Puncturing the Malthus Delusion: Structural change in the British economy before the industrial revolution, 1500-1800

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Abstract

Accounts of structural change in the pre-modern British economy vary substantially. We present the first time series of male labour sectoral shares before 1800, using a large sample of probate and apprenticeship data to produce national and county-level estimates. England experienced a rapid decline in the agricultural share between the early seventeenth and the beginning of the eighteenth centuries, associated with rising agricultural and especially industrial productivity; Wales saw only limited changes. Our results provide further evidence of early structural change, highlighting the significance of the mid-seventeenth century as a turning point in English economic development.

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How can we resolve the puzzle of what happened to the occupational structure of Britain between the start of the sixteenth and the end of the eighteenth centuries? Few gaps in historical understanding can be so large and portend so much for our understanding of the timing and speed of changes in the British economy before the industrial revolution. Our current stock of knowledge consists of two estimates (drawn from the same source) for the 1520s, one estimate for the 1570s, one for the 1650s, several for 1688 (all from the same source), and one for the 1710s. This may appear as an excess of riches compared to the dearth of information in some countries. Certainly it is a large step from the view taken by Deane and Cole that any such attempts were likely impossible due to the lack of evidence (Deane & Cole 1962). But several of these estimates are sufficiently different from each other that they suggest mutually irreconcilable accounts of economic change. Those for the 1570s and 1660s have been used by Greg Clark et al (2012) to argue for the view that Britain experienced no significant economic growth in this period. While Steve Broadberry et al (2013, 2015) use evidence from the 1520s, 1688 and later to argue that these estimates reveal exactly the opposite: significant structural change and productivity growth.

Unsurprisingly, the differences between these estimates are related to the varied sources each author has relied upon. Clark et al's analysis uses evidence drawn from probate records –wills and related documents - that appear to show a stable share of the workforce employed in agriculture in the sixteenth and seventeenth centuries. Their two samples for the 1570s and 1650s both show that the share in agriculture in England hovered around 60 percent. Clark et al highlights that England has a relatively high share of its workforce outside agriculture from a relatively early period, reflecting a relatively wealthy economy in premodern terms. However, the probate evidence, they conclude, supports Clark's (2007) view that there is "little sign" of economic growth between 1400 and 1800 (Clark et al 2012: 387).

Quite different conclusions emerge from the other sources that have been explored to date. Leigh Shaw-Taylor and E. A. Wrigley (2014) use information from baptism registers surviving from around 1710 to construct an estimate of 43 percent of males in agriculture, well below Clark's estimate for the 1650s, that they suggest implies a large and early shift out of agriculture into services and industry. Broadberry et al generated an alternative set of labour force shares for 1522 (using Muster Rolls) and *c.*1700 (using King's 1688 social table). Rather than stability, they identified a fall in the share of the male labour force in

agriculture from 68 percent in 1522 to 46 percent circa 1700. Their figure for 1700 is, it is worth noting, somewhat lower than the 55.6 percent in agriculture that Crafts estimated using the Lindert and Williamson's revisions to the same source largely because of a different, and likely more accurate, distribution of labourers (Crafts 1985: 13-15; Lindert & Williamson 1983). Broadberry et al's further estimates for 1759 and 1801 suggest that this decline continued across the eighteenth century. Their conclusion is, predictably, the opposite of Clark et al's. Instead of stagnation, they conclude that the "the critical occupational migration from agriculture to industry commenced some time after 1522 and had already made significant progress by 1700." This was "consistent with considerable dynamism and growth from the sixteenth century to the point in the nineteenth century when modern economic growth began" (Broadberry et al 2013: 26).

In this paper, we show that the apparent conflict between the sectoral estimates that these different researchers have reached is in fact illusory. Using a new, larger and more representative sample of probate records, we find a pattern of structural change that is consistent with *all* existing estimates, once they are appropriately adjusted. We introduce another new and large source on occupational structure, the occupations of London apprentices' fathers, to benchmark our probate dataset, and show that both sources are broadly consistent with each other. The English economy saw rapid and significant structural change during the seventeenth century. A high share of the male workforce was in agriculture until the late sixteenth century. Movement out of agriculture is visible from c. 1600, and accelerated from before the middle of the seventeenth century. The Welsh economy is largely stable over the same period.

SOURCES FOR OCCUPATIONS: PROBATES

It is a long-established truism that probate records are a complicated and difficult source to use (Lindert 1981; Goose and Evans 2000). Although abundant, they are affected by serious biases in coverage. Probate was a system focused on property, and this meant that women and dependent males (especially young adults who might still be legal minors) are seriously under-represented. Men with property, particularly capital goods, are significantly over-represented (Keibek and Shaw-Taylor 2013). Those women who do appear are largely widows, and are identified by their status, not their occupation. Poorer

men appear with quite different degrees of frequency, in part depending on how energetic the local court might be – court officials took fees for registering wills which varied in proportion to the value of the estate (Evans and Goose, 2000; 21 Henry VIII, c.5).

Research into probate is also afflicted by practical problems. The probate system was set up in a complicated manner. England and Wales were divided into multiple jurisdictions. Each area would generally be covered by three levels of church court. The court used for an individual's will depended upon the value of the their estate and the number of jurisdictions in which they possessed property. At the top, two provincial courts, the Prerogative Court of Canterbury and the Prerogative Court of York dealt with the Southern and Northern parts of England respectively. Beneath them, courts fragmented over counties, parishes and hundreds of small 'peculiar' jurisdictions. For the researcher, one direct effect is that the probate records for a county are usually scattered across multiple archives with no single index. Another even more concerning consequence is that the volume of probate records that was generated was shaped by institutional factors, such as differences in record keeping and enthusiasm for use of the courts, as well as the proportion of estates that met the legal criteria for probate. The share of deaths generating a probate record changes over time as a result of this, trending down in England and up in Wales (figure 1). The decline in use of the probate system during the interregnum, when it was centralised to London, emphasizes the role of proximity of a court in influencing whether or not probate carried out (Kitching, 1976).

Figure 1: Share of Male Deaths in the Probate Dataset
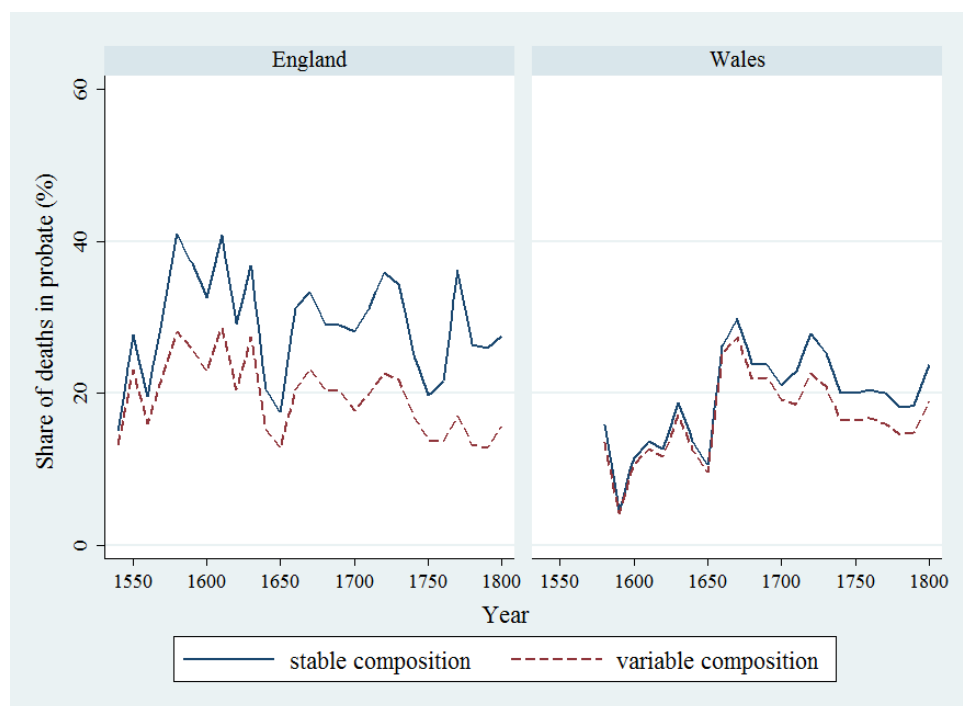
Note: The figure reports estimates by decade of the share of male deceased appearing in the probate record. We used Clark's method to estimate male deaths per decade (see Clark 2012: 368). We present two estimates: the stable composition sample holds the counties in the sample constant between 1550 and 1750 for England (n=13) and 1590 and 1750 for Wales (n=11); the variable composition sample includes all counties for which we have a count of wills across three jurisdictions in a particular decade.

Our dataset of probate records is designed to ameliorate the effect of these practical problems. In our analysis, we include a county if it meets three criteria. First, we possess probate records for over 75 percent of the county's geographical area for each of the three levels of probate jurisdiction (archdeaconry or equivalent, consistory and prerogative court).[1] Second, wills survive for more than ten percent of male deaths. Third, an occupation is reported for more than ten percent of male probate records. For the most part, reporting rates are well above this bar: mostly, we know the occupations for over half of male probate records for a county. However, for a few counties in the sixteenth century, occupational

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[1] Our dataset is summarized in Appendix 1. The dataset was largely created using OCR software and then cleaning and structuring the data. The conversion process generates losses at two points. First, the scanning and conversion may fail to recognise a line of text. Second, the text may be converted incorrectly. Both types of loss are digital versions of the usual problems we face with historical records: gaps, illegibility, variant spellings. Fortunately, the effect is relatively slight, and is unlikely to bias our estimates of occupational shares.

information is scarce enough to rule them out. We code occupations using Wrigley's Primary Secondary Tertiary system (Wrigley 2004). In our core sample, we are able to code 98.2 percent of occupational labels. We identify gender based on status indicators and forenames.[2]

After applying these restrictions, our sample contains in excess of 710,000 probate records for male testators in in England between 1540 and 1799, and about 100,000 wills from Wales. We exclude the substantial share of testators is labelled with titles, such as gentleman or esquire, that indicate high socio-economic status, not occupation. Not all wills contain an occupational descriptor for the testator, and not all indexes include occupations that are reported. There is no sign or suggestion that occupations are reported selectively in a way that will bias our results, however.[3] The share of non-elite male wills with an occupation rises from 31 percent in the 1550s to 60 percent by 1600, and exceeds 80 percent on occasion in the eighteenth century. Our final sample of male non-elite wills with a reported and matched occupation contains 684,113 observations from 23 English counties and 50,826 from 12 Welsh counties.

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[2] We allocate the small share (3.4 percent) without a gender identified through forename matching to males, as further checking indicates that individuals in this group almost all have rare variants on spellings of male forenames. Our results are robust if the sample is restricted to males only.

[3] The exception to this is the clergy, who are identifiable through titles (eg: Reverend) that are sometimes included in indexes where occupations are not otherwise reported. We avoid this by excluding samples where less than 10 percent of observations have an occupation reported.

Table 1: The Probate Dataset

Years	England			Wales		
	Obs.	Counties	Share of Male Deaths	Obs.	Counties	Share of Male Deaths
	N	N	%	N	N	%
1540-9	5,508	10	20	19		
1550-9	12,766	11	36	36		
1560-9	9,639	13	22	45		
1570-9	12,316	13	28	123	1	22
1580-9	16,110	15	31	96	2	18
1590-9	21,109	14	31	106		
1600-9	22,878	15	28	331	3	18
1610-9	31,422	17	32	525	4	20
1620-9	30,138	16	25	520	4	15
1630-9	30,269	19	30	702	7	18
1640-9	22,113	16	19	650	6	13
1650-9	35,854	15	17	794	3	11
1660-9	36,685	20	22	2,275	12	24
1670-9	33,589	20	25	2,586	12	25
1680-9	34,445	18	24	2,955	12	20
1690-9	31,329	17	24	3,321	12	19
1700-9	30,354	15	23	3,147	11	17
1710-9	29,619	14	24	3,431	12	16
1720-9	37,188	15	27	4,654	12	20
1730-9	34,367	15	25	3,993	12	19
1740-9	35,082	14	21	3,648	12	15
1750-9	24,903	12	18	2,850	12	15
1760-9	29,799	12	16	3,527	12	16
1770-9	27,163	13	17	3,300	12	15
1780-9	24,920	12	14	3,619	11	14
1790-9	24,548	12	13	3,573	12	14
Total	684,113		24	50,826		18

It is useful to briefly compare our dataset to that Clark et al used for their sectoral estimates from probate records (Clark et al 2012). There are several major differences. First, our sample is larger by an order of magnitude. Clark et al's evidence contains 16,771 records for 1560-79 and 31,400 for 1652-60. Our data includes all of Clark et al's data for the 1650s and most of it for the 1560s.[4] Any variations between our

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[4] Several of the sources Clark used are no longer available online.

results should thus not be due to us each observing different parts of the country.[5] Second, our sample covers a wider and more balanced geographical area. Clark et al's evidence for the 1560s is primarily from the south of England. Only one county is in the north, Cheshire, which supplies just 92 wills, equivalent to around two percent of male deaths in the county. As figure 2 shows, the counties in our sample cover a broad swathe of England, with both south and north captured well.

Figure 2. Map of Counties in Sample

Third, where Clark et al used two samples (1653-1660 and 1560-79) we present a continuous series that runs into the eighteenth century. Continuing past 1660 is particularly important, given that the middle of the seventeenth century is seen by some as a turning point. One might be tempted to argue that any mid-seventeenth century shift should already be visible in Clark et al's 1653-1660 sample. However, because wills are mainly generated near death, occupational estimates from probate records will lag the population as a whole. Clark's estimates suggest that the age of probate was 53 years, while the average worker would be 39 years old.[6] The 1650s estimate is effectively a sample of the occupational structure circa 1638-45.

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[5] We have re-estimated Clark's results for the 1650s and our results match closely.
[6] Clark 2012, 384.

Finally, our data share one limitation: aside from the 1650s, London is not included in our dataset. However, unlike Clark et al, we address that in our analysis.

Although our dataset covers a broader geographical sample than Clark et al, it misses some important parts of the country, notably in the midlands and Yorkshire. There is no easy way to be sure about how well our sample represents the sectoral distribution of the country as a whole. Wrigley's recently published county population estimates for 1600 onwards do suggest one rough test (Wrigley 2007, 2009). Given that population growth is likely to be concentrated in counties where economic change is occurring most rapidly, we would expect that estimates taken from our sample will underestimate sectoral change at a national level if the population of the sampled counties grows more slowly than the population of counties outside, and vice versa. For 1600 to 1700, the average growth in the population of counties in our sample was 23percent compared to 22percent for counties outside our sample. For 1700 to 1750, counties in our sample grew substantially faster than those outside the sample (18percent vs 11percent), while after 1750 counties in our sample lagged those outside (34percent vs 46percent). On this basis, we feel relatively confident about the validity of the sample for the seventeenth century, which is the period we are most concerned to address. We are less confident about its quality after 1700.

To what extent can we estimate occupational structure from the occupations reported in probate records? Probate is not a randomly generated sample, but, as we stressed above, is strongly influenced by wealth and capital-holding. Because of their bias towards the wealthy, probate records will under-represent the poor and since the extent to which they cover the population varies over time (and space) so does this bias. This impact of selection bias is most obvious in estimates of occupational shares, but trends can potentially be biased, too. On the one hand, economic growth might push the shares of individuals leaving wills up. On the other hand, institutional factors could have an opposite effect: as seen before these shares trended up in Wales, but went down in England (figure 1).

Figure 3: Notional occupational and wealth distribution
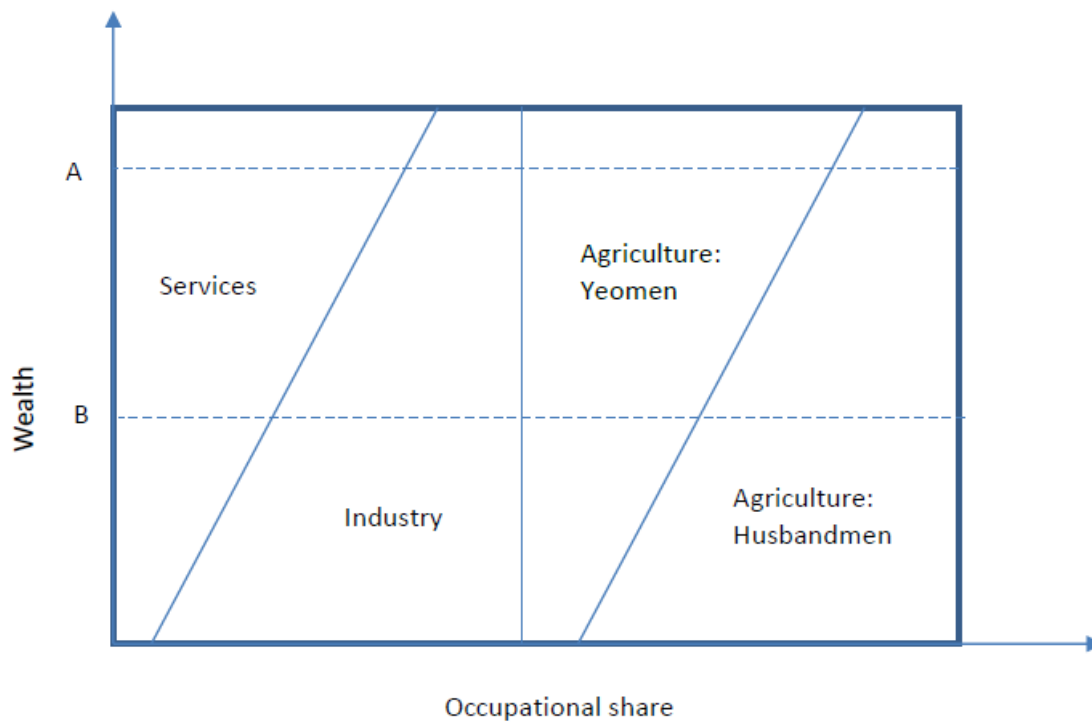
Figure 3 illustrates how the partial coverage of the probate record might lead to under and over representation of different sectors if wealth or capital are unequally distributed. It reports four stylized occupational categories: services which is on average wealthier; industry which is concentrated among the poor; and a richer and poorer part of agriculture (yeomen and husbandmen). For simplicity, we assume that probate is entirely determined by wealth. If probate only captured those with wealth above point A, then the share in services would be much greater than in industry, and agriculture would be dominated by yeomen. If probate included the much larger share of the population with wealth above point B, then the share in industry would be much larger (although still under-estimated) as would the share in agriculture from husbandmen. Moreover, if the share of deaths generating a probate record declined over time from B to A, then the occupational composition would appear to change, with a shift out of industry and into services. This would be entirely an artefact of sample composition.

It is difficult to tell a priori whether the representation of industry or agriculture will be distorted more as a result of this selection bias, but it is reasonable to assume broadly stationary and homogenous effects.

Clark et al (2012: 374) find that probates were generated roughly in proportion to the population in rural and urban areas: they only 'modestly oversample' rural areas because farming was capital intensive. Animals made up a large share of the agricultural capital stock and livestock intensity in farming remained roughly stable in early modern England (Allen 2005: 8; Broadberry 2013: 11). Implements, the other main capital component of pre-modern farming, appear to have increased significantly in importance only after 1750 (Allen 2004: 109, 2005: 8). Certainly, there were big differences in the structure of land-ownership across England (Shaw-Taylor 2012). Yet, while family farming employed fewer labourers, it was also less capital intensive and therefore less productive than capitalist farming. As for industry, it continued to be labour-intensive for most of the period under analysis: until the industrial revolution it mainly relied on hand tools and human energy (Broadberry et al 2015: 366).

There are some signs of changes in relative productivity that might undermine this assumption. In Clark's wage data, building workers' incomes start to pull away from the 1620s, and from the 1680s masons consistently earn around a fifth more than agricultural labourers. In Allen's wage data, the early seventeenth century is a period of relative prosperity for agricultural workers, and it is not until the 1680s that their earnings fall below those of building labourers. However, it is hard to imagine that a twenty percent shift in incomes, even if this mapped over onto the workforce more generally, would have a very large effect on the relative distributions of wealth and capital at death. Moreover, the extent to which these wages mirror incomes in other occupations within each sector is an open question. According to Broadberry et al's (2015: 365-7) figures between 1522 and 1801 industry's productivity growth was about the same as in services and lower than in agriculture. It is only in the nineteenth century that differences in the rates of growth across sectors grew large.

To put this in another way, probate records allow us to see just the tip of the proverbial iceberg. And as we all know, the form of the iceberg that we see tells us nothing about the shape of the part that lurks out of sight. Maybe so. But because we do know the total volume of the occupational iceberg, then we can infer something about how sectoral shares in the part 'under the waterline' would need to be changing if the overall sectoral distribution was to remain stable. What is more, because we view many different occupational icebergs across decades and counties, each floating at different levels, we can form

expectations about their overall shape. This strategy is pursued in section 5, where we econometrically estimate the effect of the share of deaths with a probate record on county-level occupational structures to construct counterfactual series, under the assumption that all male deaths were recorded. In other words, we exploit how variations in the extent to which the icebergs are visible match with variations in their visible shapes in order to figure out what the invisible parts look like. In this regard, it is important to remember that the situation is actually not as extreme as the iceberg metaphor implies: the poor are under-represented in probate, not invisible. [7]

By doing so, we only address the most obvious source of bias. There are other issues. Because death is more common among older adults, probate records are a poor source for occupations concentrated among the young. So domestic service, servants in husbandry and apprentices are all under-represented. So too, we might expect, are soldiers and sailors. Moreover, because probate records tend to report a single occupation, they fail to report by-employments. They may also under-report marginal, low status or illegal work: thieves, dung collectors and hangmen could, one might imagine, go to the grave under a more palatable job title.

Yet, the impact of these biases is likely to be relatively mild. There is no reason to believe that the sectoral distribution of workers' early years of employment changed sufficiently to affect trends over this period. Agriculture and industry both consistently employed large numbers of young workers (Kussmaul 1981; Minns & Wallis 2012; Field 2013). Neither is known to have experienced any kind of institutional or technological shock before the creation of the youth-dependent textile factories of the later eighteenth century (Honeyman 2007) that might substantially shift the age-structure of the workforce in a particular sector in a way that would bias trends from probate.

Soldiers and sailors do appear in our probate data, although they only exceed one percent of the sample for a few years during the seven years' war (1754-1763). Even then, a short period of high war-related mortality among the military largely disappears in longer-term averages. By contrast, estimates of mustered naval manpower equal roughly 3 – 5 percent of the English adult male population in the first

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[7] Sebastien Keibek is currently working on an alternative approach to identifying levels from probate data for his Cambridge PhD thesis.

half of the eighteenth century (Rodgers 2004: 636-7).[8] Most would appear in probate under whatever occupation they entered after leaving the army or navy. Mariners are a particular difficulty, as deaths at sea are often not assigned to a county in the probate record and so fall outside our sample. Nonetheless, our probate dataset does show a substantial increase in the share of the male workforce identified as mariners. They rise from around one percent of the male workforce in our sample in the early seventeenth century to four to five percent by the start of the eighteenth century.[9] The major occupations where we would expect under-representation to be an issue are concentrated in the service sector and it seems possible, even likely, that some of the growth in the size of Britain's military establishment, navy and merchant marine fleet are underplayed in our data. Aside from short periods of intense conflict, notably in the civil wars and Napoleonic wars, the impact is likely to be modest, however.

The objection that probates fail to recognise by-employments has been considered by a number of researchers. Recently, Keibek and Shaw-Taylor (2013) have shown for a sample of inventories, that the scale of by-employment has often been exaggerated. As important is the point Clark et al (2012) made that there is no reason to believe that by employment is biased towards one sector or another (so, for example, farmers were much more likely to have a by-employment in industry than weavers are to have in agriculture), or for that matter that the structure of by-employment changed over time in a way that would affect the validity of our trends.

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[8] Rogers provides annual totals for naval manpower, compared here against the English adult male population; the actual share would be lower if we knew the share recruited from outside England.

[9] In the full probate dataset of males with occupations from all locations (as many military and mariners are not identified with a country or county), just over 1 percent of deaths were in the army or navy from the 1740s onwards. Sailors are assigned to the navy where the ship is identified as naval; otherwise they are treated as merchant mariners. The naval share may be understated as a result, but as both categories fall into services there is no net effect. Mariners make up over ten percent of the workforce in some periods in the eighteenth century without restricting by jurisdiction, country or county, but this may be an overstatement as the PCC has a particular role for deaths (such as those at sea) that occur outside of other probate jurisdictions

APPRENTICES

While probate data has been used intensively for decades, apprenticeship records have not previously been used as a source on occupational structure. Their pitfalls and potential biases are many, but they can offer a useful independent alternative to probate.

Apprenticeship records offer us a viable source for adult occupations in England because of the enthusiastic way in which families across the country sent children, mainly but not always sons, to learn a trade in London (Minns & Wallis 2012). Our estimates suggest that in the order of one in ten teenage boys would make the journey to the metropolis by the late seventeenth century; the details of their contract would then be entered in the records of one of the city's guilds. One of the pieces of information that would usually be recorded was the occupation or status of their father; another was the place where the apprentice was from: the location of their family home. It is these two pieces of information that we use here. Mothers do appear, but unfortunately they are far fewer in number and are all too often simply described as widow.

The dataset we explore here includes apprenticeship records from a broad sample of London guilds. Thanks to the extraordinary industry and generosity of a few genealogists, particularly Cliff Webb, we have the records of just over 430,000 apprenticeships in London between 1550 and 1799.[10] Not all records contain a note of the father's place, and some apprentices came from Scotland, Ireland or the colonies.

There are some limits to the apprentice dataset. Before the 1590s and after the 1760s, we have too few observations for the sample to be particularly useful. Because a handful of remote English counties only sent a small number of apprentices, we restrict our sample to counties with more than ten apprentices each year for whom we are able to code their father's occupation as within agriculture, industry or services, giving us a minimum of 100 observations per decade. This avoids problematically small samples.

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[10] The majority of the dataset is described in Leunig, Minns & Wallis (2011). Additional material for the Merchant Taylors has been supplied by Michael Scott. Material for several other guilds is taken from the Records of London Livery Companies Online database (www.rollco.org), kindly supplied by the Centre for Metropolitan History.

Cornwall, Durham, Northumberland and Rutland fall out of the sample for most periods as a result, as do all Welsh counties, and we have only a few county-level observations outside the seventeenth century. We exclude the period after 1759, as there are fewer than ten counties meeting this criteria after that point.

Once these are excluded, our sample contains 304,430 apprentices known to be from England. Of these, we can identify the occupation and county for the fathers of 290,958 youths. For the seventeenth century, our detailed sample includes four to five percent of English teenage males and, most importantly, their fathers.[11]

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[11] The share of teenage males was calculated from Wrigley & Schofield's 1981 population and age structure estimates.

Table 2: The Apprentices' Fathers Dataset

Period	Observations	Guilds	Counties
	N	N	N
1590	4,361	16	22
1600	10,764	23	32
1610	17,507	26	35
1620	16,416	31	34
1630	21,405	35	34
1640	21,115	38	34
1650	27,162	42	34
1660	23,209	50	32
1670	22,727	55	34
1680	24,021	56	33
1690	22,493	62	30
1700	21,058	63	28
1710	17,576	65	24
1720	13,318	65	18
1730	10,694	64	13
1740	8,798	63	12
1750	8,334	63	11
Total	290,958		

Source: see text.
Note: The table reports a count of apprentice records where we have information on the place and occupation of the apprentice's father, and the number of guilds and counties in our analysis for each decade.

What are the limitations of this sample of fathers of London apprentices? A number leap out. Once again, we only learn about male occupations, as the information on mothers is too limited to use. Obviously, we would also expect that lifecycle occupations concentrated among the young will largely be missing. There is a wealth bias here, just as in probate. These are fathers who can afford to invest in their children's human capital. The cost of travel, clothing, and any fee (known as the 'premium') paid to the master mean that the poor are no doubt underrepresented (although some of the youths were partly funded by charity) (Minns and Wallis 2013). Given that these costs would be higher for youths coming from further afield, we might expect that the size of any wealth bias is greater for distant counties. Even more simply, these fathers were males who were able to establish and sustain families. Given that the number of surviving children was positively correlated with wealth (Clark and Hamilton 2006), is a further source of

bias towards more prosperous occupations (and some will be observed more than once, if they send several children to the city). We might also expect that the children of men working in industry or services are more likely to choose an apprenticeship in the first place. They have direct experience of this kind of work. They may have connections or resources through their family that could support them in the future.

If we compare these biases with those in the probate sample, it is obvious that several overlap. It would make little sense to suggest that the apprentices' fathers offer us a better way to generate a direct estimate of the occupational structure. Given that there is a resource barrier, we would expect that any changes in relative income and wealth inequality may all affect the internal validity of our estimates over time. The age composition of the sample, and the effects of occupational simplification (excluding by-employment etc) on coverage, both rear their heads as problems here, too.

The dataset of apprentices' fathers has two advantages, however. First, while there is a wealth bias there is no reason to anticipate any capital bias here: in fact, we would expect that there is a bias against agricultural families. Second, there is some reason to believe that our sample is drawn from a wider cross section of English society than is true for probate. While some of London's apprentices are drawn from the nation's rich, seeking lucrative careers as merchants and wholesalers, others would were training to become shoemakers, tailors and smiths. In the early eighteenth century, when we have systematic data on the amounts apprentices' families paid to masters, and the share who paid, between a third and a half of London apprentices paid no fee at all and many paid below ten pounds (Minns & Wallis 2013). Labourers are still rare though.

METHODS

For this analysis, we allocate individuals to agriculture if their occupation is coded as farming or fishing in Wrigley's PST system. Occupations coded by PST into the secondary sector are grouped under industry. Mining is allocated to industry, although it is in the primary sector in the original PST structure. Our services category contains all retailing, distribution and service sector occupations. Our agriculture category differs slightly from that used by Clark et al, but matches that employed by Broadberry et al and Shaw-Taylor.[12] We restrict our analysis to male testators. Like Clark, we allocate labourers to agriculture if they are located outside towns (defined using Langton's (2000) list).[13]

To amalgamate the individual county series of probate records into national indices for agriculture, industry and services we need to take into account three aspects of our data: the different sizes of counties in our sample; the absence of London; and the age-structure of the sampled population. To address the first issue, we weight our county sectoral data using a set of county population estimates interpolated between Wrigley's benchmark estimates from 1600 onwards, and projected back in line with national population trends before 1600. The weights adjust as relative county population shares shift over seventeenth and eighteenth centuries (although not before 1600) to reflect changes in the distribution of England's population.[14] For Wales, we interpolate linearly between Owen's county populations (Owen 1959)

The second issue needs a moment of explanation. London's growing share of the English population has a meaningful impact on the share of the workforce active outside of farming and fishing. The growth of London is one of the most dramatic developments in the English economy in this period. London exploded from around 80,000 inhabitants to around 400,000 between 1550 and 1650. In 1550, the

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[12] Several of the occupations Clark et al identify as farming and fishing are placed in other sectors under the PST system (farrier, dredger, seedsman, hop dealer, hayman, drover, groom, veterinary surgeon). One, scavelman, is uncategorised. We have tested Clark's categorisation and the results are not meaningfully different.

[13] The effect of which technique we choose to allocate labourers between sectors is relatively trivial here. Labourers only appear in small numbers. Overall, labourers supply 3.2 percent of male probates: the highest share is 5.6 percent of male probates in 1610-19. We have experimented with labourers excluded or allocated according to Broadberry et al's approach. The results are not meaningfully different.

[14] We have also explored using the constant set of population weights (based on figures for houses per county in 1689) that Clark et al used. They have no meaningful impact on our results.

metropolis contained 2.6 percent of England's population; a century later it held 7.5 percent.[15] Growth in England's other large towns meant that they also now held 0.77 percent more of the population. Almost 6 percent of the population had shifted to large urban locations where they were highly unlikely to be working in farming or fishing. Even if the share of the workforce in agriculture in rural England was constant, the shift of population into large cities would mean that the national average had declined.

To take London's growth into account in our national estimates, we calculate a weighted average of the non-London and London sectoral shares. Our population-weighted county probate series is the source for the non-London sectoral shares. Our sectoral shares for London are based on estimates from the partial probate data for Middlesex, which shows that around a third of the city's population was in industry and two-thirds in services.[16] The population estimates for London that we use in the weighted averages are linear interpolations between benchmark figures that Wrigley produced for half century intervals between 1550 and 1750 (Wrigley 1985).[17] Obviously, no adjustment is made to the Welsh data on this account.

Finally, we adjust for the age structure of our data. We do this here simply by advancing our series by two decades, so that, for example our estimate for 1620 is taken as representing the farm share in 1600. Our series should then represent the sectoral share of the averagely-aged worker.

We apply the same general approach to the apprentices' fathers dataset, weighting it by population and adjusting for age structure.[18] However, as Middlesex forms a very large part of the data, we do not need to adjust for London.

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[15] We Wrigley's estimates for the broad London population (Wrigley 1967; Harding 1990). For other cities we use De Vries 1984 and Langdon 200X. National population estimates are from Wrigley et al 1997.

[16] For simplicity, we fix the results at this level. Middlesex includes some agricultural land, but we concentrate on the London city area and exclude farming. Estimates of London's manufacturing share are similar: Alexander estimated 33 percent for the 1690s; Beier suggested 40 percent for the 1601-1700; Schwarz identifes a third for 1851(Alexander 1989: 54; Beier 1986: 150-151; Schwarz 1992: 23).

[17] If we apply the same correction to Clark et al's results, then their stable non-London farm share would conceal a gentle downward trend in the national average. Assuming the national farm share outside London was the same as they find for 1652-1660, then the national farm share declines from 0.64 in c. 1550 to 0.61 in 1650 and 0.59 in 1700 as London grows.

[18] The mean age of London apprentices' fathers when their son was bound was 52 (n=52), based on a sample of apprentice records linked to Family Reconstitution data (for the source, see Klemp et al 2013).

BASELINE RESULTS

A good introduction to the main results from our probate dataset are given in figure 4 which reports the average of the share of males in agriculture in twenty English counties at twenty year intervals between 1540 and 1799. The figure reports those series for which our data covers more than a decade or two. Recall that we are primarily interested in the trend, not the absolute level, given the problems with bias discussed above. As can be seen, in most counties the share was not stable. A downward trend after *c.*1600 is visible in most counties. Three counties in the northernmost parts of England - Cumberland, Northumberland and Westmoreland – have more stable shares in agriculture. Nonetheless, the initial impression is that Clark et al's finding of stability in farming and fishing was mistaken.

Figure 4: Share of males working in agriculture by county from probate dataset, England and Wales

A.   England

Graphs by County

B.   Wales

Graphs by County
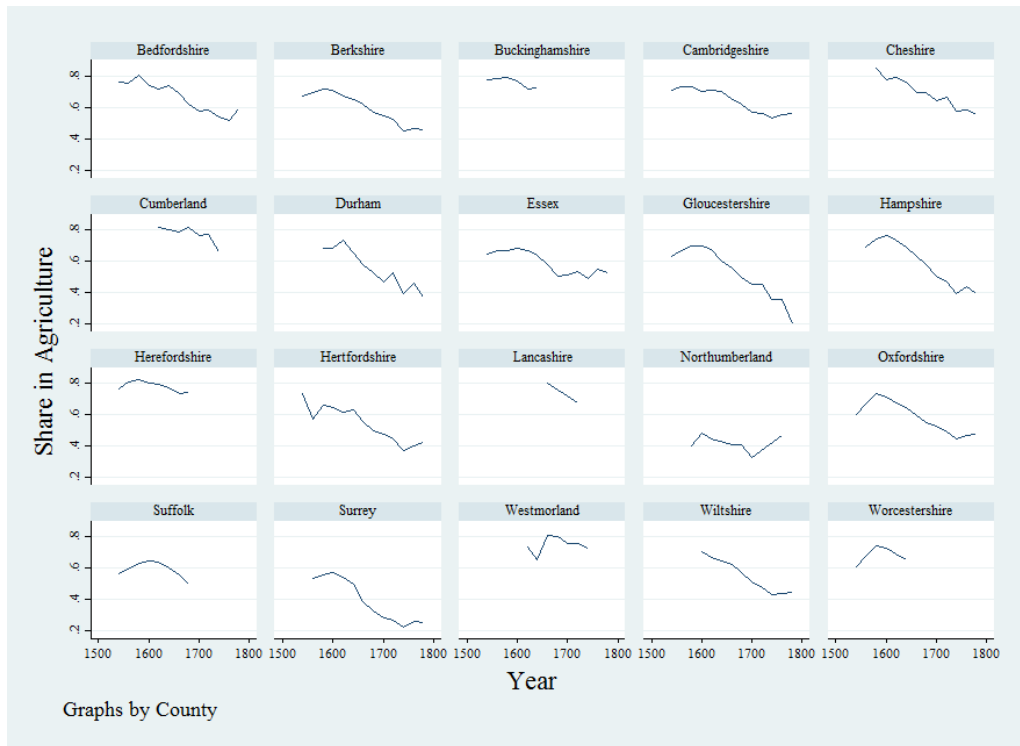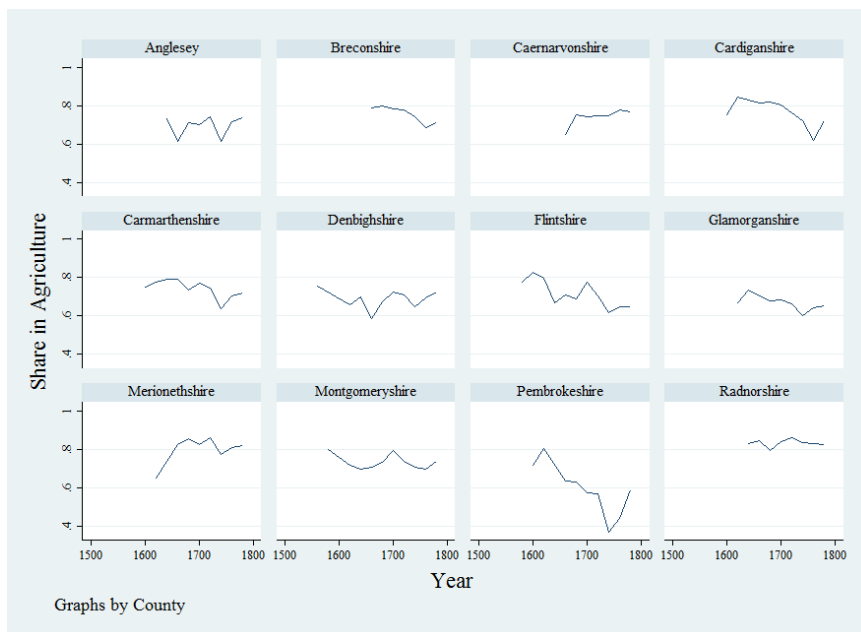
In table 3, we report indices for the share of the workforce in agriculture, industry and services for England and Wales. These are population weighted, and adjusted for London and age structure as discussed earlier. We report two estimates. The first includes all counties that meet our criteria for each decade, allowing the composition to shift over time. The second holds the counties in the sample constant For England, we find a broadly stable share of the workforce in farming and fishing in the sixteenth century, followed by a clear and persistent move out of agriculture from the start of the seventeenth century onwards. The impact of this movement on the overall share in agriculture was relatively modest in the early seventeenth century, with the farming share c. 1650 only around ten percent lower than at the close of the sixteenth century. By the end of the seventeenth century, the share of the workforce in agriculture had fallen by a quarter. The share of the workforce in industry had grown by around a third, while the share in services had roughly doubled.

In Wales, we see much less evidence of substantial structural change. The share in agriculture in the early eighteenth century was only ten to twenty percent below that seen in the late sixteenth century. The share of the workforce in services had risen by perhaps 10 percent. Industry had grown, but if 1580 or 1620 were the base years, then the size of industrial expansion would also be relatively small. The estimates are based on smaller numbers and so are more volatile and less precise, particularly for the late sixteenth century. Still, they give an impression of a relatively unchanging Welsh economy. This conclusion fits well with the impression in the literature that, despite growing prosperity among some farmers (Jenkins, 1987: 270-275; Powell, 2007), secondary and even mining activity was slow to develop in Wales. Williams suggests that as late as 1700, mining and industry were 'far more like they had been in 1400 than what they would be in 1850' (Williams, 1993: 56,395).

Table 3: Sectoral distribution of the labour force from probate dataset

	England								
	Share			Index			Index		
Sample:	Stable			Stable			Variable		
	Ag.	Ind.	Serv.	Ag.	Ind.	Serv.	Ag.	Ind.	Serv.
1540-59	0.65	0.21	0.14	101	93	108	101	89	115
1560-79	0.64	0.22	0.14	99	96	112	101	93	105
1580-99	0.67	0.22	0.11	103	97	88	104	95	88
1600-19	0.65	0.23	0.13	100	100	100	100	100	100
1620-39	0.61	0.24	0.15	95	105	119	95	103	123
1640-59	0.59	0.25	0.16	91	112	127	89	113	132
1660-79	0.51	0.28	0.2	79	125	162	79	128	163
1680-99	0.47	0.29	0.24	72	127	194	72	130	196
1700-19	0.51	0.27	0.22	79	121	171	76	126	179
1720-39	0.42	0.31	0.27	65	137	213	63	141	221
1740-59	0.42	0.3	0.27	65	134	218	64	139	221
1760-79	0.39	0.29	0.32	60	128	256	59	134	255

	Wales								
	Share			Index			Index		
Sample:	Stable			Stable			Variable		
	Ag.	Ind.	Serv.	Ag.	Ind.	Serv.	Ag.	Ind.	Serv.
1560-79	0.79	0.15	0.06	99	175	52	99	175	52
1580-99	0.74	0.12	0.14	93	137	124	93	137	124
1600-19	0.8	0.08	0.11	100	100	100	100	100	100
1620-39	0.73	0.14	0.14	91	161	120	91	156	124
1640-59	0.71	0.16	0.13	89	188	113	89	191	110
1660-79	0.72	0.15	0.13	90	175	112	91	173	109
1680-99	0.74	0.13	0.13	92	153	115	93	153	113
1700-19	0.72	0.15	0.13	90	178	114	90	176	110
1720-39	0.64	0.16	0.19	80	194	167	81	197	161
1740-59	0.67	0.16	0.17	84	193	145	84	194	140
1760-79	0.72	0.14	0.13	90	170	117	90	172	115

It is worth pausing a second to ask why our results are markedly different to those that Clark et al derive from their analysis of probate data (2012). It is important to emphasise that our raw statistics on the share of the workforce in agriculture by county are basically the same, with only small differences due to data collection and coding. The difference in the final results has two main causes. The first is the London and age adjustments we implement to correct the dataset. In particular, Clark et al's second data point (for the 1650s) is, in our analysis, pushed back to the 1630s, when the change in the agricultural share is only just becoming visible. Because Clark et al's point estimate is for one of the last decades in which the farm

share remained as high, they miss the decline. The second is the timing and scope of our samples. Clark et al's first dataset for the 1560s covers a period when the share of workers in agriculture in the probate record is rising in a number of counties (visible in figure 4). This is likely to be a mechanical effect of improvements to record keeping; we exclude some of the counties Clark et al use as the share of probate records with data is too low. By 1600, the quality of the probate record has improved markedly – and from them onwards it remains good, even as the share of the workforce in agriculture that it reveals begins to decline in most of England.

What does our dataset of apprentices' fathers suggest about the occupational structure of England in this period? In figure 5, we report the share in of male workers in agriculture by county. Taken at a county level, the trends are similar to those seen in the probate data shown in figure 4. A decline in the share in agriculture is widespread. Both Cumberland and Westmorland are relatively stable, as they are in the probate results.

Figure 5: Share of males working in agriculture by county from apprentice dataset, England
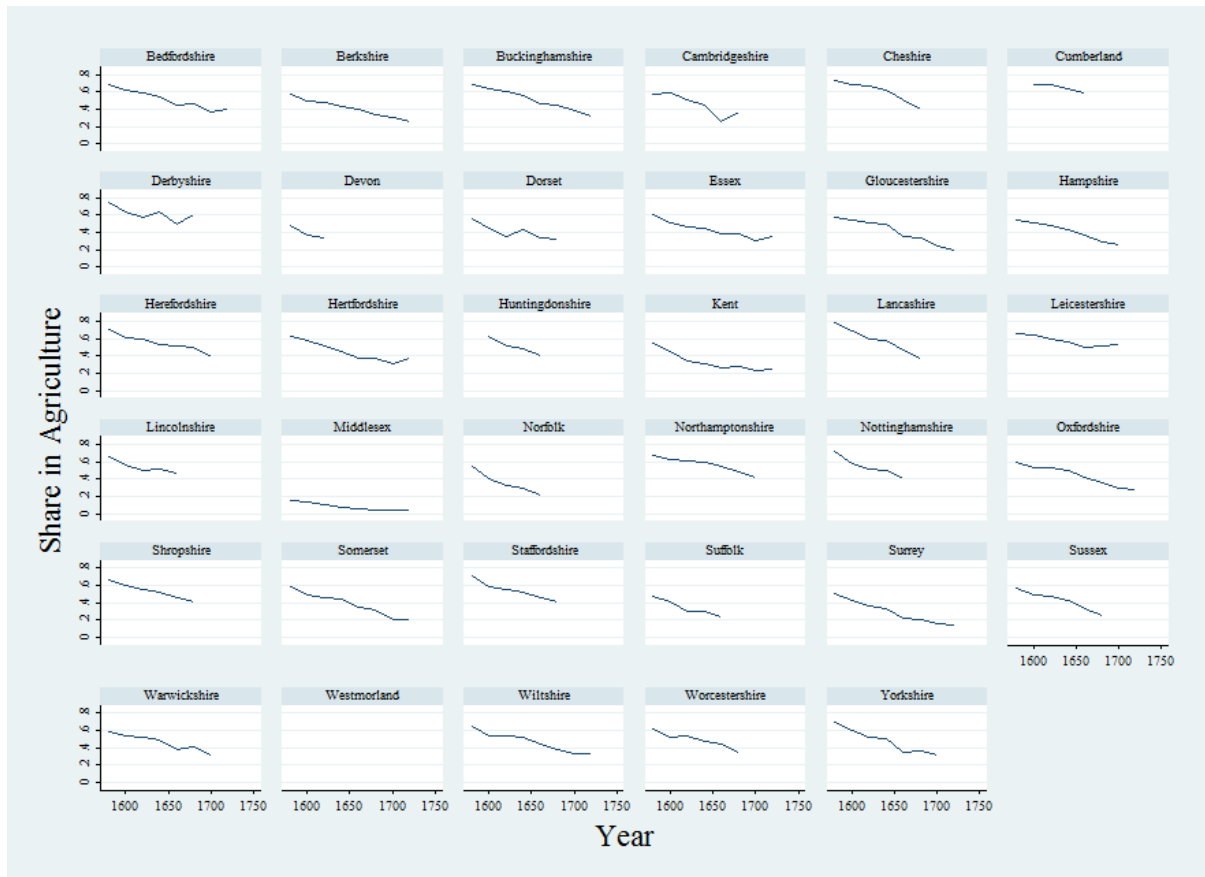
Converted into national indices, the results are broadly similar to those we found using the probate dataset. Agriculture declines from the end of sixteenth century, with the fall becoming much more marked from the middle of the seventeenth century. Industry and Services both grow at a roughly similar rate. Compared to the probate data, the share of the workforce in agriculture declines faster when measured with the apprentice data. The expansion in industry moves in a quite similar way, although it is more sustained in the later seventeenth century. The growth in services is less rapid than in the probate dataset, where it expands dramatically.

Table 4: Sectoral distribution of the labour force from apprentices' dataset

	Level, Adjusted			Index		
	Ag.	Ind.	Serv.	Ag.	Ind.	Serv.
1580-99	0.58	0.28	0.14	115	87	81
1600-19	0.5	0.32	0.18	100	100	100
1620-39	0.45	0.33	0.22	90	103	124
1640-59	0.43	0.34	0.23	85	107	131
1660-79	0.35	0.4	0.25	69	127	140
1680-99	0.33	0.45	0.23	65	140	128
1700-19	0.25	0.47	0.28	50	147	159
1720-39	0.2	0.54	0.26	40	169	146

The estimates of sectoral composition generated by both our datasets are quite similar. We would not expect them to match exactly. The apprentices' father dataset covers a larger spread of counties, and, as we anticipated, contains a higher share from industry and, particularly, services than the probate data. For some counties, we have data from both datasets, which allows us to consider how well their estimates agree.

Figure 6 gives a scatter plot of the share of workforce in agriculture for those counties for which we have more than four observations between 1600 and 1700 (out of a maximum of six twenty-year averages). As it shows, for most counties the probate and apprentices' father data agree reasonably closely on the share of the male workforce in agriculture; the correlation coefficient is 0.82. For industry and services the correlations are somewhat weaker: 0.601 for services and 0.766 for industry. We suspect the lower correlation for industry and services is a product both of the difference in bias in the dataset and the smaller size of the raw shares of each sample in these sectors increasing the margin of error around each observation. For our main sector of interest, agriculture, our datasets agree with each other reassuringly well.

Figure 6: Share of Male Workforce in Agriculture: Apprentice and Probate Datasets Compared
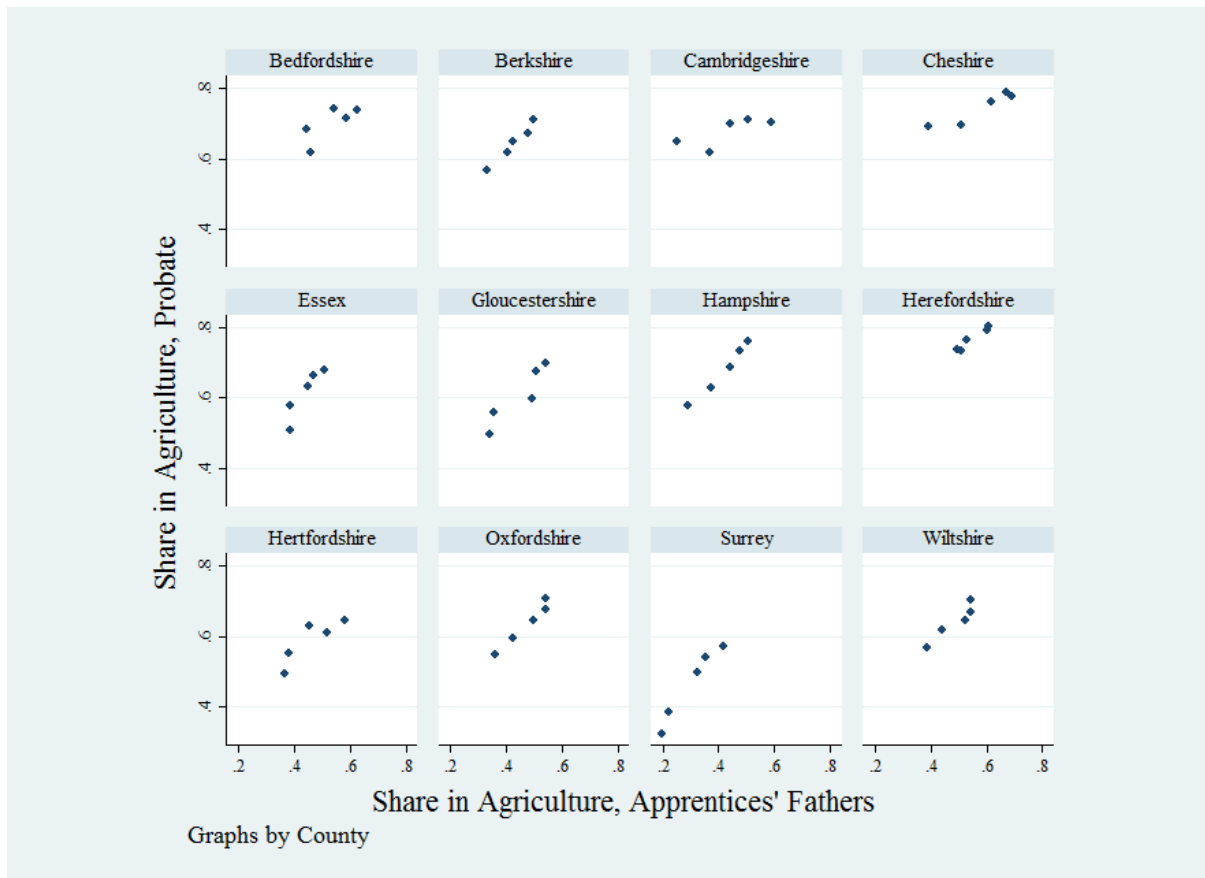
Note: the figure reports the share of the male workforce in agriculture for counties where more than four observations are available from both datasets between 1600-19 and 1700-19.

How do our results fit with the various estimates from other sources that exist in the literature? The existing estimates before the mid eighteenth century only apply to England so we exclude Wales from our discussion. In figures 7 and 8, we explore what happens if we tie our probate and apprentice index to each of the three main estimates in the literature for the seventeenth and early eighteenth centuries. We also show the position of the two estimates from the muster rolls for 1522, and Broadberry et al's estimate for 1759 from Massie. We treat Clark et al's 1653-60 estimate as reflecting the 1620-39 occupational structure, to address the age profile of the probate sample it contains. We locate Broadberry et al's estimate from King's 1688 work at 1680-99. And we position Shaw Taylor and Wrigley's estimate for 1710 at 1700-19.

Figure 7: Sectoral Distribution over Time, Probate Indices

Note: The figure reports sectoral trends for England estimated by linking the indices derived from the probate register, stable sample of counties, to three existing benchmarks. The lines labelled "B" are tied to the 1688/1700 estimate from King's social table in Broadberry et al 2015: 350. Lines labelled "ST" are tied to the 1710 estimate from baptismal registers in Shaw-Taylor & Wrigley 2014: 59. The line labelled "C" is tied to the weighted 1653-60 estimate of agricultural share from probate data in Clark et al 2012: 378. Additional point estimates for male employment are also reported for the 1522 Muster list from Broadberry et al 2015: 353 (labelled "B"), and Clark 2013: 9 (labelled "C"); for 1560-79 from Clark et al 2012: 381 (labelled "C"); and for c.1750 from Massie in Broadberry et al 2015: 356 (labelled "M").

The result of linking our probate indices to the existing estimates is clear. On this measure, there is essentially no historically meaningful conflict between the Clark et al's and the Broadberry et al's estimates of the agricultural share. Both fit on the same trend line. The differences between the series we construct by linking our index to their estimates are in the order of one or two percentage points in any one decade (see Appendix 1). The lines fit well with estimates for the early sixteenth century, neatly bisecting the two figures that have been calculated from the Muster Rolls. They also match tidily with Broadberry et al's reinterpretation of Massie's figures. The series tied to Shaw Taylor and Wrigley's estimate overlaps almost exactly with the series tied to Broadberry et al. This is a more artificial coherence, generated by an inexplicable bump in the probate series in 1700-19. If we smoothed the indices, then the series tied to

Shaw-Taylor and Wrigley would be at a somewhat higher level. The gap would not be large, however. Of course, in this form our indices offer no resolution to the quite different estimates of the industrial and services shares produced by Broadberry et al and Shaw-Taylor and Wrigley.

Figure 8: Sectoral Distribution over Time, Apprentices' Father Indices

Note: The figure reports sectoral trends for England estimated by linking the indices derived from the probate register, stable sample of counties, to three existing benchmarks. The lines labelled "B" are tied to the 1688/1700 estimate from King's social table in Broadberry et al 2015: 350. Lines labelled "ST" are tied to the 1710 estimate from baptismal registers in Shaw-Taylor & Wrigley 2014: 59. The line labelled "C" is tied to the weighted 1653-60 estimate of agricultural share from probate data in Clark et al 2012: 378. Additional point estimates for male employment are also reported for the 1522 Muster list from Broadberry et al 2015: 353 (labelled "B"), and Clark 2013: 9 (labelled "C"); for 1560-79 from Clark et al 2012: 381 (labelled "C"); and for c.1750 from Massie in Broadberry et al 2015: 356 (labelled "M").

By comparison, the index we constructed from the apprenticeship data generates too steep a decline in the share of workers in agriculture to be plausible as a long-term series; it fails to capture the more stable share in the sixteenth century and the relative slowing of the movement out of agriculture in the eighteenth century. The extreme heights reached by estimate linked to the Shaw-Taylor and Wrigley figure is likely a reflection of the weakening of this series by the first third of the eighteenth century.

Nonetheless, it seems reasonable to conclude that the probate series is likely to have been much closer to the distribution of occupations in the population as a whole. The apprenticeship series provides an independent confirmation that the trends in the probate series are moving in a plausible way, but it is not as good a guide to sectoral change in its own right.

COUNTERFACTUAL ESTIMATES

In this simple form, the evidence of both datasets agrees that England experienced a substantial movement out of agriculture in the seventeenth century. Yet, as we stressed above, partial coverage in the probate records implies that changes in the shares of the deaths covered could significantly affect trends. We therefore econometrically estimate the effect of changes in these shares and use the results to examine how the series might look like if all the deaths were recorded. This is a strong robustness check for the indices just presented, as it estimates them keeping constant the share of deaths recorded across space and time. However, as with all out of sample predictions, it should be taken as a best guess for the levels.

To estimate how occupational shares respond to changes in coverage we rely on the generalised linear model developed by Papke and Wooldridge (1996), which is designed to fit proportional data, such as sectoral shares: the predicted values are bounded between 0 and 1 and the marginal effects flatten at the margins. The marginal effects are also decreasing with the independent variable, so that they are lower for a high share of deaths than for a low one. Differences in levels are expected across counties depending on their specialisation. Figure 4 highlights differences and non-linearity in the county trends. We therefore include county dummies and county specific quadratic trends as independent variables together with the share of deaths recorded. As the marginal effects, by definition, cancel themselves out across sectors they are constrained to sum up to zero, both for the share of the wills and time. These constraints hold exactly at the sample mean of the independent variable, which by definition is one third, and approximately for other values. They ensure that the sum of the fitted values across the three sectors is close to one for all counties and time. The counterfactual sectoral shares are then computed with the predicted values under

the assumption of universal male coverage for the wills plus the errors.[19] Finally, the aggregation across counties follows the same method used for the observed sectoral shares.[20]

The relevant coefficients have the expected signs and are statistically significant at the 1 percent level.[21] Their sizes, 0.30 for agriculture, 0.41 for industry and -0.71 for services are consistent with expectations: an increase in the shares of deaths covered increases the shares of industrial and agricultural workers by about the same amount at the expense of the share in services. Specifically, these coefficients mean that on average an increase by 1 percentage points in the share of deaths covered increases the shares of agriculture and industry by 0.050 percentage points and 0.068 percentage points respectively, which is plausible. Figure 9 shows the results alongside previous estimates for England.

Figure 9: Sectoral Distribution over Time in England, Counterfactual Probate Estimates

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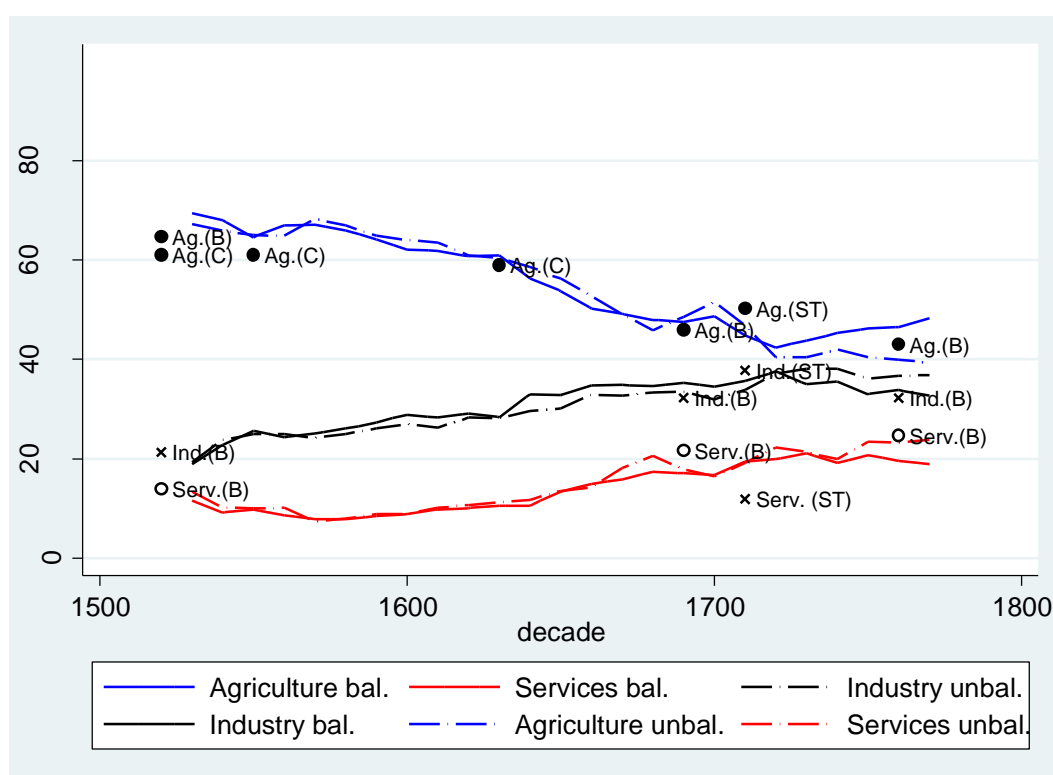
[19] On average the absolute difference between the sums of the fitted values by county and decade and one is less than one percentage point. However, the counterfactual sectoral shares tend to slightly over-predict their sizes: on average by a total of about five percentage points. The counterfactual labour shares are therefore scaled to sum up to one for each county and decade before they are aggregated.
[20] However, to exploit variation the econometric analysis is carried out on 10-years rather than 20-years means. There are 1800 observations; the coefficient of variation of the sectoral shares is 72 per cent (range: 0 to 88 per cent) and that of the share of deaths recorded is 40 per cent (range: 10 to 56 per cent).
[21] This applies to almost all of the controls as well. Standard errors clustered by sector allow for arbitrary within sector correlation.

As with our baseline results, the unbalanced and the balanced sample agree, both on trends and levels. Clearly the counterfactual estimates strongly corroborate the results from the un-adjusted series: agricultural shares went down, while both industry and services went up; the decline of agriculture was slow between the later sixteenth and the early seventeenth centuries and became rapid from then until the early eighteenth century.

Reassuringly, there is a very close match with previous estimates. Indeed, across the three sectors, there is a strikingly close match with Broadberry's et al's estimates. Clark et al's agricultural shares are significantly different from ours only at the beginning of the period. Thus, in the 1530s our estimate is closer to Broadberry et al's revised estimate from the Muster list than to Clark et al's. Clark et al's figure for 1560-79, which is based on un-adjusted probate records at a time when the quality of record-keeping was low, seems to under-estimate the agricultural share. Unless this rose in first half of the sixteenth century, which is unlikely, our figures are more plausible. Our estimate of the share of services for the 1710s is higher than Shaw-Taylor and Wrigley's. This is only partly due to their inclusion of Wales: if we also include Wales then the difference goes down from 7.2 to 6.2 percentage points.[22] Their estimate of 12 percent appears low; given levels of urbanization and the numbers likely employed in catering to the needs of the gentry, we might expect services to be higher overall. Our estimates for services in the eighteenth century are in line with, albeit somewhat lower than, those of Broadberry et al. Caution is in order, not least because after 1700, as said before, it is likely that our sample become less representative of England. Yet, all in all, our estimates ring true.

Figure 10: Sectoral Distribution over Time in Wales, Counterfactual Probate Estimates

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[22] Computation based on the unbalanced sample assuming that the population of Wales was equal to 6.6 percent of that of England and Wales, as in the 1801 census. The difference is smaller for the balanced sample.
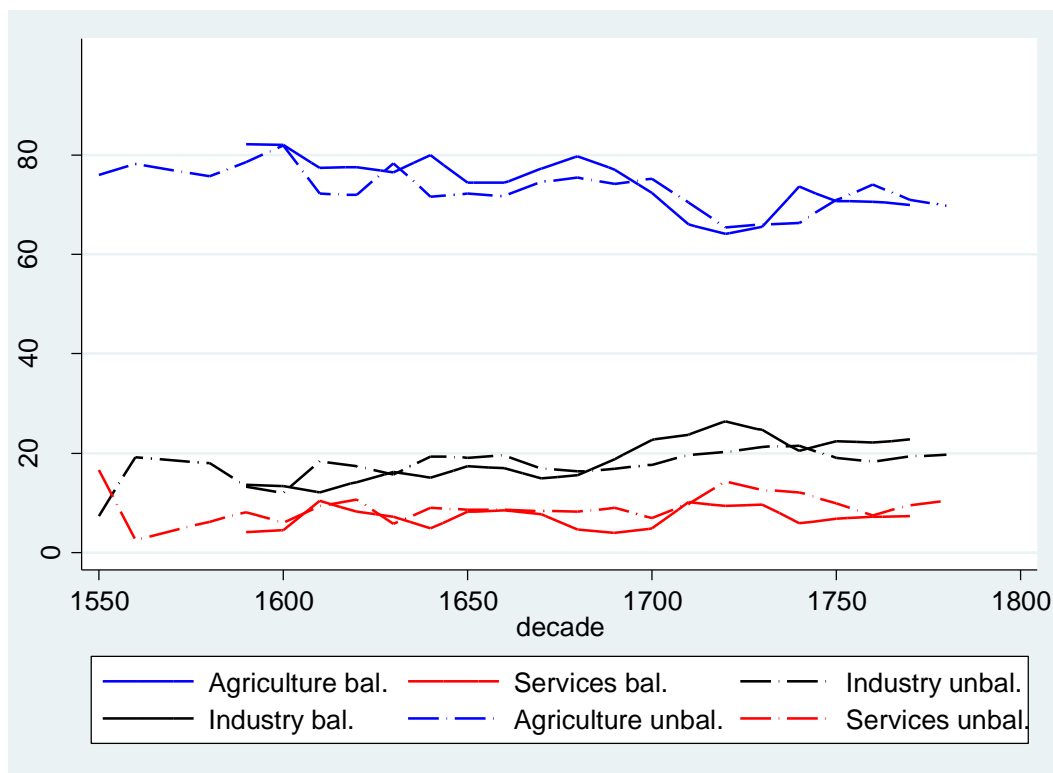
Note: The figure reports counterfactual sectoral trends for Wales estimated assuming that all male deaths were included in the probate records of the counties in our sample. The lines coded "unbal." use all available data. The lines coded "bal." uses a constant sample of counties for which we have data in all the decades.

There is very little difference between the unbalanced and balanced samples in Wales, too (figure 10). As with the unadjusted series, we find much less evidence of structural change there: we only detect a comparatively slight fall in the agricultural share between the late seventeenth and early eighteenth centuries.

Our sectoral shares estimate can be used to construct time series of indexed trends in output per worker, using Broadberry et al's (2015: 364-369) method together with their data on female sectoral shares, sectoral output and population.[23] Figure 11 shows the results.

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[23] For reasons of space we only present the results of the balanced sample. Given that the sectoral shares estimated with the unbalanced sample are very similar so are the trends in labour productivity. Since Broadberry et do not provide separate sectoral output figures for England, we have to assume that in the eighteenth century the English GDP per capita grew at the same rate as that of the UK.

Figure 11: Indexed trends in output per worker in England (1700-09=100)
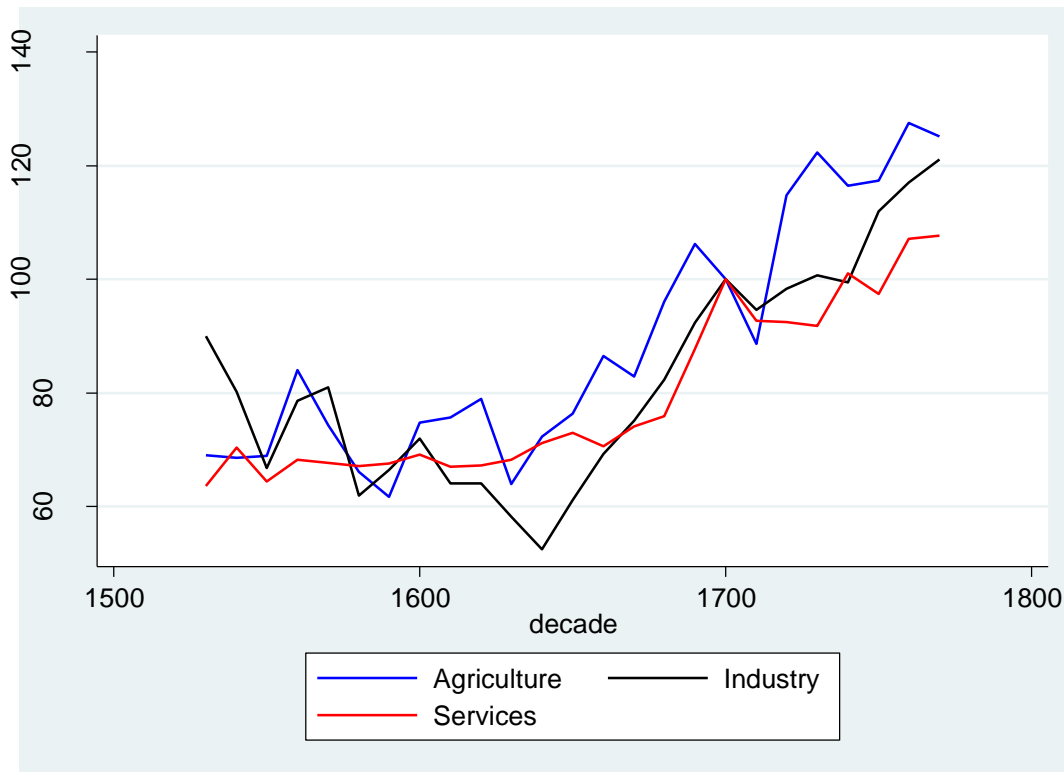
All three sectors experienced rapid rises in labour productivity between the 1630s and the beginning of the eighteenth century - essentially the same time period over which structural transformation became rapid. It therefore makes sense to break down the 1522-1700 period analysed by Broadberry et al into two parts. One before 1630, and one running from then until the first decade of the eighteenth century. Table 5 reports the yearly rates of growth in labour productivity in these two periods.

Table 5: Yearly rates of growth in labour productivity in England (in percentage)

	Beta*100	
	1530s-1620s	1630s-1700s
Agriculture	0.076	0.679***
Industry	-0.304**	0.904***
Services	0.028	0.463***
Total	-0.021	0.755***

Note: Beta is the yearly rate of growth; ***=significant at the 1 percent level, **=significant at the 5 percent level and *=significant at the 1 percent level

Broadberry et al find that between 1522 and 1700 labour productivity growth was twice faster in agriculture and service than in industry and emphasise how industry really became the backbone of productivity growth only during the classical period of the industrial revolution in 1759-1851, with an yearly rate of growth of 0.93 per cent. Our estimates instead suggest industry already had a central role in the English economic take-off of the mid-seventeenth century, when the rates of productivity from this sector were about as large as they were during the industrial revolution. The only reason behind the discrepancy between ours and Broadberry et al's interpretation is that a particularly poor performance for industry in the preceding decades means that its subsequent rise is obscured in their periodisation.

Our results would explain why so many Englishmen were willing to move into industry after 1630, while not denying the impressive gains made in agricultural productivity at the same time that made this structural transformation possible. By the early eighteenth century, however, growth was running into diminishing return and both productivity growth and structural transformation slowed down. Not until the first of half of the nineteenth century did the English economy see again rates of productivity growth as fast as those of the 1630s-1700s (Broadberry et al 2015: 367).

CONCLUSION

In this paper we have presented a set of new estimates for the share of the male workforce in agriculture, industry and services in England and Wales. Both the probate and apprentice series show substantial declines in the share of the workforce in agriculture in England during the seventeenth century.

When we use these data to construct indices of sectoral shares in England over the sixteenth and seventeenth centuries, we find they are consistent with the point estimates of sectoral distribution that other historians have generated using (mainly) different sources. Although the sources that we use here are affected by a number of serious limitations, this exercise in triangulation indicates that they offer a reasonably good measure of trends in sectoral shares. Our econometric estimates similarly indicate that

the changeable share of the population captured in the probate series is not driving our results: the results are very close to those we generate with our baseline index linked to independent estimates.

Finally, a simple back of the envelope calculation underlines how unlikely it is that we are mistaken in identifying a substantial decline in the share in agriculture in the seventeenth century. Our data contains around 30 to 40 percent of deceased adult males in the seventeenth century. If the overall share in agriculture was to remain stable, as Clark et al (2012) argued, then the share in agriculture among the poorer, less capital rich section of society who we do not observe would have to increase substantially. Assuming that the same share of observed and unobserved are in agriculture in 1600, then the share of the unobserved employed in agriculture would have to rise by twenty percent from .63 to .75 to keep the overall share in agriculture stable. To us, such a dramatic shift into agriculture seems implausible.

As any attempt to estimate national sectoral shares from these kinds of evidence will undoubtedly leave some more sceptical readers unconvinced, it is useful to discuss the main implications of the paper in order of plausibility. First, given that we utilize a much expanded collection of the same data that Clark et al (2012) used to argue for a stable agricultural share in the sixteenth and seventeenth centuries, there can be little doubt that our results show that their conclusions were mistaken. As such, Clark's more general argument that the English economy experienced little or no meaningful growth in this period does not find the support from occupational distribution that he thought.

Second, both our series agree that the seventeenth century saw a major decline in the agricultural share of the male workforce. Decline is visible from c. 1600 onwards, and became more rapid from around the middle of the century. Taken just as broad indicators of occupational trends, they thus provide strong evidence for the timing of this important inflection point in English structural change. Finally, if the reader will accept that the close fit between our series and other estimates lends confidence to the results, then we have a credible new set of estimates for occupational shares over this period.

Taken in their fullest form, then, our results serve to locate the moment when a significant and continuous flow of labour out of agriculture and into industry and services began in England firmly at the start of the seventeenth century. Our figures suggest a decline in the share of the male workforce in agriculture in England from c. 63 percent in 1600, to c. 45 percent in 1700. The sixteenth century had

seen little change, by contrast. Our county level estimates (figures 4 & 5) show people leaving farming in most parts of England, both in the North and South. Part of this adjustment took place in the growing urban centres of the nation. But the share of the workforce employed in industry and services increased substantially in rural areas too.

Needless to say, our results fit poorly with the argument that England was in some ways stuck in a stagnant, barely changing equilibrium. However, the account they give us for Wales is perhaps not too far from that image. Certainly, there is little sign that Wales experienced a transformation of the kind apparent in England, implying that British economic development was accompanied by divergence across the island.

Most of England's transition out of agriculture was complete by the end of the seventeenth century. At the end of the eighteenth century, the share in agriculture would have fallen a further ten percentage points to c. 35 percent. This timing fits well with the idea that the commercial and protoindustrial development that occurred before the industrial revolution – developments evidenced most visibly in the dramatic expansion of London from a modest city by European standards to one of the biggest centres in the continent - marked a transitional phase towards industrialization. Finally, these new estimates of sectoral shares suggest that agricultural and especially industrial productivities were rising even faster in the seventeenth century than in Broadberry et al's (2015: 367) recent work, implying that industry played a central role in explaining the take-off of the English economy in the seventeenth century.

Appendix 1: Estimates of Sectoral Share, National

England

	Weighted constant county sample			Broadberry 1688/1700			Shaw Taylor 1710			Clark 1650s
	Ag	Ind	Serv	Ag	Ind	Serv	Ag	Ind	Serv	Ag
1540-59	65.4	21.1	13.5	64.1	23.7	12.1	64.2	29.0	7.6	62.9
1560-79	64.1	21.7	14.1	62.8	24.5	12.6	63.0	29.9	7.9	61.7
1580-99	67.0	22.0	11.1	65.6	24.7	9.9	65.8	30.2	6.2	64.4
1600-19	64.8	22.6	12.6	63.5	25.4	11.2	63.7	31.0	7.0	62.4
1620-39	61.3	23.7	15.0	60.1	26.7	13.3	60.2	32.6	8.3	59.0
1640-59	58.8	25.2	16.0	57.6	28.4	14.3	57.8	34.6	8.9	56.6
1660-79	51.3	28.3	20.4	50.3	31.8	18.2	50.4	38.9	11.4	49.3
1680-99	46.9	28.7	24.4	46.0	32.3	21.7	46.1	39.4	13.6	45.2
1700-19	51.1	27.4	21.5	50.1	30.8	19.2	50.2	37.6	12.0	49.2
1720-39	42.2	31.0	26.8	41.4	34.9	23.8	41.5	42.6	14.9	40.6
1740-59	42.3	30.3	27.4	41.4	34.1	24.4	41.5	41.6	15.3	40.7
1760-79	38.8	29.0	32.2	38.0	32.6	28.7	38.1	39.8	18.0	37.3

Wales

	Weighted constant county sample		
	Ag	Ind	Serv
1560-79	0.79	0.15	0.06
1580-99	0.74	0.12	0.14
1600-19	0.8	0.08	0.11
1620-39	0.73	0.14	0.14
1640-59	0.71	0.16	0.13
1660-79	0.72	0.15	0.13
1680-99	0.74	0.13	0.13
1700-19	0.72	0.15	0.13
1720-39	0.64	0.16	0.19
1740-59	0.67	0.16	0.17
1760-79	0.72	0.14	0.13

Note: tables report the weighted and adjusted sectoral shares we estimate from the probate dataset (constant county sample), and the shares when the indices are tied to the various estimates. Sources are discussed fully in the note to figure 7.

Appendix 2: Sources for Probate Data

Bedfordshire	Alan F. Cirket, *Index of Bedfordshire Probate Records 1484-1858*, ed. by Joan Stuart and Peggy Wells, The Index Library, 105 (London: British Record Society, 1994)
Berkshire	Berkshire Family History Society, *Berkshire Probate Index, 1480-1857*, 2012
Buckinghamshire	Hunt, Julian, Roger Bettridge, and Alison Toplis, eds., *Probate Records of the Archdeaconry Court of Buckingham, 1483-1660 and of the Buckinghamshire Peculiars, 1420-1660*, The Index Library, 114 (London: British Record Society, 2001)
Cambridgeshire	Thurley, Clifford A., and Dorothea Thurley, eds., *Index of the Probate Records of the Court of the Archdeacon of Ely, 1513-1857*, The Index Library, 88 (London: British Record Society, 1976)
	Thurley, Clifford A., and Dorothea Thurley, *Index of the Probate Records of the Consistory Court of Ely, 1449-1858*, ed. by Rosemary Rodd and E. S. Leedham-Green, The Index Library, 103, 106, 107 (London: British Record Society, 1994). Dataset formerly available at http://venn.csi.cam.ac.uk/Probates/ [accessed 7/6/2013] (no longer available)
Cheshire, Lancashire	Cheshire Archives and Local Studies, *Chester probate records 1519-1858*, http://archivedatabases.cheshire.gov.uk/RecordOfficeWillEPayments/search.aspx [accessed 25/4/2016]
Cumberland, Westmorland	Cumbria Archive Service, CASCAT, http://www.archiveweb.cumbria.gov.uk/CalmView/Record.aspx?src=CalmView.Catalog&id=PROB [accessed 25/4/2016]
County Durham, Northumberland	Durham University Library, North East Inheritance Database, http://familyrecords.dur.ac.uk/nei/data/simple.php [accessed 25/4/2016]
Essex, Hertfordshire	Essex Record Office, Essex Records Online, http://seax.essexcc.gov.uk/ [accessed 25/4/2016]
	London Metropolitan Archives, *Volunteer projects - Diocese of London Consistory Court Wills*, https://www.cityoflondon.gov.uk/things-to-do/london-metropolitan-archives/about/Pages/volunteer-wills-project.aspx [accessed 25/4/2016]
Hampshire	Hampshire Archives and Local Studies, *CALM*, http://calm.hants.gov.uk/ [accessed 25/4/2016]
Herefordshire	Cliff Webb, Index to Hereford Wills 1500-1700 (unpublished private notes, 2008)
Hertfordshire	Crawley, Beryl, and Cliff Webb, eds., *Wills at Hertford 1415-1858*, Index Library, 120 (London: British Record Society, 2007)
Lancashire, Westmorland	Lancashire Archives, *LANCAT*, http://www.lancashire.gov.uk/libraries-and-archives/archives-and-record-office/search-the-archives/lancat.aspx [accessed 25/4/2016]
Oxfordshire	Oxfordshire Wills Index 1516-1857, origins.net, http://www.origins.net/help/aboutNWI-oxf.aspx [accessed 28/03/2014] (now available via Findmypast)
Suffolk	Grimwade, M. E., W. R. Serjeant, and R. K. Serjeant, eds., *Index of the Probate Records of the Court of the Archdeacon of Suffolk, 1444-1700*, The Index Library, 90-91 (Keele, Staffordshire: British Record Society, 1979)
	Serjeant, W. R., and M. E. Grimwade, eds., *Index of the Probate Records of the Court of the Archdeacon of Sudbury, 1354-1700*, The Index Library, 95-96 (Keele, Staffordshire: British Record Society, 1984)
	Norfolk Record Office, *NROCAT*, http://nrocat.norfolk.gov.uk/DServe/public/searches/nroprobate.htm [accessed 25/4/2016]
Surrey	Surrey & South London Will Abstracts 1470-1858, eds. origins.net and Cliff

	Webb, http://www.origins.net/help/aboutNWI-surrwills.aspx [accessed 23/02/2014] (now available via Findmypast)
Wiltshire	Webb, Cliff, ed., *Wills at Salisbury 1464-1858*, The Index Library, 122, 123, 123A (London: British Record Society, 2009)
Warwickshire	Webb, Cliff, ed., *Wills in the Consistory Court of Lichfield 1650-1700*, The Index Library, 125 (London: British Record Society, 2010)
Worcestershire, Warwickshire	Fry, Edw Alex, ed., *Calendar of Wills and Administrations in the Consistory Court of the Bishop of Worcester, 1451-[1652]: Also Marriage Licenses and Sequestrations Now Deposited in the Probate Registry at Worcester*, The Index Library, 31,39 (London: British Record Society, 1904-1910)
Wales	National Library of Wales, *Wills Online*. https://www.llgc.org.uk/discover/nlw-resources/wills/ [accessed 25/4/2016]
(Province of Canterbury)	The National Archives, 'Prerogative Court of Canterbury Wills, 1384-1858' (UK Data Service, 2004) <http://discover.ukdataservice.ac.uk/catalogue/?sn=4816> [accessed 27 August 2013]
(Province of York)	*Index of Wills in the York Registry* [1389-1688], Yorkshire Archaeological Society, vols. 11,14,19,22,24,26,28,32,35, 49,60, 68, 89. (Worksop, 1888-1934)

Appendix 3: sectoral shares by county (probate).

Decade	county	Actual			Counterfactual		
		Ag.	Ind.	Serv.	Ag.	Ind.	Serv.
1620	Anglesey	0.71	0.08	0.21	0.75	0.11	0.14
1640	Anglesey	0.57	0.24	0.19	0.60	0.26	0.13
1650	Anglesey	0.62	0.20	0.18	0.65	0.23	0.12
1660	Anglesey	0.54	0.18	0.28	0.58	0.21	0.21
1670	Anglesey	0.77	0.08	0.15	0.80	0.11	0.09
1680	Anglesey	0.66	0.11	0.23	0.69	0.14	0.16
1690	Anglesey	0.72	0.14	0.14	0.75	0.17	0.08
1700	Anglesey	0.76	0.11	0.13	0.78	0.14	0.08
1710	Anglesey	0.70	0.16	0.14	0.72	0.18	0.10
1720	Anglesey	0.53	0.24	0.23	0.56	0.26	0.17
1730	Anglesey	0.64	0.20	0.16	0.67	0.22	0.12
1740	Anglesey	0.70	0.21	0.09	0.72	0.23	0.05
1750	Anglesey	0.72	0.15	0.13	0.74	0.17	0.09
1760	Anglesey	0.75	0.11	0.14	0.77	0.14	0.10
1770	Anglesey	0.73	0.16	0.12	0.75	0.18	0.07
1780	Anglesey	0.74	0.11	0.15	0.76	0.13	0.11
1520	Bedfordshire	0.75	0.10	0.14	0.77	0.14	0.09
1530	Bedfordshire	0.76	0.13	0.11	0.77	0.17	0.06
1540	Bedfordshire	0.76	0.15	0.09	0.77	0.19	0.04
1550	Bedfordshire	0.71	0.19	0.10	0.73	0.23	0.04
1560	Bedfordshire	0.77	0.15	0.08	0.78	0.20	0.02
1570	Bedfordshire	0.81	0.14	0.05	0.82	0.19	0.00
1580	Bedfordshire	0.72	0.20	0.08	0.73	0.24	0.03
1590	Bedfordshire	0.68	0.23	0.08	0.69	0.27	0.03
1600	Bedfordshire	0.65	0.26	0.09	0.66	0.30	0.03
1610	Bedfordshire	0.68	0.26	0.07	0.69	0.30	0.01
1620	Bedfordshire	0.67	0.24	0.09	0.68	0.29	0.03
1630	Bedfordshire	0.75	0.19	0.06	0.76	0.24	0.00
1640	Bedfordshire	0.66	0.27	0.07	0.68	0.32	0.01
1650	Bedfordshire	0.61	0.30	0.10	0.62	0.34	0.04
1660	Bedfordshire	0.58	0.29	0.13	0.60	0.33	0.07
1670	Bedfordshire	0.59	0.30	0.11	0.61	0.35	0.04
1680	Bedfordshire	0.53	0.33	0.14	0.56	0.37	0.07
1690	Bedfordshire	0.56	0.29	0.15	0.58	0.34	0.08
1700	Bedfordshire	0.58	0.27	0.15	0.61	0.32	0.07
1710	Bedfordshire	0.51	0.30	0.19	0.55	0.35	0.10
1720	Bedfordshire	0.52	0.27	0.21	0.56	0.33	0.11
1730	Bedfordshire	0.52	0.27	0.21	0.57	0.33	0.11
1740	Bedfordshire	0.50	0.32	0.18	0.55	0.38	0.07
1750	Bedfordshire	0.51	0.29	0.20	0.57	0.35	0.08
1760	Bedfordshire	0.58	0.25	0.17	0.64	0.32	0.05

1770	Bedfordshire	0.59	0.24	0.18	0.65	0.31	0.04
1780	Bedfordshire	0.56	0.25	0.19	0.63	0.32	0.05
1520	Berkshire	0.50	0.25	0.25	0.52	0.30	0.18
1530	Berkshire	0.72	0.16	0.12	0.72	0.20	0.08
1540	Berkshire	0.70	0.19	0.12	0.70	0.24	0.06
1550	Berkshire	0.68	0.26	0.07	0.68	0.30	0.02
1560	Berkshire	0.69	0.22	0.09	0.68	0.27	0.05
1570	Berkshire	0.72	0.21	0.07	0.72	0.26	0.03
1580	Berkshire	0.72	0.21	0.07	0.71	0.26	0.03
1590	Berkshire	0.70	0.23	0.07	0.69	0.28	0.03
1600	Berkshire	0.67	0.24	0.09	0.67	0.29	0.04
1610	Berkshire	0.66	0.24	0.10	0.65	0.29	0.06
1620	Berkshire	0.65	0.25	0.10	0.65	0.31	0.04
1630	Berkshire	0.64	0.25	0.11	0.64	0.31	0.05
1640	Berkshire	0.63	0.27	0.10	0.63	0.33	0.04
1650	Berkshire	0.59	0.28	0.13	0.59	0.34	0.07
1660	Berkshire	0.56	0.31	0.12	0.57	0.37	0.06
1670	Berkshire	0.56	0.32	0.12	0.57	0.38	0.06
1680	Berkshire	0.52	0.32	0.15	0.53	0.38	0.09
1690	Berkshire	0.55	0.32	0.13	0.56	0.38	0.06
1700	Berkshire	0.53	0.31	0.16	0.54	0.38	0.08
1710	Berkshire	0.49	0.32	0.19	0.50	0.39	0.11
1720	Berkshire	0.43	0.35	0.22	0.45	0.42	0.13
1730	Berkshire	0.44	0.32	0.24	0.46	0.39	0.14
1740	Berkshire	0.47	0.32	0.21	0.49	0.40	0.10
1750	Berkshire	0.44	0.29	0.27	0.47	0.38	0.15
1760	Berkshire	0.42	0.34	0.24	0.46	0.43	0.12
1770	Berkshire	0.47	0.29	0.24	0.51	0.38	0.10
1780	Berkshire	0.43	0.31	0.26	0.47	0.41	0.12
1640	Breconshire	0.77	0.18	0.06	0.74	0.22	0.05
1650	Breconshire	0.80	0.15	0.05	0.77	0.19	0.04
1660	Breconshire	0.80	0.15	0.05	0.77	0.20	0.03
1670	Breconshire	0.79	0.16	0.05	0.76	0.21	0.03
1680	Breconshire	0.79	0.13	0.08	0.76	0.18	0.06
1690	Breconshire	0.78	0.13	0.09	0.76	0.18	0.06
1700	Breconshire	0.80	0.14	0.06	0.77	0.19	0.03
1710	Breconshire	0.75	0.16	0.09	0.73	0.21	0.06
1720	Breconshire	0.78	0.15	0.07	0.76	0.20	0.04
1730	Breconshire	0.67	0.18	0.15	0.65	0.23	0.11
1740	Breconshire	0.64	0.19	0.17	0.63	0.25	0.12
1750	Breconshire	0.75	0.13	0.12	0.73	0.19	0.08
1760	Breconshire	0.69	0.19	0.11	0.68	0.25	0.07
1770	Breconshire	0.72	0.17	0.11	0.71	0.23	0.06
1780	Breconshire	0.68	0.16	0.17	0.66	0.22	0.12
1520	Buckinghamshire	0.76	0.09	0.16	0.77	0.12	0.11
1530	Buckinghamshire	0.77	0.09	0.14	0.77	0.12	0.11

1540	Buckinghamshire	0.80	0.14	0.06	0.79	0.18	0.03
1550	Buckinghamshire	0.76	0.18	0.06	0.74	0.23	0.03
1560	Buckinghamshire	0.79	0.15	0.06	0.77	0.20	0.03
1570	Buckinghamshire	0.78	0.16	0.06	0.76	0.20	0.04
1580	Buckinghamshire	0.77	0.17	0.07	0.74	0.22	0.04
1590	Buckinghamshire	0.76	0.17	0.07	0.73	0.22	0.04
1600	Buckinghamshire	0.69	0.21	0.10	0.67	0.26	0.07
1610	Buckinghamshire	0.72	0.20	0.08	0.69	0.24	0.06
1620	Buckinghamshire	0.72	0.19	0.09	0.70	0.24	0.06
1630	Buckinghamshire	0.73	0.18	0.09	0.71	0.23	0.05
1640	Caernarvonshire	0.63	0.15	0.23	0.67	0.21	0.12
1650	Caernarvonshire	0.65	0.14	0.21	0.69	0.20	0.12
1660	Caernarvonshire	0.65	0.18	0.18	0.68	0.23	0.09
1670	Caernarvonshire	0.80	0.10	0.10	0.82	0.16	0.02
1690	Caernarvonshire	0.74	0.14	0.13	0.75	0.19	0.05
1700	Caernarvonshire	0.78	0.13	0.09	0.79	0.18	0.03
1710	Caernarvonshire	0.68	0.17	0.15	0.69	0.22	0.09
1720	Caernarvonshire	0.75	0.14	0.11	0.76	0.19	0.05
1730	Caernarvonshire	0.72	0.15	0.13	0.72	0.20	0.07
1740	Caernarvonshire	0.73	0.16	0.11	0.74	0.21	0.05
1750	Caernarvonshire	0.83	0.09	0.08	0.84	0.14	0.02
1760	Caernarvonshire	0.78	0.12	0.10	0.80	0.17	0.04
1770	Caernarvonshire	0.75	0.12	0.14	0.77	0.16	0.07
1780	Caernarvonshire	0.75	0.09	0.16	0.78	0.13	0.09
1520	Cambridgeshire	0.61	0.14	0.25	0.64	0.17	0.19
1530	Cambridgeshire	0.76	0.08	0.16	0.77	0.12	0.11
1540	Cambridgeshire	0.71	0.16	0.13	0.72	0.20	0.08
1550	Cambridgeshire	0.75	0.16	0.09	0.76	0.20	0.04
1560	Cambridgeshire	0.72	0.17	0.11	0.72	0.20	0.08
1570	Cambridgeshire	0.72	0.20	0.08	0.72	0.23	0.05
1580	Cambridgeshire	0.70	0.21	0.09	0.70	0.26	0.04
1590	Cambridgeshire	0.66	0.25	0.08	0.66	0.28	0.06
1600	Cambridgeshire	0.69	0.23	0.08	0.68	0.27	0.04
1610	Cambridgeshire	0.66	0.24	0.10	0.65	0.28	0.07
1620	Cambridgeshire	0.70	0.22	0.08	0.69	0.27	0.04
1630	Cambridgeshire	0.68	0.23	0.09	0.67	0.29	0.04
1640	Cambridgeshire	0.63	0.27	0.10	0.63	0.31	0.06
1650	Cambridgeshire	0.65	0.26	0.10	0.64	0.31	0.05
1660	Cambridgeshire	0.61	0.27	0.12	0.61	0.32	0.07
1670	Cambridgeshire	0.61	0.27	0.12	0.61	0.32	0.07
1680	Cambridgeshire	0.56	0.30	0.15	0.56	0.35	0.10
1690	Cambridgeshire	0.56	0.29	0.16	0.56	0.33	0.11
1700	Cambridgeshire	0.56	0.31	0.13	0.56	0.36	0.08
1710	Cambridgeshire	0.54	0.30	0.16	0.55	0.35	0.10
1720	Cambridgeshire	0.52	0.29	0.18	0.54	0.35	0.12
1730	Cambridgeshire	0.54	0.29	0.17	0.55	0.35	0.10

1740	Cambridgeshire	0.57	0.24	0.19	0.59	0.30	0.11
1750	Cambridgeshire	0.53	0.25	0.22	0.55	0.31	0.14
1760	Cambridgeshire	0.57	0.26	0.18	0.59	0.32	0.09
1770	Cambridgeshire	0.54	0.24	0.22	0.57	0.30	0.12
1780	Cambridgeshire	0.58	0.21	0.21	0.61	0.27	0.12
1590	Cardiganshire	0.81	0.03	0.16	0.83	0.05	0.12
1600	Cardiganshire	0.80	0.07	0.13	0.82	0.09	0.09
1610	Cardiganshire	0.87	0.08	0.05	0.89	0.10	0.01
1640	Cardiganshire	0.82	0.07	0.10	0.84	0.09	0.06
1650	Cardiganshire	0.80	0.13	0.07	0.81	0.15	0.03
1660	Cardiganshire	0.86	0.05	0.09	0.88	0.07	0.05
1670	Cardiganshire	0.77	0.07	0.16	0.79	0.10	0.11
1680	Cardiganshire	0.84	0.10	0.06	0.86	0.12	0.01
1690	Cardiganshire	0.77	0.14	0.10	0.79	0.17	0.04
1700	Cardiganshire	0.81	0.07	0.12	0.83	0.10	0.06
1710	Cardiganshire	0.69	0.12	0.19	0.72	0.15	0.13
1720	Cardiganshire	0.75	0.08	0.17	0.79	0.11	0.10
1730	Cardiganshire	0.67	0.10	0.24	0.70	0.13	0.17
1740	Cardiganshire	0.64	0.15	0.21	0.67	0.18	0.14
1750	Cardiganshire	0.58	0.12	0.30	0.62	0.15	0.22
1760	Cardiganshire	0.73	0.10	0.17	0.78	0.14	0.09
1770	Cardiganshire	0.70	0.12	0.17	0.75	0.16	0.09
1780	Cardiganshire	0.68	0.14	0.18	0.73	0.17	0.10
1580	Carmarthenshire	0.70	0.21	0.09	0.72	0.24	0.04
1590	Carmarthenshire	0.80	0.08	0.13	0.81	0.11	0.08
1600	Carmarthenshire	0.80	0.06	0.14	0.82	0.09	0.09
1610	Carmarthenshire	0.73	0.09	0.18	0.75	0.12	0.13
1620	Carmarthenshire	0.80	0.09	0.11	0.82	0.12	0.06
1640	Carmarthenshire	0.77	0.13	0.10	0.79	0.16	0.05
1650	Carmarthenshire	0.83	0.09	0.08	0.84	0.12	0.03
1660	Carmarthenshire	0.75	0.13	0.12	0.77	0.16	0.07
1670	Carmarthenshire	0.72	0.12	0.16	0.74	0.15	0.10
1680	Carmarthenshire	0.79	0.10	0.12	0.81	0.13	0.06
1690	Carmarthenshire	0.75	0.12	0.13	0.77	0.15	0.07
1700	Carmarthenshire	0.79	0.12	0.09	0.80	0.16	0.04
1710	Carmarthenshire	0.71	0.17	0.12	0.73	0.20	0.07
1720	Carmarthenshire	0.64	0.15	0.21	0.67	0.19	0.14
1730	Carmarthenshire	0.63	0.18	0.19	0.66	0.22	0.12
1740	Carmarthenshire	0.65	0.15	0.20	0.68	0.19	0.13
1750	Carmarthenshire	0.75	0.12	0.13	0.77	0.16	0.07
1760	Carmarthenshire	0.72	0.14	0.14	0.74	0.18	0.08
1770	Carmarthenshire	0.72	0.13	0.15	0.75	0.17	0.08
1780	Carmarthenshire	0.73	0.13	0.14	0.75	0.17	0.08
1570	Cheshire	0.85	0.08	0.07	0.85	0.12	0.04
1580	Cheshire	0.76	0.12	0.12	0.76	0.15	0.09
1590	Cheshire	0.79	0.13	0.08	0.79	0.15	0.06

1600	Cheshire	0.78	0.13	0.09	0.78	0.16	0.06
1610	Cheshire	0.79	0.10	0.10	0.79	0.14	0.07
1620	Cheshire	0.76	0.14	0.10	0.76	0.18	0.06
1640	Cheshire	0.69	0.18	0.12	0.70	0.22	0.08
1650	Cheshire	0.70	0.18	0.12	0.70	0.21	0.09
1660	Cheshire	0.70	0.17	0.13	0.70	0.21	0.09
1670	Cheshire	0.68	0.19	0.13	0.69	0.22	0.09
1680	Cheshire	0.64	0.20	0.16	0.65	0.24	0.11
1690	Cheshire	0.64	0.20	0.15	0.65	0.25	0.10
1700	Cheshire	0.68	0.19	0.13	0.69	0.23	0.09
1710	Cheshire	0.64	0.19	0.16	0.65	0.23	0.12
1720	Cheshire	0.57	0.22	0.21	0.58	0.27	0.14
1730	Cheshire	0.58	0.23	0.19	0.59	0.28	0.12
1740	Cheshire	0.56	0.26	0.18	0.58	0.30	0.12
1750	Cheshire	0.59	0.22	0.18	0.60	0.27	0.13
1760	Cheshire	0.57	0.24	0.20	0.58	0.29	0.13
1770	Cheshire	0.54	0.27	0.19	0.55	0.33	0.12
1780	Cheshire	0.54	0.25	0.21	0.55	0.31	0.14
1610	Cumberland	0.82	0.10	0.09	0.83	0.13	0.04
1640	Cumberland	0.77	0.14	0.09	0.78	0.17	0.05
1650	Cumberland	0.80	0.14	0.07	0.80	0.17	0.03
1660	Cumberland	0.78	0.15	0.07	0.79	0.19	0.02
1670	Cumberland	0.85	0.09	0.06	0.86	0.13	0.02
1680	Cumberland	0.76	0.11	0.13	0.78	0.15	0.07
1690	Cumberland	0.76	0.12	0.11	0.78	0.16	0.06
1700	Cumberland	0.80	0.10	0.09	0.82	0.14	0.04
1710	Cumberland	0.73	0.15	0.12	0.75	0.19	0.06
1720	Cumberland	0.66	0.19	0.15	0.70	0.23	0.08
1550	Denbighshire	0.76	0.05	0.19	0.76	0.07	0.17
1610	Denbighshire	0.65	0.22	0.13	0.65	0.24	0.11
1620	Denbighshire	0.70	0.17	0.13	0.69	0.19	0.11
1640	Denbighshire	0.55	0.27	0.18	0.55	0.29	0.17
1650	Denbighshire	0.61	0.26	0.12	0.60	0.28	0.11
1660	Denbighshire	0.66	0.19	0.15	0.65	0.22	0.13
1670	Denbighshire	0.70	0.17	0.13	0.69	0.19	0.12
1680	Denbighshire	0.73	0.17	0.09	0.72	0.20	0.08
1690	Denbighshire	0.71	0.18	0.11	0.70	0.20	0.10
1700	Denbighshire	0.72	0.19	0.09	0.71	0.21	0.08
1710	Denbighshire	0.69	0.19	0.12	0.68	0.21	0.11
1720	Denbighshire	0.64	0.24	0.13	0.63	0.26	0.11
1730	Denbighshire	0.65	0.21	0.14	0.64	0.23	0.13
1740	Denbighshire	0.70	0.20	0.10	0.68	0.22	0.09
1750	Denbighshire	0.70	0.17	0.13	0.69	0.19	0.12
1760	Denbighshire	0.74	0.13	0.12	0.73	0.16	0.11
1770	Denbighshire	0.71	0.18	0.11	0.70	0.20	0.10
1780	Denbighshire	0.65	0.19	0.16	0.64	0.21	0.15

1640	Derbyshire	0.64	0.27	0.09	0.64	0.32	0.04
1650	Derbyshire	0.65	0.25	0.10	0.65	0.30	0.05
1560	Durham	0.67	0.15	0.17	0.69	0.19	0.12
1590	Durham	0.68	0.18	0.15	0.69	0.22	0.09
1610	Durham	0.73	0.17	0.09	0.74	0.22	0.04
1640	Durham	0.58	0.28	0.14	0.60	0.33	0.07
1650	Durham	0.57	0.31	0.12	0.59	0.35	0.06
1660	Durham	0.62	0.28	0.10	0.63	0.33	0.04
1670	Durham	0.41	0.31	0.27	0.44	0.36	0.20
1680	Durham	0.39	0.28	0.32	0.43	0.33	0.24
1690	Durham	0.56	0.24	0.21	0.58	0.29	0.13
1700	Durham	0.56	0.28	0.16	0.58	0.33	0.08
1710	Durham	0.49	0.28	0.23	0.52	0.33	0.15
1720	Durham	0.35	0.31	0.34	0.39	0.36	0.24
1730	Durham	0.43	0.32	0.25	0.47	0.37	0.16
1740	Durham	0.45	0.30	0.24	0.49	0.36	0.16
1750	Durham	0.45	0.30	0.25	0.49	0.35	0.16
1760	Durham	0.38	0.29	0.33	0.42	0.35	0.23
1770	Durham	0.36	0.31	0.34	0.40	0.37	0.23
1780	Durham	0.37	0.30	0.34	0.41	0.35	0.24
1520	Essex	0.58	0.25	0.16	0.60	0.28	0.12
1530	Essex	0.66	0.22	0.12	0.67	0.24	0.09
1540	Essex	0.68	0.21	0.12	0.69	0.23	0.08
1550	Essex	0.65	0.21	0.14	0.66	0.24	0.10
1560	Essex	0.66	0.22	0.11	0.67	0.25	0.09
1570	Essex	0.64	0.24	0.11	0.65	0.26	0.08
1580	Essex	0.66	0.22	0.11	0.67	0.25	0.08
1590	Essex	0.68	0.22	0.09	0.69	0.24	0.06
1600	Essex	0.66	0.24	0.10	0.66	0.27	0.07
1610	Essex	0.67	0.24	0.09	0.68	0.26	0.06
1620	Essex	0.65	0.25	0.11	0.66	0.28	0.07
1630	Essex	0.62	0.25	0.13	0.63	0.28	0.09
1640	Essex	0.58	0.32	0.10	0.60	0.34	0.06
1650	Essex	0.57	0.28	0.15	0.59	0.31	0.11
1660	Essex	0.51	0.32	0.17	0.53	0.35	0.12
1670	Essex	0.50	0.29	0.22	0.52	0.32	0.16
1680	Essex	0.51	0.29	0.19	0.54	0.32	0.14
1690	Essex	0.51	0.30	0.19	0.53	0.33	0.14
1700	Essex	0.54	0.28	0.18	0.57	0.31	0.13
1710	Essex	0.51	0.28	0.21	0.53	0.31	0.16
1720	Essex	0.48	0.30	0.22	0.51	0.33	0.16
1730	Essex	0.50	0.27	0.24	0.53	0.30	0.18
1740	Essex	0.53	0.27	0.21	0.56	0.30	0.15
1750	Essex	0.55	0.22	0.23	0.58	0.25	0.17
1760	Essex	0.51	0.26	0.23	0.54	0.30	0.17
1770	Essex	0.54	0.24	0.22	0.57	0.27	0.16

1780	Essex	0.55	0.25	0.20	0.58	0.28	0.14
1560	Flintshire	0.78	0.07	0.15	0.79	0.12	0.10
1590	Flintshire	0.83	0.15	0.02	0.84	0.19	-0.04
1600	Flintshire	0.81	0.16	0.02	0.83	0.21	-0.04
1610	Flintshire	0.81	0.07	0.12	0.82	0.12	0.06
1620	Flintshire	0.68	0.13	0.20	0.69	0.18	0.13
1640	Flintshire	0.72	0.11	0.17	0.73	0.16	0.11
1650	Flintshire	0.72	0.14	0.14	0.73	0.20	0.08
1660	Flintshire	0.69	0.14	0.17	0.70	0.20	0.10
1670	Flintshire	0.74	0.14	0.13	0.74	0.20	0.06
1680	Flintshire	0.71	0.12	0.18	0.71	0.18	0.10
1690	Flintshire	0.84	0.09	0.07	0.84	0.16	0.01
1700	Flintshire	0.71	0.18	0.11	0.71	0.24	0.04
1710	Flintshire	0.71	0.21	0.09	0.71	0.27	0.02
1720	Flintshire	0.64	0.25	0.11	0.65	0.32	0.04
1730	Flintshire	0.60	0.28	0.12	0.61	0.35	0.04
1740	Flintshire	0.61	0.28	0.11	0.62	0.35	0.03
1750	Flintshire	0.68	0.20	0.12	0.68	0.27	0.05
1760	Flintshire	0.65	0.22	0.13	0.65	0.30	0.06
1770	Flintshire	0.65	0.23	0.12	0.64	0.31	0.05
1780	Flintshire	0.61	0.25	0.14	0.60	0.33	0.07
1610	Glamorganshire	0.65	0.17	0.18	0.67	0.21	0.12
1620	Glamorganshire	0.70	0.12	0.18	0.72	0.16	0.11
1630	Glamorganshire	0.77	0.08	0.15	0.79	0.13	0.08
1640	Glamorganshire	0.74	0.13	0.13	0.75	0.18	0.07
1650	Glamorganshire	0.67	0.12	0.21	0.69	0.16	0.15
1660	Glamorganshire	0.65	0.18	0.17	0.67	0.22	0.10
1670	Glamorganshire	0.69	0.13	0.18	0.70	0.17	0.12
1680	Glamorganshire	0.70	0.13	0.18	0.72	0.17	0.12
1690	Glamorganshire	0.66	0.14	0.20	0.68	0.19	0.13
1700	Glamorganshire	0.69	0.15	0.16	0.71	0.19	0.10
1710	Glamorganshire	0.60	0.21	0.18	0.63	0.26	0.11
1720	Glamorganshire	0.58	0.12	0.30	0.60	0.17	0.23
1730	Glamorganshire	0.61	0.20	0.19	0.63	0.25	0.12
1740	Glamorganshire	0.63	0.16	0.21	0.66	0.21	0.14
1750	Glamorganshire	0.65	0.15	0.21	0.67	0.20	0.13
1760	Glamorganshire	0.66	0.15	0.19	0.69	0.20	0.12
1770	Glamorganshire	0.63	0.15	0.22	0.65	0.20	0.14
1780	Glamorganshire	0.64	0.18	0.17	0.66	0.24	0.11
1530	Gloucestershire	0.62	0.18	0.20	0.64	0.20	0.15
1540	Gloucestershire	0.69	0.18	0.13	0.71	0.21	0.09
1550	Gloucestershire	0.65	0.23	0.12	0.66	0.25	0.09
1560	Gloucestershire	0.67	0.22	0.11	0.68	0.24	0.08
1570	Gloucestershire	0.71	0.20	0.09	0.72	0.22	0.06
1580	Gloucestershire	0.71	0.21	0.08	0.72	0.24	0.05
1590	Gloucestershire	0.68	0.23	0.09	0.69	0.25	0.06

1600	Gloucestershire	0.69	0.21	0.10	0.70	0.24	0.06
1610	Gloucestershire	0.66	0.22	0.13	0.66	0.24	0.09
1620	Gloucestershire	0.59	0.27	0.14	0.60	0.30	0.10
1630	Gloucestershire	0.61	0.25	0.15	0.62	0.28	0.10
1640	Gloucestershire	0.58	0.28	0.14	0.60	0.30	0.10
1650	Gloucestershire	0.53	0.32	0.14	0.55	0.35	0.10
1660	Gloucestershire	0.51	0.33	0.16	0.52	0.36	0.12
1670	Gloucestershire	0.48	0.34	0.18	0.50	0.37	0.14
1680	Gloucestershire	0.43	0.38	0.19	0.45	0.40	0.15
1690	Gloucestershire	0.47	0.37	0.16	0.49	0.39	0.12
1700	Gloucestershire	0.48	0.38	0.14	0.50	0.40	0.09
1710	Gloucestershire	0.40	0.40	0.20	0.43	0.43	0.14
1720	Gloucestershire	0.36	0.40	0.24	0.39	0.44	0.17
1730	Gloucestershire	0.34	0.40	0.25	0.38	0.44	0.18
1740	Gloucestershire	0.39	0.39	0.22	0.43	0.43	0.14
1750	Gloucestershire	0.20	0.34	0.47	0.24	0.38	0.38
1760	Gloucestershire	0.21	0.34	0.45	0.25	0.40	0.35
1770	Gloucestershire	0.17	0.31	0.51	0.21	0.37	0.42
1540	Hampshire	0.66	0.19	0.15	0.66	0.23	0.11
1550	Hampshire	0.71	0.19	0.10	0.70	0.23	0.07
1560	Hampshire	0.74	0.18	0.09	0.73	0.22	0.05
1570	Hampshire	0.73	0.19	0.08	0.73	0.23	0.04
1580	Hampshire	0.75	0.17	0.08	0.74	0.21	0.05
1590	Hampshire	0.77	0.16	0.07	0.76	0.20	0.03
1600	Hampshire	0.73	0.19	0.08	0.73	0.24	0.04
1610	Hampshire	0.74	0.19	0.07	0.74	0.23	0.03
1620	Hampshire	0.71	0.21	0.08	0.71	0.25	0.03
1630	Hampshire	0.66	0.20	0.15	0.66	0.24	0.09
1640	Hampshire	0.66	0.22	0.13	0.66	0.26	0.07
1650	Hampshire	0.59	0.26	0.14	0.60	0.31	0.09
1660	Hampshire	0.61	0.26	0.12	0.62	0.31	0.07
1670	Hampshire	0.54	0.29	0.17	0.55	0.34	0.11
1680	Hampshire	0.49	0.28	0.22	0.51	0.33	0.16
1690	Hampshire	0.49	0.28	0.23	0.51	0.32	0.17
1700	Hampshire	0.46	0.31	0.23	0.47	0.35	0.17
1710	Hampshire	0.46	0.30	0.24	0.48	0.35	0.17
1720	Hampshire	0.33	0.35	0.32	0.35	0.39	0.25
1730	Hampshire	0.40	0.36	0.23	0.43	0.41	0.16
1740	Hampshire	0.42	0.37	0.22	0.44	0.42	0.14
1750	Hampshire	0.42	0.35	0.23	0.44	0.41	0.15
1760	Hampshire	0.38	0.36	0.26	0.41	0.43	0.16
1770	Hampshire	0.38	0.36	0.27	0.41	0.42	0.17
1520	Herefordshire	0.75	0.05	0.20	0.81	0.07	0.12
1530	Herefordshire	0.76	0.07	0.17	0.79	0.09	0.11
1540	Herefordshire	0.80	0.07	0.13	0.82	0.10	0.08
1550	Herefordshire	0.81	0.08	0.11	0.82	0.10	0.07

1560	Herefordshire	0.83	0.11	0.06	0.83	0.14	0.03
1570	Herefordshire	0.81	0.15	0.04	0.81	0.17	0.01
1580	Herefordshire	0.79	0.15	0.06	0.79	0.18	0.03
1590	Herefordshire	0.80	0.15	0.04	0.79	0.19	0.02
1600	Herefordshire	0.81	0.13	0.06	0.80	0.17	0.03
1610	Herefordshire	0.77	0.16	0.07	0.76	0.20	0.04
1620	Herefordshire	0.76	0.16	0.09	0.75	0.20	0.05
1630	Herefordshire	0.77	0.15	0.08	0.76	0.20	0.04
1640	Herefordshire	0.73	0.20	0.07	0.72	0.24	0.04
1650	Herefordshire	0.72	0.20	0.07	0.72	0.23	0.05
1660	Herefordshire	0.73	0.20	0.06	0.73	0.24	0.04
1670	Herefordshire	0.74	0.18	0.08	0.74	0.22	0.04
1520	Hertfordshire	0.65	0.16	0.20	0.67	0.19	0.14
1530	Hertfordshire	0.77	0.14	0.09	0.78	0.17	0.05
1540	Hertfordshire	0.62	0.24	0.14	0.64	0.27	0.09
1550	Hertfordshire	0.51	0.34	0.14	0.54	0.37	0.10
1560	Hertfordshire	0.65	0.26	0.09	0.67	0.29	0.05
1570	Hertfordshire	0.66	0.25	0.08	0.68	0.28	0.04
1580	Hertfordshire	0.66	0.27	0.08	0.67	0.29	0.04
1590	Hertfordshire	0.63	0.28	0.09	0.64	0.30	0.06
1600	Hertfordshire	0.60	0.28	0.12	0.61	0.31	0.08
1610	Hertfordshire	0.62	0.26	0.12	0.64	0.28	0.08
1620	Hertfordshire	0.62	0.24	0.14	0.64	0.28	0.08
1630	Hertfordshire	0.64	0.25	0.11	0.66	0.28	0.06
1640	Hertfordshire	0.58	0.31	0.11	0.60	0.33	0.06
1650	Hertfordshire	0.51	0.33	0.15	0.54	0.36	0.10
1660	Hertfordshire	0.49	0.33	0.17	0.52	0.36	0.11
1670	Hertfordshire	0.49	0.35	0.16	0.52	0.38	0.10
1680	Hertfordshire	0.49	0.29	0.22	0.52	0.33	0.15
1690	Hertfordshire	0.46	0.34	0.20	0.50	0.37	0.14
1700	Hertfordshire	0.47	0.33	0.20	0.51	0.36	0.13
1710	Hertfordshire	0.40	0.35	0.25	0.44	0.38	0.18
1720	Hertfordshire	0.35	0.39	0.26	0.40	0.42	0.18
1730	Hertfordshire	0.38	0.33	0.29	0.43	0.37	0.21
1740	Hertfordshire	0.37	0.35	0.28	0.42	0.39	0.19
1750	Hertfordshire	0.41	0.33	0.26	0.46	0.37	0.17
1760	Hertfordshire	0.42	0.30	0.28	0.47	0.34	0.19
1770	Hertfordshire	0.42	0.29	0.29	0.47	0.34	0.19
1780	Hertfordshire	0.42	0.30	0.28	0.47	0.35	0.18
1640	Lancashire	0.82	0.14	0.04	0.81	0.17	0.02
1650	Lancashire	0.78	0.16	0.07	0.77	0.19	0.05
1700	Lancashire	0.76	0.15	0.09	0.76	0.19	0.05
1710	Lancashire	0.61	0.21	0.18	0.63	0.25	0.12
1610	Merionethshire	0.65	0.20	0.15	0.66	0.24	0.11
1640	Merionethshire	0.79	0.09	0.12	0.79	0.12	0.09
1650	Merionethshire	0.84	0.13	0.03	0.83	0.16	0.01

1660	Merionethshire	0.85	0.07	0.08	0.84	0.10	0.06
1670	Merionethshire	0.84	0.13	0.03	0.83	0.16	0.01
1680	Merionethshire	0.79	0.13	0.07	0.78	0.16	0.05
1690	Merionethshire	0.86	0.08	0.06	0.85	0.11	0.04
1700	Merionethshire	0.87	0.09	0.03	0.86	0.13	0.01
1710	Merionethshire	0.86	0.08	0.07	0.84	0.11	0.05
1720	Merionethshire	0.77	0.14	0.09	0.77	0.17	0.07
1730	Merionethshire	0.77	0.15	0.08	0.76	0.18	0.06
1740	Merionethshire	0.82	0.11	0.07	0.81	0.14	0.05
1750	Merionethshire	0.80	0.12	0.08	0.79	0.15	0.06
1760	Merionethshire	0.83	0.08	0.09	0.82	0.11	0.06
1770	Merionethshire	0.81	0.10	0.10	0.80	0.13	0.07
1780	Merionethshire	0.72	0.15	0.13	0.72	0.18	0.10
1560	Montgomeryshire	0.80	0.20	0.00	0.78	0.24	-0.02
1610	Montgomeryshire	0.72	0.19	0.09	0.71	0.23	0.06
1620	Montgomeryshire	0.63	0.21	0.16	0.63	0.25	0.12
1630	Montgomeryshire	0.75	0.18	0.07	0.74	0.23	0.03
1640	Montgomeryshire	0.69	0.20	0.11	0.69	0.24	0.07
1650	Montgomeryshire	0.71	0.19	0.09	0.71	0.23	0.06
1660	Montgomeryshire	0.72	0.22	0.07	0.72	0.25	0.03
1670	Montgomeryshire	0.75	0.17	0.08	0.74	0.21	0.04
1680	Montgomeryshire	0.81	0.12	0.07	0.81	0.17	0.03
1690	Montgomeryshire	0.78	0.13	0.09	0.78	0.17	0.05
1700	Montgomeryshire	0.75	0.19	0.07	0.75	0.23	0.03
1710	Montgomeryshire	0.74	0.17	0.10	0.74	0.21	0.05
1720	Montgomeryshire	0.67	0.23	0.10	0.68	0.27	0.05
1730	Montgomeryshire	0.74	0.17	0.09	0.75	0.21	0.04
1740	Montgomeryshire	0.67	0.19	0.13	0.68	0.24	0.08
1750	Montgomeryshire	0.71	0.17	0.12	0.72	0.22	0.07
1760	Montgomeryshire	0.79	0.13	0.08	0.79	0.18	0.03
1770	Montgomeryshire	0.68	0.18	0.15	0.69	0.22	0.09
1780	Montgomeryshire	0.69	0.17	0.15	0.70	0.21	0.09
1560	Northumberland	0.39	0.30	0.30	0.44	0.35	0.21
1590	Northumberland	0.48	0.29	0.23	0.52	0.34	0.14
1610	Northumberland	0.44	0.29	0.27	0.48	0.34	0.18
1640	Northumberland	0.42	0.30	0.28	0.46	0.35	0.19
1650	Northumberland	0.40	0.31	0.29	0.45	0.36	0.20
1660	Northumberland	0.46	0.33	0.22	0.50	0.38	0.12
1670	Northumberland	0.36	0.29	0.35	0.41	0.34	0.25
1680	Northumberland	0.33	0.29	0.38	0.38	0.34	0.28
1780	Northumberland	0.40	0.24	0.36	0.46	0.28	0.26
1520	Oxfordshire	0.53	0.10	0.37	0.58	0.15	0.28
1530	Oxfordshire	0.62	0.11	0.27	0.64	0.14	0.21
1540	Oxfordshire	0.68	0.16	0.16	0.71	0.20	0.08
1550	Oxfordshire	0.65	0.17	0.17	0.67	0.22	0.11
1560	Oxfordshire	0.72	0.19	0.09	0.73	0.23	0.05

1570	Oxfordshire	0.73	0.18	0.09	0.73	0.23	0.04
1580	Oxfordshire	0.72	0.20	0.08	0.72	0.25	0.03
1590	Oxfordshire	0.69	0.22	0.09	0.68	0.27	0.05
1600	Oxfordshire	0.66	0.25	0.09	0.66	0.30	0.04
1610	Oxfordshire	0.65	0.25	0.10	0.64	0.29	0.06
1620	Oxfordshire	0.61	0.26	0.13	0.60	0.32	0.08
1630	Oxfordshire	0.68	0.20	0.13	0.67	0.27	0.07
1640	Oxfordshire	0.60	0.27	0.13	0.59	0.33	0.08
1650	Oxfordshire	0.57	0.29	0.13	0.56	0.35	0.09
1660	Oxfordshire	0.55	0.31	0.14	0.54	0.37	0.09
1670	Oxfordshire	0.52	0.34	0.14	0.51	0.40	0.09
1680	Oxfordshire	0.54	0.32	0.14	0.53	0.38	0.09
1690	Oxfordshire	0.50	0.36	0.15	0.49	0.41	0.09
1700	Oxfordshire	0.50	0.34	0.16	0.50	0.40	0.10
1710	Oxfordshire	0.44	0.37	0.19	0.44	0.43	0.12
1720	Oxfordshire	0.41	0.41	0.18	0.42	0.47	0.11
1730	Oxfordshire	0.42	0.37	0.21	0.43	0.43	0.14
1740	Oxfordshire	0.43	0.36	0.20	0.44	0.43	0.12
1750	Oxfordshire	0.46	0.32	0.22	0.47	0.40	0.13
1760	Oxfordshire	0.48	0.28	0.24	0.49	0.36	0.15
1770	Oxfordshire	0.45	0.31	0.24	0.47	0.39	0.14
1780	Oxfordshire	0.48	0.30	0.22	0.50	0.39	0.11
1580	Pembrokeshire	0.81	0.08	0.12	0.81	0.10	0.09
1590	Pembrokeshire	0.66	0.17	0.17	0.67	0.19	0.14
1600	Pembrokeshire	0.80	0.09	0.11	0.82	0.12	0.07
1640	Pembrokeshire	0.65	0.17	0.19	0.68	0.18	0.14
1650	Pembrokeshire	0.60	0.19	0.21	0.63	0.20	0.17
1660	Pembrokeshire	0.63	0.19	0.17	0.67	0.21	0.12
1670	Pembrokeshire	0.62	0.15	0.22	0.66	0.17	0.17
1680	Pembrokeshire	0.60	0.15	0.25	0.64	0.17	0.18
1690	Pembrokeshire	0.54	0.11	0.35	0.58	0.14	0.28
1700	Pembrokeshire	0.57	0.14	0.29	0.62	0.16	0.22
1710	Pembrokeshire	0.55	0.10	0.34	0.60	0.13	0.27
1720	Pembrokeshire	0.33	0.10	0.57	0.39	0.13	0.49
1730	Pembrokeshire	0.42	0.12	0.46	0.48	0.15	0.38
1740	Pembrokeshire	0.37	0.17	0.46	0.42	0.19	0.38
1750	Pembrokeshire	0.51	0.25	0.25	0.56	0.27	0.18
1770	Pembrokeshire	0.58	0.17	0.25	0.62	0.19	0.19
1780	Pembrokeshire	0.61	0.18	0.21	0.64	0.20	0.16
1630	Radnorshire	0.83	0.09	0.08	0.84	0.12	0.04
1640	Radnorshire	0.86	0.12	0.02	0.86	0.14	0.00
1650	Radnorshire	0.82	0.12	0.06	0.83	0.13	0.04
1660	Radnorshire	0.77	0.16	0.07	0.77	0.18	0.05
1670	Radnorshire	0.83	0.12	0.05	0.83	0.14	0.03
1680	Radnorshire	0.87	0.09	0.03	0.88	0.12	0.01
1690	Radnorshire	0.82	0.12	0.06	0.82	0.14	0.03

1700	Radnorshire	0.87	0.09	0.04	0.88	0.11	0.01
1710	Radnorshire	0.85	0.09	0.07	0.85	0.11	0.04
1720	Radnorshire	0.85	0.11	0.04	0.85	0.13	0.02
1730	Radnorshire	0.81	0.13	0.06	0.82	0.15	0.03
1740	Radnorshire	0.82	0.14	0.05	0.83	0.16	0.02
1750	Radnorshire	0.85	0.08	0.07	0.85	0.11	0.04
1760	Radnorshire	0.75	0.19	0.05	0.77	0.21	0.02
1770	Radnorshire	0.88	0.09	0.03	0.89	0.11	0.00
1780	Radnorshire	0.83	0.07	0.10	0.84	0.10	0.06
1640	Shropshire	0.57	0.28	0.14	0.59	0.33	0.08
1650	Shropshire	0.62	0.25	0.14	0.63	0.30	0.07
1660	Shropshire	0.53	0.32	0.15	0.55	0.37	0.08
1520	Suffolk	0.53	0.29	0.18	0.57	0.33	0.10
1530	Suffolk	0.57	0.24	0.19	0.59	0.27	0.13
1540	Suffolk	0.57	0.26	0.17	0.60	0.30	0.10
1550	Suffolk	0.60	0.25	0.16	0.62	0.28	0.10
1560	Suffolk	0.60	0.25	0.14	0.62	0.28	0.09
1570	Suffolk	0.64	0.26	0.11	0.66	0.29	0.06
1580	Suffolk	0.64	0.25	0.12	0.66	0.28	0.06
1590	Suffolk	0.64	0.25	0.11	0.65	0.28	0.07
1600	Suffolk	0.64	0.25	0.11	0.66	0.28	0.06
1610	Suffolk	0.62	0.26	0.12	0.64	0.28	0.08
1620	Suffolk	0.60	0.26	0.14	0.62	0.30	0.08
1630	Suffolk	0.60	0.25	0.15	0.63	0.29	0.09
1640	Suffolk	0.58	0.29	0.13	0.60	0.32	0.08
1650	Suffolk	0.53	0.31	0.16	0.56	0.34	0.10
1660	Suffolk	0.51	0.32	0.17	0.54	0.35	0.10
1670	Suffolk	0.48	0.32	0.21	0.51	0.35	0.13
1540	Surrey	0.50	0.35	0.15	0.52	0.38	0.09
1550	Surrey	0.57	0.28	0.14	0.60	0.32	0.08
1560	Surrey	0.53	0.33	0.14	0.56	0.37	0.07
1570	Surrey	0.56	0.29	0.14	0.60	0.33	0.07
1580	Surrey	0.57	0.28	0.15	0.61	0.32	0.07
1590	Surrey	0.57	0.26	0.16	0.61	0.31	0.08
1600	Surrey	0.49	0.32	0.19	0.54	0.36	0.10
1610	Surrey	0.59	0.26	0.15	0.64	0.31	0.05
1620	Surrey	0.53	0.26	0.21	0.59	0.31	0.10
1630	Surrey	0.47	0.31	0.21	0.54	0.36	0.10
1640	Surrey	0.40	0.34	0.27	0.47	0.38	0.15
1650	Surrey	0.37	0.32	0.31	0.44	0.37	0.19
1660	Surrey	0.39	0.30	0.31	0.46	0.36	0.18
1670	Surrey	0.27	0.28	0.45	0.34	0.33	0.33
1680	Surrey	0.27	0.28	0.45	0.35	0.33	0.32
1690	Surrey	0.29	0.32	0.39	0.37	0.38	0.26
1700	Surrey	0.26	0.34	0.40	0.34	0.39	0.27
1710	Surrey	0.26	0.36	0.37	0.34	0.42	0.24

1720	Surrey	0.21	0.36	0.43	0.29	0.42	0.29
1730	Surrey	0.24	0.40	0.37	0.31	0.46	0.23
1740	Surrey	0.26	0.38	0.37	0.33	0.45	0.22
1750	Surrey	0.26	0.38	0.36	0.33	0.44	0.22
1760	Surrey	0.26	0.36	0.38	0.34	0.43	0.23
1770	Surrey	0.23	0.39	0.38	0.31	0.46	0.23
1780	Surrey	0.24	0.38	0.38	0.31	0.45	0.23
1630	Warwickshire	0.70	0.22	0.08	0.70	0.26	0.04
1600	Westmorland	0.75	0.17	0.07	0.76	0.21	0.03
1610	Westmorland	0.71	0.22	0.07	0.72	0.25	0.04
1620	Westmorland	0.65	0.25	0.10	0.65	0.29	0.06
1640	Westmorland	0.80	0.18	0.02	0.79	0.21	0.00
1650	Westmorland	0.80	0.15	0.05	0.80	0.18	0.02
1660	Westmorland	0.78	0.17	0.05	0.77	0.21	0.02
1670	Westmorland	0.81	0.15	0.04	0.81	0.18	0.01
1680	Westmorland	0.73	0.22	0.05	0.73	0.25	0.01
1690	Westmorland	0.77	0.15	0.08	0.77	0.19	0.04
1700	Westmorland	0.78	0.17	0.05	0.78	0.20	0.02
1710	Westmorland	0.72	0.19	0.09	0.73	0.22	0.05
1720	Westmorland	0.72	0.18	0.09	0.74	0.21	0.05
1580	Wiltshire	0.72	0.22	0.06	0.72	0.26	0.03
1590	Wiltshire	0.69	0.25	0.06	0.69	0.29	0.02
1600	Wiltshire	0.68	0.25	0.07	0.68	0.30	0.03
1610	Wiltshire	0.67	0.26	0.07	0.66	0.30	0.03
1620	Wiltshire	0.63	0.27	0.10	0.64	0.32	0.05
1630	Wiltshire	0.66	0.23	0.11	0.66	0.29	0.05
1640	Wiltshire	0.64	0.26	0.10	0.64	0.32	0.04
1650	Wiltshire	0.60	0.28	0.12	0.61	0.33	0.06
1660	Wiltshire	0.58	0.31	0.11	0.59	0.36	0.05
1670	Wiltshire	0.54	0.35	0.10	0.56	0.40	0.04
1680	Wiltshire	0.51	0.37	0.12	0.54	0.42	0.04
1690	Wiltshire	0.51	0.37	0.12	0.53	0.42	0.05
1700	Wiltshire	0.48	0.38	0.14	0.51	0.43	0.06
1710	Wiltshire	0.46	0.39	0.15	0.49	0.44	0.06
1720	Wiltshire	0.42	0.38	0.20	0.46	0.44	0.10
1730	Wiltshire	0.41	0.39	0.20	0.46	0.45	0.09
1740	Wiltshire	0.42	0.37	0.21	0.47	0.44	0.09
1750	Wiltshire	0.43	0.37	0.20	0.48	0.44	0.08
1760	Wiltshire	0.43	0.35	0.22	0.49	0.42	0.09
1770	Wiltshire	0.43	0.35	0.21	0.49	0.43	0.08
1780	Wiltshire	0.47	0.31	0.22	0.53	0.39	0.09
1520	Worcestershire	0.54	0.13	0.33	0.58	0.16	0.25
1530	Worcestershire	0.63	0.14	0.23	0.64	0.17	0.19
1540	Worcestershire	0.64	0.19	0.16	0.66	0.23	0.11
1550	Worcestershire	0.68	0.18	0.14	0.68	0.21	0.11
1560	Worcestershire	0.69	0.20	0.11	0.69	0.22	0.09

1570	Worcestershire	0.76	0.20	0.04	0.75	0.23	0.01
1580	Worcestershire	0.73	0.20	0.07	0.72	0.24	0.04
1590	Worcestershire	0.70	0.23	0.07	0.69	0.27	0.05
1600	Worcestershire	0.70	0.22	0.08	0.69	0.26	0.05
1610	Worcestershire	0.68	0.24	0.08	0.66	0.28	0.05
1620	Worcestershire	0.63	0.24	0.13	0.62	0.29	0.09
1630	Worcestershire	0.67	0.23	0.09	0.67	0.28	0.05

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