming).

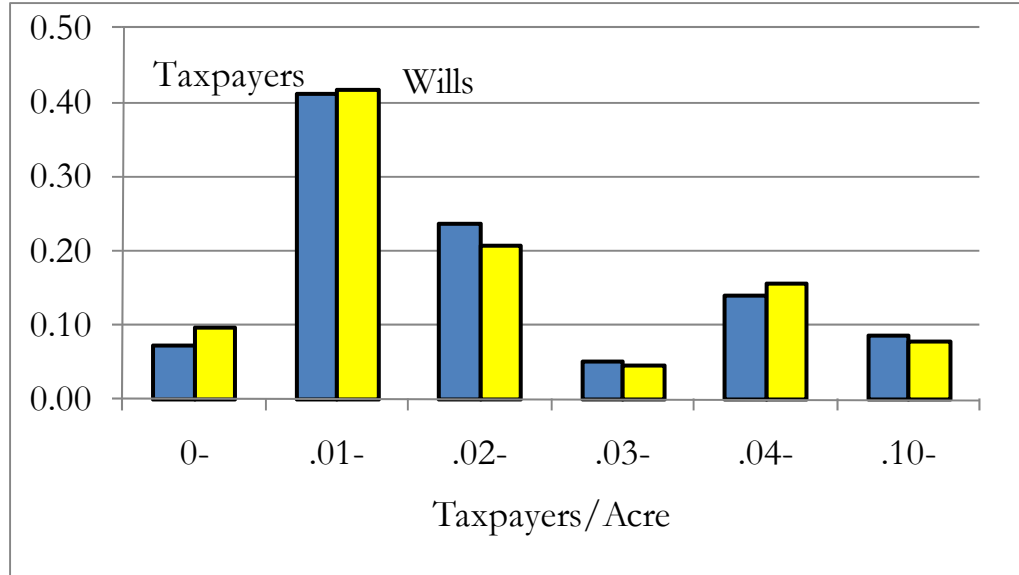**Figure 7: The Distribution of Will Occupations versus Hearths per Acre, Essex, 1670**

Note: the wills are from the years 1650-1699.

Figure 8: Will Occupations versus Hearths per Acre, Suffolk, 1674

Source: Hearths, Hervey, 1905. Parish areas, 1851 census.

Figure 9: The Distribution of Wills 1540-99 versus taxpayers, Suffolk

parish population densities in Suffolk in 1524. Figure 9 shows that even as early as 1540-99 will occupation reports are distributed across rural and urban parishes in proportion to their relative population in 1524. From at least 1540 the share of people reporting farming as their occupation in wills will provide an unbiased estimate of the farm share in the population.

Thus will occupations in pre-industrial England, if anything, tended to have a modest bias in terms of overstating farm occupation shares all the way from 1540 to 1841. The likely reason for this earlier bias in favor of farm occupation is that farming in pre-industrial England was even more property intensive than town production activities, because of the value of land and farm inventories.

The second test of will occupation reports as a source on the general occupational split between farming and fishing and other occupations comes by comparing these reports for the years 1825-1858 with occupations in the 1841 census. The 1841 census has the advantage that occupations were recorded in a terms very similar to those of occupation statements on wills. Table 3 shows the census share in farming in Essex and Surrey, counties with very different degrees of urbanization, compared to the shares among men's

Table 3: Shares in Farming and Fishing, 1841

	Share Farm and Fishing, 1841 census (%)	Share Farm and Fishing, Wills, raw (%)	Share Farm and Fishing, Wills, adjusted (%)
Essex	44.1	43.3	44.3
Surrey	12.2	17.8	14.1

wills stating occupations.[12] The Essex shares match almost exactly. In Surrey the wills report too many men in farming. But this stems largely from their being disproportionately many wills from rural areas. Once we correct for that, the farming share in wills is within 2 percent of the census share.

National Farming Share, 1652-1660

Before 1858 wills in England were probated in a great variety of ecclesiastical courts, as is discussed in appendix 2. Thus getting a representative sample of will occupations for every county in England would be an enormous task. However in 1652 to 1660, in the Interregnum, the great majority of wills were filed in the newly established national Court for Proving of Wills and the Granting of Administrations, which sat in London. The index of this court in these years is available to us from the National Archives, filed with the Prerogative Court of Canterbury wills. We thus have for 1652-60 an estimate by county of the farming share in employment. In appendix 2 we show that for Suffolk the wills from the London court in 1652-60 have the same characteristics as wills in general in Suffolk, 1600-51 and 1661-1702.

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[12] Appendix 1 shows the occupations in wills that were taken as indicating farm or fishing employment.

Table 4 shows for each county in England the number of houses in 1689 estimated from the hearth tax. This measures the likely relative populations of these counties in 1652-60. In the third column in table 14 are shown the number of interregnum wills giving occupations for each of these counties in 1652-60. The will frequencies relative to the likely populations of the counties are shown in column 4, with 100 set as the average. There is a fair amount of variation around the average, mainly dependent of how close the counties were to London. Thus the most northern counties, Cumberland, Northumberland, Durham, and Westmorland, all show only 21-29% of the average number of wills per person. Those counties close to London are typically overrepresented in their will frequency. To get the national share in farming, fishing we thus have to reweight the share in farming in each county by the relative county population, to correct for the underrepresentation of the north of England.

The fifth column shows the fraction of will makers in each county in 1652-60 who reported their occupation as being in farming or fishing. This varied from a low of 9 percent in Middlesex to a high of 79 percent in Cheshire. For 1652-60 the population weighted average for the country as a whole was 59 percent. Thus even one hundred years before the Industrial Revolution a substantial fraction of the English labor force, 41 percent, was engaged in other than agricultural occupations.

Interestingly in 1652-60 there is little evidence from the wills of the later industrialization of the north. By the 1760s Shaw Taylor and Wrigley report that about 65 percent of the occupied of Lancashire and the West Riding of Yorkshire were employed in manufacturing. In 1652-60 only one northern county, Northumberland, has less than 60 percent of its male population in farming, fishing and forestry. Lancashire reports 77 percent in farming and Yorkshire as a whole 66 percent, both well above the national average. In contrast in the south Middlesex, Surrey, Norfolk, Suffolk, Kent, and Gloucester all had less than 60 percent of the population engaged in farming.

Table 4 also shows the fraction of will makers engaged in the production and distribution of textiles and clothing, shown in the last column.[13] Lancashire is below the national average of 13 percent, and Yorkshire just at this average. Concentrations of such workers appear in Middlesex, followed by Worcester and Gloucester. However, if we look

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[13] Appendix 1 lists the occupations counted as being in this sector.

Table 4: Fraction in Farming and Fishing by County, 1652-60

County	Houses 1689	PCC wills 1652-60	Wills per house (index)	Share farm occupations	Share clothing occupations
Bedford	12,170	520	152	0.77	0.07
Berkshire	16,906	475	100	0.65	0.13
Buckingham	18,390	655	127	0.72	0.08
Cambridge	17,347	608	125	0.68	0.08
Cheshire	24,054	363	54	0.79	0.09
Cornwall	25,374	585	82	0.72	0.07
Cumberland	14,825	89	21	0.72	0.11
Derby	21,155	440	74	0.74	0.08
Devon	56,310	1,694	107	0.62	0.14
Dorset	21,944	431	70	0.62	0.10
Durham	19,362	124	23	0.64	0.14
Essex	34,819	1,328	135	0.60	0.14
Gloucester	26,764	988	131	0.59	0.16
Hampshire	26,851	694	92	0.61	0.11
Hereford	15,006	284	67	0.77	0.07
Hertford	16,569	616	132	0.62	0.12
Huntingdon	8,217	313	135	0.73	0.09
Kent	39,242	1,674	152	0.56	0.12
Lancashire	40,202	563	50	0.77	0.10
Leicester	18,702	450	85	0.70	0.08
Lincoln	40,590	1,677	147	0.76	0.08
Middlesex	100,136	3,847	136	0.09	0.28
Norfolk	47,180	1,744	131	0.57	0.15
Northampton	24,808	741	106	0.71	0.08
Northumberland	19,363	121	22	0.26	0.10
Nottingham	17,554	347	70	0.75	0.08
Oxford	19,007	528	99	0.62	0.09
Rutland	3,263	79	86	0.72	0.03
Shropshire	23,284	408	62	0.75	0.10
Somerset	49,808	1,517	108	0.72	0.14
Stafford	23,747	463	69	0.70	0.08
Suffolk	34,422	1,314	136	0.58	0.15
Surrey	34,218	926	96	0.44	0.16

Table 4: Fraction in Farming and Fishing by County, 1652-60 (continued)

| County	Houses 1689	PCC wills 1652-60	Wills per house (index)	Share farm occupations	Share clothing occupations
Sussex	21,537	1,156	191	0.73	0.09
Warwick	21,973	647	105	0.69	0.13
Westmorland	6,501	53	29	0.66	0.28
Wiltshire	27,093	794	104	0.64	0.15
Worcester	20,634	602	104	0.66	0.17
Yorkshire	106,151	1,542	52	0.66	0.13
All counties	1,115,478	31,400	100	0.60	0.13
No county	-	643	-	0.04	0.02
Weighted		32,043		0.59	0.13
Unweighted		32,043		0.57	0.14

Source: Houses, 1689. Glass, 1950, 372, Houghton estimate.

just at the production of cloth (such occupations as weaver, fuller, dyer, shearman, comber, clothworker, clothier) the county with the largest percentage was Suffolk (9.2%), followed by Worcester (8.1%), Devon (8.1%), Gloucester (7.8%), Norfolk (7.3%), Somerset (7.3%), Essex (6.9%), and Wiltshire (6.9%). Cloth production was concentrated in East Anglia and the South West, as would be expected from the history of these industries.

The reason the share of farming nationally was only 59 percent of employment in 1652-60 despite low levels of urbanization was that even in completely rural areas a significant fraction of men reported occupations outside farming. Figure 10 shows the share of testators reporting farming or fishing as their occupation in Essex in three periods - 1640-79, 1780-1819, and 1820-58 – where parishes are grouped by their estimated numbers of people per acre in each period.[14] Even in the most rural parts of Essex in 1640-79, those with more

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[14] For 1640-69 the number of people per acre is estimated from the number of hearths per acre in 1670, assuming 1.86 people per hearth (there were 4.84 people per house in England in 1689, and 2.6 hearths per house).

Figure 10: The Share in Farming by Parish Population Density, Essex
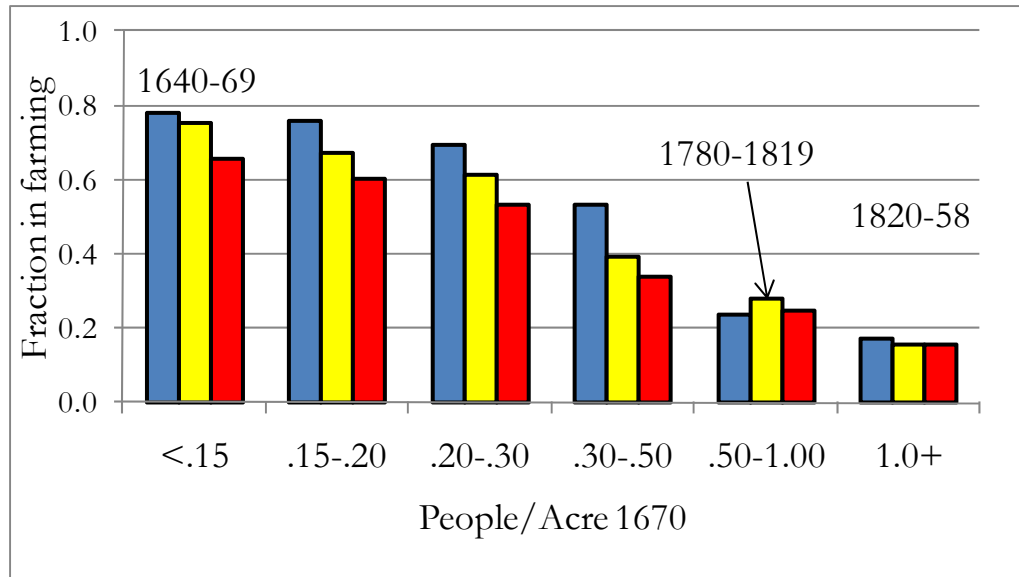
than 6 acres per person, only 75 percent of testators reported farming occupations. And in a broad swath of parishes which would not be counted as urban – they had between 1 and 5 acres of land per person – only a minority of men engaged in agriculture. The share of men in the most rural parishes of 1670 reporting farming occupations circa 1800 and 1840 declined only modestly – to 69 percent in 1800 and 61 percent in 1840. The pre-industrial countryside in England had many manufacturing and service workers.

National Farming Share, 1560-1579

From wills the earliest broad representative estimation of occupational structure we can get comes in 1560-79. Before this few wills state occupations, and of those that do are potentially unrepresentative of the broad occupational structure, since they seem to contain too many clergy (wills were proved in ecclesiastical courts, and clergy may early on have had easier access to these courts).

We have thus constructed for a broad range of 16 counties and parts of counties in 1560-79, representing 30 percent of the population of England, county level estimates of the shares of wills listing occupations in farming and fishing. The sample includes parts of south London, so it will capture hopefully a representative sample of the effects on occupational shares of the growth of London. The details of how this was done are given in the appendix. Because ecclesiastical jurisdictions crossed county boundaries, in some cases were only have data for part of the county in 1560-79 (Cambridge, Dorset, Gloucester, Hertford, Kent, Norfolk, Warwickshire). In these cases were compare the occupation shares in 1560-79 with the share of the equivalent parishes later. Figure 11 shows the distribution of these counties across England.

The farm share estimates for 1560-79 are shown in table 5. Column 3 reports the farming share in these counties in 1652-60. Column 5 shows the same raw estimated farm share for 1560-79 for these counties, and column 4 the number of observations 1560-79. There is no shortage of observations on which to make this estimate: 15,768 occupation statements. Based on the raw numbers the same share of the population was employed in farming in 1560-79 as in 1652-60 in the sample counties. The implied national population share in farming would be 59.3 percent in 1560-79 the same as in 1652-60.

However an average of 6.5 percent of men report clerical occupations in 1560-79, nearly double the 3.6 percent clergy for these same counties in 1652-60. Some of this higher share may reflect occupational realities in the mid sixteenth century. The extensive holding of religious institutions were seized by the crown only in 1536-9, with many monks and priests pensioned off, and there may have been a higher fraction of men dying 1560-79 who were clergy. But some may reflect either a higher likelihood of clergy being attributed an occupation in earlier years, when few men had an occupation attributed to them, or a higher likelihood of clergy having wills proved in church courts.

To control for possible overrepresentation of clergy in the early years the the last column of the table reports for each county in 1560-79 the share in farming, making the share of clergy in 1560-79 the same as that for the same county in 1652-60. In this case the estimated share in farming in 1560-79 in the sample counties becomes 66 percent, and the implied national share in farming in 1560-79 is 61 percent. Thus we can conclude that the

Figure 11: The Sample Counties in England, 1560-79

<u>Note</u>: Lighter shaded counties are those where only some part of the county was included.

national share of employment in farming in 1560-79 was, at 59-61 percent, little more than in 1652-60.[15]

Figure 11 shows the estimated share in farming in counties in 1560-79 versus the share in 1652-60. As can be seen there is a close relationship between the shares in these two periods (the correlation coefficient is 0.7). Also shown is the 45° line, where the shares are the same in both periods. Most counties are very close to this line.

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[15] One other issue is that Cheshire, with a very small amount of data is the one county that shows a significantly lower farm share in 1550-89. Excluding Cheshire the farm share in 1560-79 is estimated at 62 percent.

Table 5: Fraction Farming and Fishing by County, 1560-79

County	Houses 1689	Share in farming 1652-60	1560-79 Wills (Number)	1560-79 Farm share (raw)	1560-79 Farm share (adjusted)
Buckingham	18,390	0.72	612	0.74	0.75
Cambridge[a]	17,347	0.75	2,588	0.74	0.78
Cheshire	24,054	0.78	92	0.53	0.60
Dorset[b]	-	0.54	228	0.62	0.58
Essex	34,819	0.60	1,266	0.66	0.65
Gloucester[c]	26,764	0.68	1,425	0.68	0.70
Hampshire	26,851	0.61	1,252	0.64	0.65
Hertford[d]	-	0.61	179	0.64	0.64
Kent[e]	39,242	0.59	1,096	0.58	0.62
Norfolk[f]	47,180	0.70	1,201	0.70	0.74
Suffolk	34,422	0.58	2,207	0.57	0.59
Surrey	34,218	0.44	599	0.46	0.46
Sussex	21,537	0.73	826	0.67	0.70
Warwick[g]	-	0.64	174	0.66	0.70
Wiltshire	27,093	0.64	978	0.71	0.72
Worcester	20,634	0.66	902	0.66	0.70
All	362,551	0.642	15,768	0.642	0.663
National Average	-	0.593	-	0.593	0.612

Notes: [a]Part of the county, 1551-1600. [b]Part of the county, 1550-89. [c]Excluding Bristol. [d]Part of the county, 1550-89. [e]East Kent. [f]Norfolk Deanery. [g]Parishes in the Worcester diocese, 1550-89. The farm share in 1652-60 is calculated for the same parishes as earlier in all cases.

Figure 12: Farm Shares 1560-79 versus 1652-60
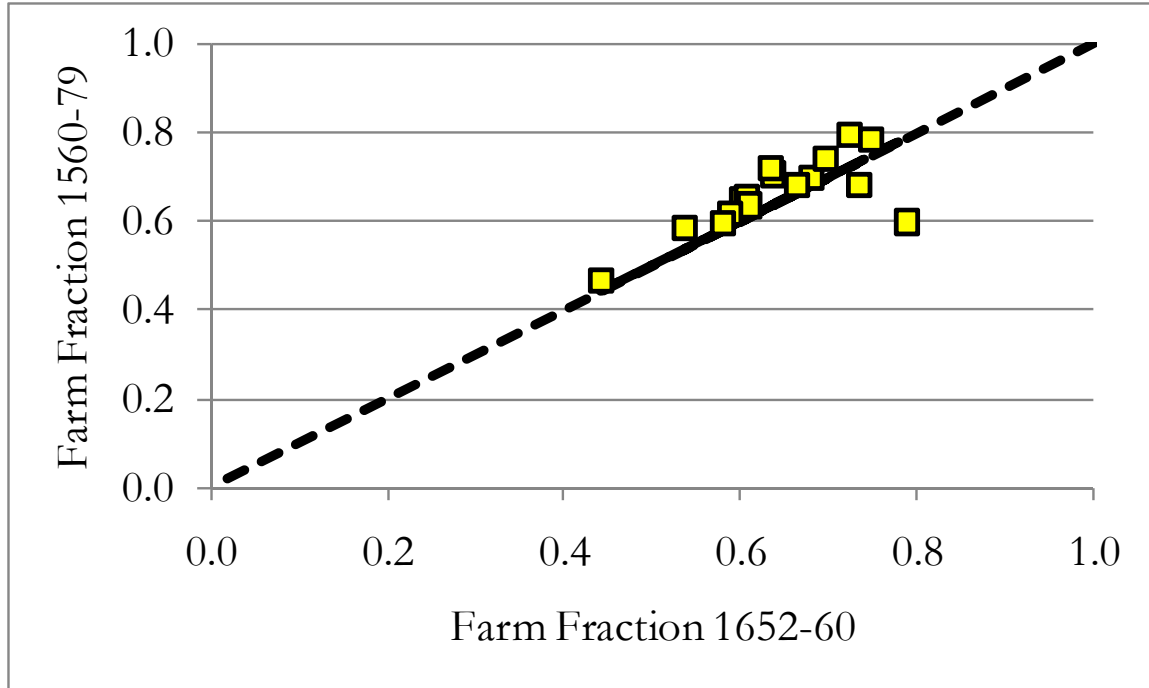
Though we lack information on any county in the north other than Cheshire in 1560-79, this will not likely bias our estimated farm share then, since by 1652-60 the farm share in the north was still higher than in England as a whole. The north became heavily involved in manufacturing only after 1660.

National Farm Share, 1817

Wrigley and Shaw-Taylor report the primary share in 1817, based on a sample of occupation reports from 300 parishes, as 42 percent (Wrigley and Shaw-Taylor, 2008).[16] However, by 1817 imports to England of food and raw materials had become significant. To calculate the *effective* primary share, the share we would observe in the absence of such imports, we need to estimate net imports of food and raw materials as a share of national income.

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[16] The primary share includes about 2 percent of the population engaged in coal mining. But since the energy from coal was a substitute for the energy produced in agriculture in the pre-industrial world, this is counted here.

Imports into Britain (England, Wales and Scotland) 1814-16 of food and raw materials averaged £46.6 million (Davis, 1979). The raw material content of exports (cottons, woolens, and coal) averaged £15.8 million, leaving a net import of £30.8 million. How should we divide these net raw material imports between England, Wales and Scotland? England's share of population in Britain was 84 percent, which would imply £26.6 million in imports. However, Wales and Scotland were much less densely populated relative to their land areas, and themselves exported farm produce and raw materials to England. So we assume here all these raw material imports went to England. National income in England 1814-6 averaged £324 million, making net raw material imports 10 percent of national income in these years (Clark, 2010, 95). This would make the effective primary share in 1817 52 percent of the work force.

Back in 1560-79, England was on balance a raw material exporter. Its principle export was woolen cloth, which incorporated domestically grown wool. It's typical export of wool in this cloth was 28,000 sacks, equivalent to 1 million lbs of wool, worth £0.25 million, about 1 percent of English income then (Rorke, 2006, 275, figure 3). The mining share at this date was negligibly small, making the *effective* primary share 0.59-0.60. For 1652-60 we assume a net raw materials inflow of zero. There were still substantial woolen cloth exports, but by this date there were also substantial imports of tropical foodstuffs such as sugar.

Table 6 shows the raw primary sector shares in 1560-79, 1652-60, and 1817, and the shares corrected for net raw material imports. The implied relative incomes per person based on equation (5) are shown, with incomes predicted to have risen 25 percent between 1560 and 1817 as a consequence of the decline in the effective primary share from 60 percent to 52 percent. In the last column are shown the calculations of income per person from Clark (2010). The very modest income gain suggested there of 25 percent between 1560-79 and 1815-19 is entirely consistent with the shares in the primary sector.

Possible Biases

Are there biases in the will occupation statements that might lead to them giving the wrong impression of levels of farm employment in 1560 and 1650? One issue is that most of the wills give only one occupation per testator, while many men in the pre-industrial world may have had two or more occupations – weaver and farmer, for example. In a sample of 5,000 wills from Suffolk, Essex and Surrey pre 1650 21 percent of farmers, for

Table 6: Farm Shares in Employment and Incomes, 1560-1817

Date	Primary Share	Net Import Share	Effective Primary Share	Implied Relative Income	Relative Income (Clark, 2010)
1560-79	0.61	-0.01	0.60	1.00	1.00
1652-60	**0.59**	**0.00**	**0.59**	**1.05**	**0.97**
1817	0.42	0.10	0.52	1.25	1.26

example, left cattle in their wills. But 8 percent of craftsmen – carpenters, smiths, etc. – also left cattle. So a significant fraction of craftsmen engaged in some farming on the side. But while this adds noise to the estimates of the fraction engaged in farming, but there is no reason to expect that it would bias estimates against farm occupations. For just as craftsmen engaged in some farming, so did early farmers engage also in some construction, manufacturing, service and trade. Farm households, for example, routinely engaged in the production of homespun cloth, in shoes, and in wooden objects.

Suppose the distribution of the fraction of time spent on farm and non-farm work across the population was as in figure 13. The fraction of the population who spend the majority of their time in farming is 0.6, but on either side of that share there are many people who split their time between both sectors. However, if we exactly calculate the share of time that the average person spends in farming it is also 0.6. The only way in which making the split at the point where people's time switches towards more than 0.5 in agriculture would underestimate the share in farming would be if people who spend most of their time in non-farming pursuits engaged in more farm activities than the corresponding people who were mainly in farming. There is no evidence that this was ever the case.

A second issue is the substantial numbers of will makers who instead of an occupation were described as "gentleman" or "esquire". In Suffolk 1600-1702, for example, 9 percent of men beyond those with a specific occupation are described only by honorifics such as "gentleman" or "esquire". If these men were really just high class farmers, then we would underestimate the share in farming. However, if that was the case, then "gentlemen" should appear more frequently per head of the population in the most rural areas. Figure 14 shows the distribution of testators described only as "gentleman" or the like compared with the distribution of hearths by parish hearth density for Suffolk 1600-1702. The distributions are very similar, with just a slight bias in favor of rural locations. Gentlemen as a group were not just high status farmers.

The final issue is the effect of the omission of women. Women were not included in the wills sample, since occupations are rarely recorded, and the most common one recorded "spinster" is ambiguous between being an occupation and a statement about marital status. Could this omission bias the estimated occupational shares against farming? Here we have to be clear that we are using the occupations of male testators, mainly richer men and property owners, as an index of the location of economic activity. The idea is that there will be as many workers, both men and women, associated with each of these property owners in both the farm and non-farm sectors. Thus though women are not directly included, the index we use implicitly is counting all workers in each sector. The test of the reasonableness of this assumption, as described above, is that these occupation reports are proportionate to populations.

Rural Occupations

Since even in rural parishes in pre-industrial England less than 70 percent of male testators were typically employed in farming, what other occupations were appearing in the countryside? Looking at parishes with less than 0.3 hearths per acre in Suffolk in 1675, for the years 1600-1702 the main occupations were as follows: farming and fishing, 0.666, clothing production and distribution, 0.128, clergy, 0.049, food production and distribution, 0.046, building trades, 0.036, transport, 0.027, and metalworking, 0.019. Rural pre-industrial England thus had both significant manufacturing activity, but also trade and transport.

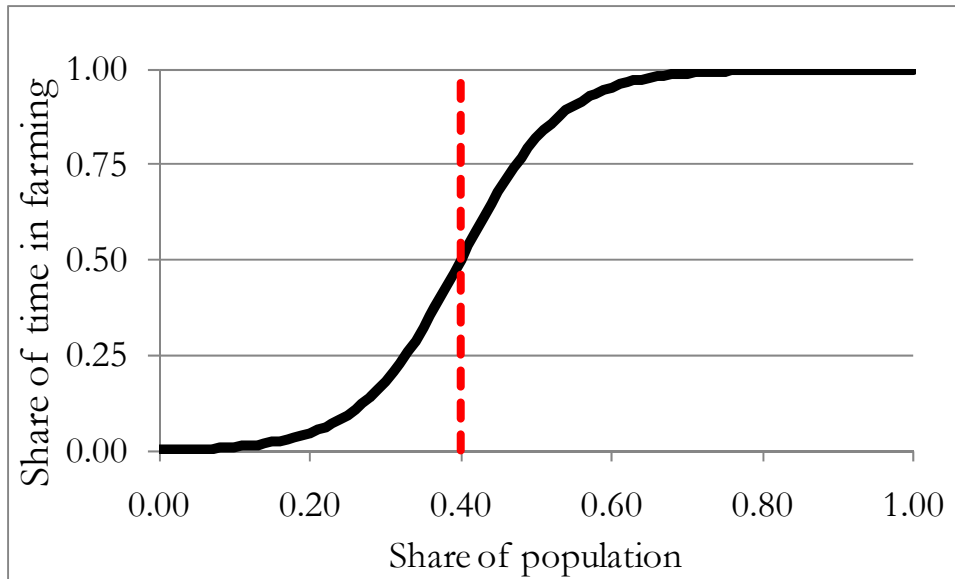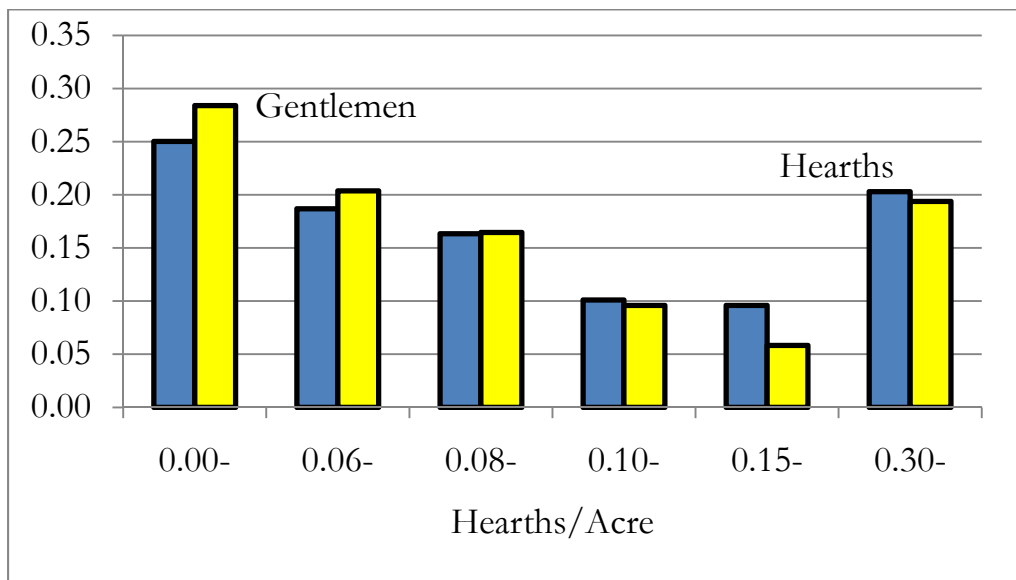**Figure 13: The Estimated Share in Farming with Mixed Occupations**

Figure 14: Distribution of "gentlemen" versus Hearths, Suffolk, 1600-1702

Conclusion

The apparent contradiction between wage and income estimates for England and the urbanization record is resolved once we get detailed information on the economic activity of men in England from wills. These show that a large fraction of rural workers, more than a third, in the years before 1700 were engaged in non-farm activities. Urbanization consequently is not a good guide to the division of the population between farm and non-farm employments in pre-industrial England. It may fail also in the rest of pre-industrial Europe.

The evidence assembled here suggests that in both 1560-79 and 1652-60 *effectively* only about 60 percent of the population in England engaged in farming, fishing or mining. The estimated real income based on modern farm shares would be $2,107 per person in 2007 (in 2005 $). This would make England in 1560 richer than at least 25 countries in Africa. It was more than three times as rich as such countries as Burundi ($645), and more than twice as rich as such countries as Tanzania ($894), Madagascar ($859), and Niger ($824). England then would have an income similar to Uzbekistan, Nicaragua, and Bangladesh in 2007.

Appendix 1: Assignment of Occupations to Sectors.

Farming/Fishing: Brander, Castrator, Dredger, Drover, Farmer, Farrier, Fisher, Fisherman, Gamekeeper, Gardener, Grain Picker, Grazier, Groom, Harvest Man, Hayman, Herdsman, Hop Man, Husbandman, Laborer (outside the most urban parishes), Marshman, Nurseryman, Oyster Dredger, Scavelman, Seedsman, Sheepman, Shepherd, Warner, Warrener, Veterinary Surgeon, Yeoman.

Clothing/Fabrics/Shoes: Bagmaker, Barker, Baymaker, Bed Weaver, Bleacher, Bodice Maker, Braider Embroiderer, Broadcloth Weaver, Button Maker, Capper, Card Maker, Chaloner, Clog Maker, Cloth Maker, Cloth Weaver, Cloth Worker, Clothier, Clothman, Cobbler, Collar Maker, Comb Maker, Comber, Cord Maker, Cord Winder, Cordiner, Cordwainer, Coverlet Maker, Coverlet Weaver, Currier, Dornick Weaver, Draper, Drawer, Dyer, Feather Bed Driver, Fellmonger, Felt Maker, Fuller, Fustian Maker, Fustian Weaver, Glover, Haberdasher, Hair Maker, Hair Weaver, Hatter, Hosier, Leather Currier, Leather Dresser, Leather Worker, Linen Bleacher, Linen Draper, Linen Weaver, Liner, Lining Weaver, Lister, Mercer, Merchant Tailor, Milliner, Milner, Pinner, Point Maker, Poldavis Weaver, Quilt Weaver, Reed Maker, Sackcloth Weaver, Sacking Weaver, Say Maker, Say Scourer, Say Weaver, Say Worker, Sere Maker, Sewing Man, Shearer, Shearman, Shoemaker, Silk Weaver, Skinner, Spindle Maker, Spur Maker, Spurrier, Stapler, Stay Maker, Stuff Weaver, Tailor, Tanner, Twill Weaver, Water Glover, Weaver, Webster, Whitener, Woollen Draper, Wool Chapman, Wool Comber, Wool Man, Woollen Weaver, Wool Stapler, Worsted Weaver, Yarn Man.

Church: Archdeacon, Bachelor of Divinity, Bishop, Canon, Chaplain, Church Clerk, Cleric, Clerk, Curate, Doctor of Divinity, Hermit, Minister, Organist, Parish Clerk, Parson, Pastor, Preacher, Priest, Professor of Divinity, Professor of Theology, Rector, Sexton, Sub-dean, Treasurer of Saint Paul's London, Vicar.

Food/Lodging: Alehouse Keeper, Baker, Beer Brewer, Bocher, Brewer, Bucher, Butcher, Cheese Factor, Cheesemonger, Cook, Corn Merchant, Costermonger, Distiller, Eelmonger, Fishmonger, Gingerbread Maker, Grocer, Inn Holder, Innkeeper, Malt Grinder, Malster, Maltster, Mill Hand, Miller, Oatmeal Maker, Oatmeal Man, Poulterer, Salt Refiner, Salter, Saltfiner, Slaughterman, Spicer, Victualler, Vintner, Viteler, Water Distiller.

Construction/Housing: Architect, Brick Burner, Brick Maker, Brick Layer, Brick Striker, Builder, Carpenter, Carver, Dauber, Freemason, Furbisher, Gilder, Glasswright, Glazier,

Hardware Man, House Carpenter, Housewright, Joiner, Lime Burner, Locksmith, Mason, Pailmaker, Painter, Paviour, Pipe Maker, Plasterer, Plumber, Pump Maker, Reed Layer, Reeder, Rough Mason, Sawyer, Stone Mason, Thatcher, Tiler, Timber Man, Timber Master, Timber Merchant, Timber Sawyer, Well Beater, Wright.

Transport: Anchorsmith, Boatman, Boatwright, Carrier, Carter, Cartwright, Coachman, Ferryman, Harness Maker, Keelman, Mariner, Mate, Portman, Saddler, Sail Sewer, Sailmaker, Sailor, Seafarer, Seaman, Ship Carpenter, Shipmaster, Shipwright, Skepmaker, Waterman, Wheeler, Wheelwright.

Metals: Armourer, Bell Founder, Blacksmith, Bladesmith, Copper Smith, Cutler, Edge Tool Smith**,** Goldsmith, Gun Maker, Gun Smith, Gunlock Maker, Ironmonger**,** Metalman**,** Nailman**,** Pewterer**,** Silversmith**,** Smith**,** Whitesmith, Wire Drawer.

Appendix 2: Will Courts and Representative Will Samples

Prior to 1858, wills were proved in one of a hierarchy of ecclesiastical courts. Parishes were grouped into archdeaconries, and a set of archdeaconries in turn formed a diocese. Each diocese belonged to the ecclesiastical province of York or of Canterbury. If a testator's property lay wholly within one archdeaconry, the will was proved in the archdeacon's court. But if property worth at least £5 were owned elsewhere in the diocese, the will would be proved in the bishop's court (the Commissary Court). If, however, £5 or more of property was owned in more than one diocese, the will would be proved in one of the two archbishops' prerogative courts. Unless the properties were all within the province of York, the will would be proved in Canterbury (PCC). In addition to this ecclesiastical court hierarchy, some parishes, called "peculiars" were situated in one archdeaconry or diocese, but subject to the jurisdiction of another court. If a person held property only in a peculiar parish, the will would be proved in the peculiar court of that parish. The peculiar court could be that of an archdeaconry, a diocese, the Dean and Chapter of a cathedral, or a local lord of the manor.

Table A.1 shows the available data from the various courts for Essex, 1540-1858, giving the various will courts that covered Essex, and the numbers of surviving wills that recorded occupations. For each period we get samples from each level of court, though the archdeaconry level courts are underrepresented 1540-1620, and the bishop's court

Table A.1: The Main Probate Courts of Essex 1540-1858

Court Type	Court	Years Available	No of wills with occupations
Archdeaconry	Archdeaconry of Essex	1540-1858	6,910
	Archdeaconry of Colchester	1540-1858	7,430
	Archdeaconry of Middlesex	1605-1858	2,577
Peculiars	Bocking	1627-1858	461
	Writtle with Roxwell	1618-1858	383
	Good Easter	1615-1858	37
	The Sokens	1675-1858	21
Bishop	Bishop of London	1540-1823*	16,787
Archbishop	Prerogative Court, Archbishop of Canterbury	1540-1858	12,000

Note: *The wills in this source are not indexed individually after 1823.

Table A.2: Essex wills with a statement of occupation

Period	Archdeacon	Bishop	Archbishop	All Wills
1540-59	210	663	82	955
1560-79	457	636	174	1,267
1580-99	1,295	1,537	295	3,127
1600-19	1,802	2,252	438	4,492
1620-39	2,135	1,694	414	4,243
1640-59	871	556	1,636	3,063
1660-79	1,767	1,391	488	3,646
1680-99	1,534	1,165	378	3,077
1700-19	1,271	1,143	387	2,801
1720-39	1,399	1,324	483	3,206
1740-59	1,067	1,026	616	2,709
1760-79	1,053	1,199	1,047	3,299
1780-99	837	954	1,146	2,937
1800-19	868	986	1,365	3,219
1820-39	817	185	1,476	2,478
1840-58	647	284	1,528	2,459

occupations are missing for most of 1823-1858.[17]   But we can reweight to cover these omissions. Table A.2 shows the numbers of wills with occupations, 1540-1858, by twenty year periods.

The wills filed in each of the three main court levels had different occupational characteristics. The higher the level of the court a will was filed in, the more urban was the location likely to be, and the less frequent was farming as an occupation for any given location. Figure A.1, for example, shows the distribution of wills in Suffolk across parishes of different population densities (as measured by hearths per acre in 1674) compared to the distribution of the population as a whole. Archdeaconry wills occur relatively more frequently than the population as a whole in the most rural parishes, PCC wills are relatively much more frequent in the most urban parishes.

Even once we control for the "urbanness" of place of residence, wills proved in higher level courts less likely to record farm occupations. Table A.3 shows this for Suffolk. In the most rural parishes, for example, in the seventeenth century 77 percent of locally proved wills were of those engaged in farming, compared to only 59 percent for the PCC wills. This implies that to get an estimate of a representative share of the workforce engaged in farming we need from each county a proportionate sample from all three levels of the ecclesiastical courts: archdeaconry, commissary and PCC.

The Suffolk data shows that in the years 1652-1660 when all wills were proved in the London court (and the records later added to the PCC), this does provide such a representative sample. In table A.3 the London court wills, in both their distribution between urban and rural parishes, and in their share in farming controlling for the degree of urbanization, look like the wills of Suffolk in general 1600-51 and 1661-1702. This suggests that for the years 1652-1660 we can get from the PCC will index an estimate of the share of the English population as a whole engaged in farming and fishing across all counties.

In forming the will estimate for each county 1560-79 we have thus reweighted the number of observations from the archdeaconry or bishop's courts where we are missing observations from some of these courts.   Table A.4 summarizes the numbers of observations from each court in each county 1560-79.

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[17] The wills are in Essex record office, but are not catalogued individually.

Figure A.1: Distribution of PCC and Archdeaconry wills, Suffolk, 1600-1702
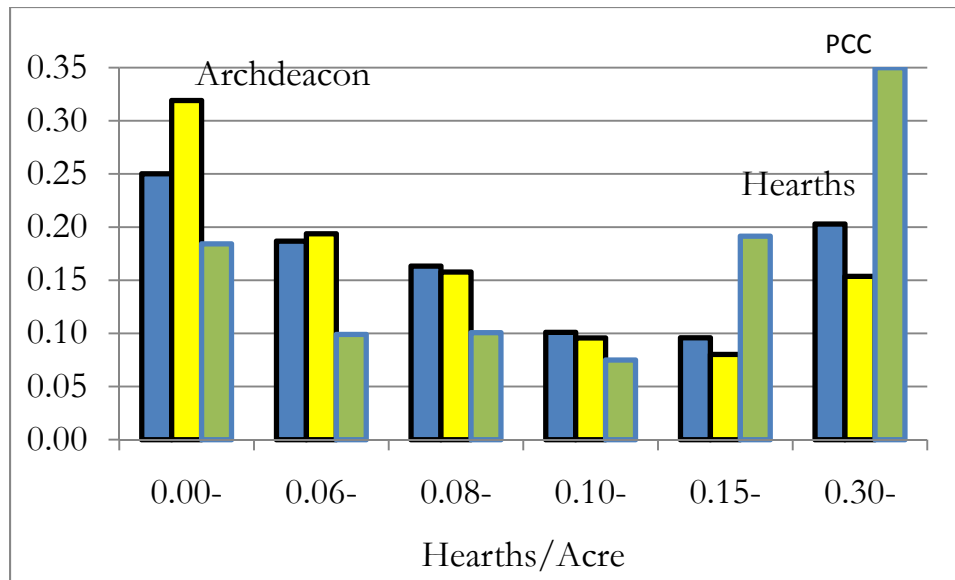
Note: PCC wills for 1600-1651, 1661-1702.

Table A.3: Farming Share in Suffolk Wills from different sources

Hearths per acre, 1674	Farming Share All Wills 1600-1702	Farming Share Archdeacon 1600-51, 1661-1702	Farming Share Bishop 1600-51, 1661-1702	Farming Share PCC 1600-51, 1661-1702	Farming Share PCC 1652-1660
0.00-0.06	0.75	0.77	0.60	0.59	0.77
0.06-0.08	0.72	0.75	0.61	0.54	0.78
0.08-0.10	0.68	0.69	0.64	0.54	0.71
0.10-0.15	0.57	0.57	0.61	0.36	0.67
0.15-0.30	0.32	0.36	0.42	0.15	0.28
0.30+	0.16	0.17	0.25	0.09	0.15
All	0.58	0.61	0.56	0.30	0.58

Table A.4: Sources by County, 1560-79

County	Archdeaconry	Archdeaconry (reweighted)	Bishop	PCC
Buckingham			571[*]	41
Cambridge[a]	247	247	2,161[*]	180
Cheshire			86[*]	6
Dorset[b]			133[*]	95
Essex	457	457	636	173
Gloucester[c]			1,244[*]	181
Hampshire			1,202[*]	50
Hertford[d]	-	-	141	38
Kent[e]	763	872	277	56
Norfolk[f]	772	772	393	146
Suffolk	1,695	1,695	305	207
Surrey			482[*]	117
Sussex			724[*]	102
Warwick[g]			153[*]	21
Wiltshire			849[*]	129
Worcester			747[*]	46
All	3,943		10,816	1,607

Notes: [a]Parishes from the Ely and Norwich dioceses, 1551-1600. [b]Parishes in the Salisbury diocese, 1550-89. [c]Excluding Bristol.   [d]Parishes in the London diocese, 1550-89. [e]East Kent. [f]Norfolk Deanery. [g]Parishes in the Worcester diocese, 1550-89. *Both archdeaconry and commissary courts. The farm share in 1652-60 is calculated for the same parishes as earlier in all cases.

The sources of the local will occupations for each county before 1600 were -

Buckingham:
https://apps2.buckscc.gov.uk/ecommerce/WillsExternal/WillsExternalSearch.aspx
Cambridge: Evans, 2000. Serjeant and Serjeant, 1984.
Cheshire: http://apps.cheshirewestandchester.gov.uk/RecordOfficeWillEpayments/search.aspx
Dorset: **http://history.wiltshire.gov.uk/heritage/index.php**

Essex: http://seax.essexcc.gov.uk/

Gloucester: http://ww3.gloucestershire.gov.uk/genealogy/Search.aspx

Hampshire: **http://calm.hants.gov.uk/DServe/Advsearch.htm**

Hertfordshire: http://seax.essexcc.gov.uk/

Kent: Fry, 1940. Ridge, 1940.

Norfolk:

http://nrocat.norfolk.gov.uk/Dserve/public/searches/nroprobate.htm

Suffolk: Serjeant and Serjeant, 1979, 1984.

http://nrocat.norfolk.gov.uk/Dserve/public/searches/nroprobate.htm

Surrey: Webb, 1996-2004.

Sussex: Fry, 1940. Hall, 1901.

Warwickshire: Fry, 1904.

Wiltshire: **http://history.wiltshire.gov.uk/heritage/index.php**

Worcestershire: Fry, 1904.

The source of PCC will occupations in all periods was
http://www.nationalarchives.gov.uk/documentsonline/wills.asp

Other Online Data:

International Labour Organization: http://laborsta.ilo.org/STP/guest

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